Research Article

Assembling of Desktop Computer System with In-Built Uninterrupted Power Supply (UPS)

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Abstract: Desktop computer system been DIY (assembled) or Branded has become sine-qua-non compare to other tools in business organizations like banks and schools. This desktop computer requires clean electricity power to operate. Supply of clean and un-interrupted electricity power is compulsory to keep computer running and also for maintains and preventing of components like HDD, RAM, and other electronics components and circuitry from damage and hazard. This gives the reasons why UPS is recommended for every desktop computer. This UPS comes as separate device connect to power source and computer system then connect to it for power source. The focus of this research work is to clone a PC (desktop) with in-built UPS. The work starts with case and power packs modification to accommodate the UPS and it circuitry system and the system is clone and tested to ascertain that it achieved the research aim and objectives.
Keywords: Desktop Computer, electricity power, UPS, IPO cycles.

INTRODUCTION

The use of computers has touched every part of our everyday lives, the way we work, learn or even play, it is almost impossible to go through a single day without encountering a computer. Modern computer system is electronic devices that obey IPO cycles based on predefine instructions [1]. A desktop computer is a personal computer designed for regular use at a single location on or near a desk or table due to its size and power requirements. Figure 1 illustrates a desktop computer. The most common configuration has a case that houses the power supply, motherboard (a printed circuit board with a microprocessor as the central processing unit (CPU), memory, bus, and other electronic components), disk storage The case may be oriented horizontally or vertically and placed either underneath, beside, or on top of a desk (Wikipedia n.d).

Fig-1: Desktop computer (Source: www.computerhope.com)

Desktop computer can be either clone (assembled or DIY desktop computers) or branded. Looking at the diagram in figure 1, we can see that UPS is not included, but it is an important component part require for desktop computer to work effectively.

The use of desktop computers is still very common among individuals, institutions, business organizations. None of this computer type comes with inbuilt UPS that supply power to it or protecting it from power interruption (Spike and Surge). This can result to hazard like: damages to components parts like HDD, RAM, CPU and other electronic circuitry in the system. The focus of this work is to a DIY desktop computer system with inbuilt UPS which will result to the following objectives: that will enable computer operator properly short down the system when there is power failure from the main source; and to protect data (documents file) and hardware from potential hazard from electricity power interruption.

LITERATURE REVIEW
Evolution of Desktop Computer System

HP 9830A, was actually an early desktop computer. Earlier to the widespread use of microprocessors, a computer that could fit on a desk was considered remarkably small; the type of computers most commonly used were minicomputers, which were themselves desk-sized. Early computers took up the space of a whole room. Minicomputers generally fit into one or a few refrigerator-sized racks. The very first "programmable calculator/computer" was marketed in the second half of the 1960s, starting with the Italian machinery Programma 101 (1965) computer at typewriter size. More desktop models were introduced in 1971, leading to a model programmable in BASIC in 1972. Throughout the 1980s and 1990s, desktop computers became the predominant type, the most popular being the IBM PC and its clones, followed by the Apple Macintosh, with the third-placed Commodore Amiga having some success in the mid-1980s but declining by the early 1990s. Early personal computers, like the original IBM Personal Computer, were enclosed in a "desktop case", horizontally oriented to have the display screen placed on top, thus saving space on the user's actual desk, although these cases had to be sturdy enough to support the weight of CRT displays that were widespread at the time. Over the course of the 1990s, desktop cases gradually became less common than the more-accessible tower cases that may be located on the floor under or beside a desk rather than on a desk. Creative Technology's Sound Blaster series were a de facto standard for sound cards in desktop PCs during the 1990s until the early 2000s, when they were reduced to a niche product, as OEM desktop PCs came with sound boards integrated directly onto the motherboard [2, 3].

DIY Versus Branded Desktop Computer

DIY (Do it yourself) desktop computer is the one where we buy all the components of a computer separately and assemble them to get-up to our tenacity, while branded computers are manufactured by a company e.g. HP, Dell, etc., Pluses of DIY desktop include: customize of it configuration; choosing of best of the breed components; selection of the components which are easy to upgrade in the future; getting a perfect PC for one requirement at a low budget. Disadvantage of assembled PC: Poor service support [4].

Uninterrupted Power Supply and It Function

An uninterruptible power supply, also uninterruptible power source is an electrical apparatus that provides emergency power to a load when the input power source or mains power fails. A UPS differs from an auxiliary or emergency power system or standby generator in that it will provide near-instantaneous protection from input power interruptions, by supplying energy stored in batteries, super capacitors, or flywheels. The on-battery runtime of most uninterruptible power sources is relatively short (only a few minutes) but sufficient to start a standby power source or properly shut down the protected equipment. A UPS is typically used to protect hardware such as computers, data centers, telecommunication equipment or other electrical equipment where an unexpected power disruption could cause injuries, fatalities, serious business disruption or data loss [5].

METHODOLOGY
Data Collection

The first step to building a computer is acquiring the parts which were carefully done by first considering the purpose of the computer to be coupled.

The core components were selected and listed as follows:

Power Supply/PSU – Power Supply Unit, converts outlet power, which is alternating current (AC), to direct current (DC) which is required by internal components, as well as providing appropriate voltages and currents for these internal components.

- Motherboard/mainboard – As the name indicates, this is the electronic centerpiece of the computer: everything else connects to the motherboard.
- Processor/CPU – central processing unit, the "brain" of the computer, most actual computation takes place here.
- RAM – random access memory, the "short-term memory" of a computer, used by the CPU to store program instructions and data upon which it is

currently operating. Data in RAM is lost when the computer is powered off, thus necessitating a hard drive.

- HDD (Hard disk drive - slower of the two but less expensive) and/or SSD (solid state drive. Very fast but not as cheap) – the "long-term memory" of the computer, used for persistent storage – i.e. the things stored on it remain even when the computer is powered down.
- Optical Drive – device for reading/writing optical disks. May read CDs, DVDs, or other optical media, depending on the type. It is essential for installing many operating systems and programs, although the vast majority can be run from USB. It may be able to write some of these discs, as well.

Some people like to have two such drives for copying disks.

Case and Power Supply Modification

The case will be modifying to accommodate the UPS battery, while the power pack will also be modifying to supply power to the UPS. This will be done by dismantling of case and find best location for the UPS battery and it circuit panel. More so, the UPS will be dismantling and transfer into the computer case as it will be implemented in chapter 4. Remove the empty computer case from its packaging. Unscrew and remove both side panels, and take out any items that may be inside. Lay the case down flat on your workspace, so that the mounting space for the motherboard is facing up (see figure 2).

Fig-2: Chassis Case with Power Supply Unit

Placing the converting unit of the UPS at the bottom left corner and the 12v battery at the bottom right corner with a plastic insulator to protect the battery in contacting with the converting unit. Much attention is needed here because proper connection needs to be done, be very much careful.

This section is a bit technical because you need to connect the **UPS DC to AC Convert Unit** inside the power supply unit. The Block Diagram below explains more on power conversion.
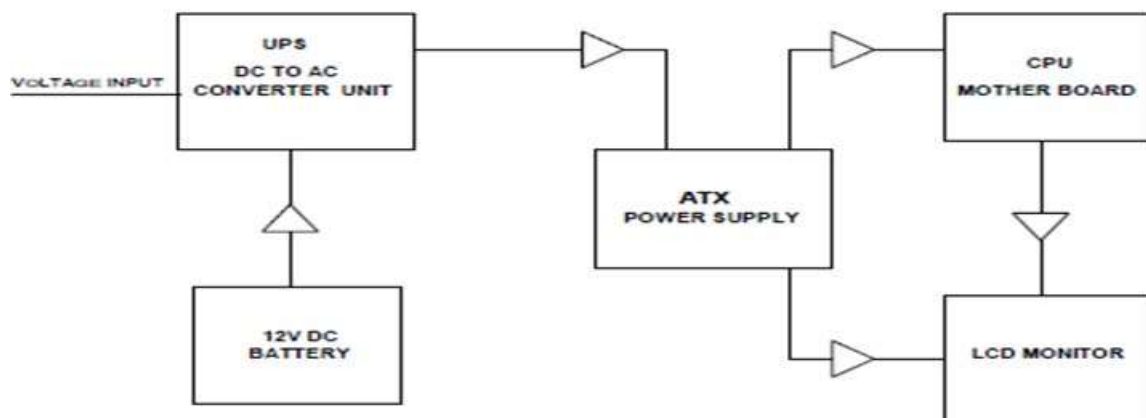

Fig-3: Block Diagram UPS Computer System

DIY Approach

There is no special approach for DIY desktop computer system; the method used here is as follows.

Preparing the case: Remove the modify computer case from its pack. Unscrew and remove both side panels, and take out any items that may be inside. Lay the case down flat on your workspace, so that the mounting space for the motherboard is facing up.

Installing Motherboard and CPU: Remove your motherboard from its packaging and lower it into the case. Line up the ports on the motherboard (PS/2, USB, etc.) with the appropriate holes in the back panel I/O shield of the case. Once the board is *temporarily* in place, observe which screw holes in the case line up with the holes in the motherboard. These are where you will need to place risers if they are not already pre-installed. Remove the motherboard and insert the risers in the appropriate screw holes, then placed back the motherboard and screw it to casing.

Installing RAM (Memory): All modern RAM (memory) is keyed so it can only fit into the DIMM slots in a certain way. With modern motherboards, it should not matter which slot you use, though if they are numbered in the manual or on the board, it is always a good idea to go with slot one first. Hold the RAM module next to the slot so that the indentation(s) on the green PCB line up with the bumps in the slot.
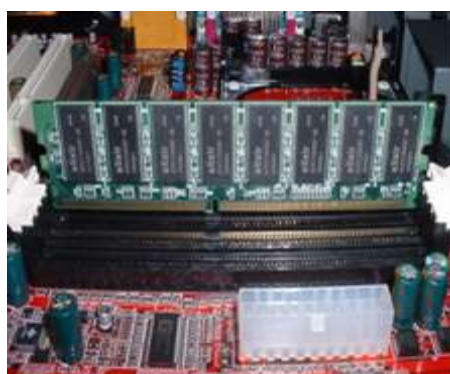

Fig-4: RAM (Memory) Installation

Installing the Hard Disk Drive CD Drive: check the bay available in the case for mounting of HDD and CD ROM drive. Some Case has more than one bay available for mounting the HDD and CD drive. Locate the best one for the available disks and mount it accordingly.

Finish up installing of the hardware's: Attach Cables and connector in the casing to all components in the casing. If your motherboard came with any extras, such as Modem or network adaptor riser cards, or additional USB ports on a mounting bracket, now's the time to plug them into the board (consult your manual for the correct locations) and screw them into any free mounting brackets you may have. Double-check all the wiring. Make sure all connections are firmly attached, and ensure that no wires are running close to the top of the CPU heat sink fan. You do NOT want to jam the CPU heat sink fan, especially with an AMD processor.

Powering up for the first time

Stand the case upright, if it is not already. Ensure that no wires are touching the CPU heat sink fan. Plug your monitor cable into the video card (VGA) port, and turn on the monitor. Plug your PS/2 (or USB) keyboard cable into the keyboard port. Plug in the power cord and switch the power supply switch to the on (|) position. Press the power button. If everything is connected as it should be, all system fans should start spinning, you should hear a single beep, and after about 5-10 seconds, the amber light on the monitor should go green, and you will see the computer start to boot. Depending on the manufacturer of the Motherboard, you may get a splash screen, or just a memory check. The system will then halt with an error because we have yet to install an operation system. If something has gone horribly wrong, just go straight down to the troubleshooting section.

Loading of the Operating System and application Software

After the system has certify booting processes and all is working fine, then the operating system needs to be installed and the computer system will be put into operation.

System Implementation & Testing

The final phase in the SDLC is the implementation phase, during which the system is actually built. The research method mentioned in chapter 3 is physically implemented and the new system is produced.

First we actualized the modification of casing to produce the new case with inbuilt power supply see figure 5.

Figure 5: Modified Computer case

The components acquired then installed in the modified case according to the lay down procedures earlier mentioned.

System Testing

System testing is to check if the system meets the functional requirement. Testing is conducted on a complete, integrated system to evaluate the system's compliance with its specific requirement.

After the installations of the components, the system was powered and put into operations for one hour. During this period, we OFF and ON the power sources at an interval of fifteen minutes. This is done to test if the system set to perform the main purpose of it design i.e to supply power to the system if outlet power is lost.
The system was also left for some times after the battery is fully charged to ascertain the validity period of the battery without power supply.

CONCLUSION AND RECOMMENDATION

We have been able to implement DIY desktop computer with in-built Un-Interrupter Power Supply. DIY desktop system is very important in a country like Nigeria where fluctuation and epileptic power supply is in vogue. Henceforth Uninterrupted Power Supply (UPS) most not be seen as computer peripherals again. It must be perceived as integral part of the system to enhance it functionality. Consequently, we recommend that branded PC manufacturers should come up with and in-built UPS desktop computer and computer case manufacturers should start to manufacture an inbuilt UPS compatible case so that assembling of desktop with inbuilt UPS can be done with ease.

REFERENCES
1. Awuor, F. M., Khisa, J. W., & Rambi, D. A. (2014). Delivering Equitable and Quality Education to Remote Kenya Using ICT. *Emerging Issues and Prospects in African E-Government*, 108.
2. Pingdom, R. (2013). Internet 2012 in numbers. *Available at royal. pingdom. com*.
3. Friedman, T. L. (2005). *The world is flat: A brief history of the twenty-first century*. Macmillan.
4. Waleed Abd Elrahman 2015. What are the differences between the branded computer machine and assembled computer? And what are those differences and advantages/disadvantages?
5. Yekini, N.A., & Ojo O. 2014. Computer Peripherals and their function PC upgrading and Maintenance. Hasfem publication Shomolu Lagos Nigeria.
6. Wikipedia (n.d) desktop computer available at https://en.wikipedia.org/wiki/Desktop_computer. Retrieved February 20, 2017
7. www.computerhope Desktop computer overview. Available http://www.computerhope.com/jargon/d/desktopc.htm. Retrieved January 29, 2017.