REPORT ON STUDENT INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES)

UNDERTAKEN AT

PC AID COMPUTER ENGINEERING,

3D, Baysal plaza, opp. MKO Abiola house,
Queen cinema, Ibadan, Oyo state.
Email: pcaidng@gmail.com

BY

MATTHEW OLUWADAMILARE AKANDE
17/67EC/727
Electrical and Computer Engineering,
Faculty of Engineering and Technology,
Kwara State University, Malete.

Being a report submitted to the SIWES unit, Kwara State University, Malete, Nigeria, in partial fulfilment of the requirements for the Student Industrial Work Experience Scheme (SIWES).

January 2022

DEDICATION

To my wonderful parents, who taught me that the largest task can be accomplished if one can work hard and remain committed to one's true self.

ABSTRACT

This report is based on the student industrial work experience scheme held at PC AID computer engineering located at queen cinema, Ibadan. It provides a brief explanation about the SIWES program such as its history, objectives, aims while also giving a description of the work done in PC AID computer engineering. It further focuses on the technical exposure gained from each department such as the marketing department, operation and procurement department, and training department. It finally gives account to some of the machine and equipment used in the various department as well as its function. It also provides insight in some of the challenges faced and gives a few recommendations on how to further improve the program.

ACKNOWLEDGEMENT

All praise and adoration are to God Almighty my creator, my strong pillar, my source of inspiration, wisdom, knowledge and understanding. He has been the source of my strength throughout this program.

I owe thanks to my parents for their unstinting support, co-operation, encouragement and understanding throughout the span of this program and many other close friends and family members.

I have taken effort in this report. However, it would not have been possible without the kind of roles played by all the technical staffs of PC AID computer engineering for their relentless supports, guidance, constant supervision, and explanation of work(s) done even though the work was so hectic. Other members of staff of PC AID computer engineering who contributed to one form, or the other are deeply appreciated and to the people who have willingly helped me out with their abilities.

DECLARATION

I hereby declare that I, Matthew Oluwadamilare Akande from Electrical and Computer Engineering Department, Faculty of Engineering and Technology, Kwara State University, Malete, Nigeria underwent the six months Students Industrial Work Experience Scheme (SIWES) at PC AID computer engineering, 3D, Baysal plaza, opp. MKO Abiola house, Queen cinema, Ibadan Oyo state, from 31st of May to the 26th of November 2021. I also declare that to the best of my knowledge, all sources of knowledge used have been duly acknowledged.

Matthew Oluwadamilare, AKANDE
17/67EC/727

TABLE OF CONTENT

1. CHAPTER ONE: THE SIWES

1.1 Introduction

The Students Industrial Work Experience Scheme (SIWES) is the accepted skills training program, which forms part of the approved minimum Academic Standards in the various degree program for all the Nigerian Universities. It is funded by the Federal Government of Nigeria and jointly co-ordinate by the Industrial Training Fund (ITF) and the National Universities Commission (NUC).

It is also designed to expose and prepare students at Universities, Polytechnics, Colleges of Technology, Colleges of Agriculture and Colleges of Education for the industrial work situation they are likely to meet after graduation. The scheme also affords students the opportunity of familiarizing and exposing themselves to the needed experience in handling equipment and machinery that are usually not available in their Institutions. Before the establishment of the scheme, there was a growing concern among our industrialists that graduates of our Institutions of higher learning lacked adequate practical background studies preparatory for employment in Industries. Thus, the employers believed the theoretical education going on in higher institutions was not responsive to the needs of the employers of labor. It is against this background that the rationale for initiating and designing the scheme by the Industrial Training Fund (ITF) during its formative years – 1973/74 was introduced to acquaint students with the skills of handling employers' equipment and machinery. The ITF solely funded the scheme during its formative years. But as the financial involvement became unbearable to the Fund, it withdrew from the Scheme in 1978. The Federal Government handed over the scheme in 1979 to both the National Universities Commission (NUC) and the National Board for Technical Education (NBTE). Later the Federal Government in November 1984 revert the management and implementation of the SIWES Programmed to ITF and it was effectively taken over by the Industrial Training Fund in July 1985 with the funding being solely borne by the Federal Government (SA'AD, 2018).

1.2 Importance of SIWES

- It provides students with an opportunity to apply their theoretical knowledge in real life situations.
- It strengthens links between the employers, universities, and industrial training fund (ITF).
- It also prepares the students for the labor market after graduation (Hameed, 2019).
- It helps in increasing self-confidence and identifying their own proficiency.
- The industrial training program improves students' awareness in single technology.
- The learners can obtain hands-on experience and know the real job scenario
- It cultivates the leadership ability of the students and gives them the responsibility to execute and perform the given task (NIMS, 2018).

2 CHAPTER TWO: PC AID COMPUTER ENGINEERING

2.1 Computer repair services in Nigeria

The profession of computer repairing is relatively new. The industry is characterized by an extremely fast turnover of knowledge and skills. This is due to the rapid technological advancements. The history of computer repairs is therefore inextricably interwoven with the history of computers. This is particularly true for the personal computer. There are however certain defining factors that have made the computer repair profession what it is today.

Prior to 1980, Apple, Commodore and Tandy Corporation (Radio Shack) manufactured majority of microcomputers. As computer parts became cheaper, more and more companies entered the industry. As a result, more affordable computers were produced. The industry expanded rapidly in the 1980s and personal computer use became widespread. The increased usage of computers brought about the need for a growing number of skilled technicians.

In the times before there was a computer (or two) in every household, personal computer users often had only the most basic of computer skills. Computer technicians would regularly encounter customers with simple computer problems. Thus, often the technicians were required to educate users as part of their repair service.

In the late 80s and early 90s many computers had hardware and software systems functioning in the same way as many others. The market was also dominated by a handful of major brand names. Thus ‘early’ history of computer repairs was relatively straightforward. This contrasts to the vast amount of hardware and software options available today. Computer technicians are now required to keep pace with an ever-growing market of hardware and software. The Internet has impacted upon the computer repair industry more than any other technological innovation. Increased Internet use has been accompanied by the emergence of cybercrime. This includes malicious software or ‘malware’ which is intentionally designed to damage computer systems.

Computers have become inseparable from seemingly every sphere of modern life. Correspondingly, the various workplaces in which a computer technician has had to negotiate have also expanded. With every market and industry recognizing the advantages that computers can bring, technicians are often needed on site. Sometimes in potentially hazardous locations.

2.2 About PC AID COMPUTER ENGINEERING

PC AID computer engineering is a certified computer engineering company headquartered at Dugbe in Ibadan, Nigeria. It was established and registered by the Corporate Affairs Commission in 2018, it is primarily involved in the sales, repair and maintenance of Computers and its accessories with services rendered to Private Organizations and individuals with a robust and extensive supply and services network. PC AID contributes to the smooth running of different organizations in Nigeria. The company has in the past 4 years gone mainstream due to the display of integrity with respect to quality products and professional services. In PC AID Computer Engineering, there exist unique programs that guarantee value to quench our clients' thirst for satisfaction and ensures excellence in the management of consumers resources.

Over the years, the company has grown profitable networks with several companies in Nigeria which has immensely contributed to her incredible growth and development. PC AID clients include Fly Me High International resources (FMH), SLVR WLF Digitale limited, Newtonian schools among others. Besides, the company is also in partnership with other engineering company in Nigeria e.g., Fixtel.

2.3 Organizational structures of PC AID COMPUTER ENGINEERING

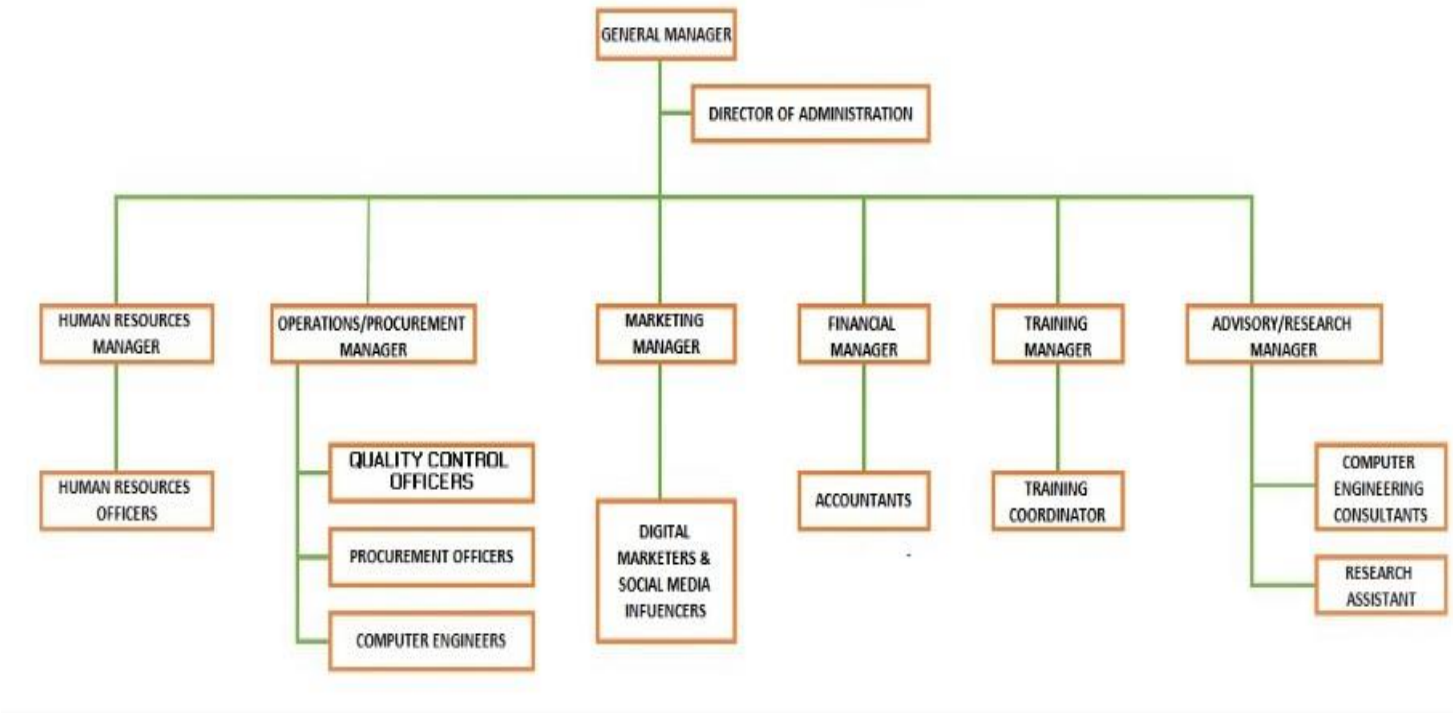


Fig 2.1. Organogram of PC AID COMPUTER ENGINEERING

2.3.1 PC AID computer engineering's Products and services

PC AID has a wide variety of services being rendered across the country. The type of service being provided in any location in Nigeria is dependent on customers' demand in that location. PC AID computer engineering classified their services broadly into hardware repair and complete installation of computer systems (any brand), local and international buying and selling of laptop computers (any brand) and accessories, I.T consultancy, data recovery, software engineering and ICT training. The company's head office in Ibadan is partitioned into various departments with functional workshops complimented with a number of students enrolled for ICT training.

2.4 The Department in PC AID Computer engineering company and Their Functions

The various departments in PC AID Computer Engineering located in Ibadan and their various functions are stated below:

2.4.1 Human resources Department

The human resources department is responsible for activities spanning a wide variety of core functions. In a nutshell, the human resources department performs the staffing, development, compensation and employee and labor relation functions in the company.

2.4.2 Health safety and environment Department

This department is responsible for the encouragement and regulation, regulation and enforcement of workplace health, safety, and welfare of the staff. It also looks into the occupational risks involved in the use of each machinery and equipment at the different working levels in the organization.

2.4.3 Operation and procurement department

The operation and procurement unit of the organization is responsible for the day-to-day activities of the organization. The department also deals with the procurement of laptops and their hardware parts both locally and internationally.

2.4.4 Training Department

Training of students who intend to learn about computer engineering and repairs.

2.4.5 Advisory on research Department

This department makes research on new technological trends, conducts feasibility tests and writes reports on the research and tests conducted. It also advises the organization on what to do to progress due to the research that had been carried out based on previous records.

2.4.6 Admin Department

The department is saddled with the responsibility of keeping records and data important to the organization.

2.4.7 Audit Department

This department makes sure that the other department complies with policies and procedures. They also assess the quality of internal controls and evaluate risk managements.

2.4.8 Logistic Department

The role of the logistic department includes the delivery and storage of products and goods. They ensure that the right products are delivered to the right location at the time. They are also involved in transportation, stock control, warehousing and monitoring the flow of goods.

2.4.9 Marketing Department

This department is responsible for brand representation. They analyze the market and conduct campaigns for marketing initiatives.

2.4.10 Finance department

Their duties include financial planning, management of the financial capitals of the organization. Their activities include disbursement of funds, keeping of the company's daily transactions details etc., reporting and controls short- and long-term business strategies including investments, hedging, mergers and acquisitions.

3 CHAPTER THREE: WORK DONE & EXPERIENCE GAINED

3.1 Introduction

This chapter covers the information on experience gained from various departments. We were advised and lectured that the importance of safety cannot be overemphasized in any company or establishment. So, we were drilled on the safety procedures, processes, and the use personal protection equipment by the HSE department in our first few weeks of internship. Before any activities are carried out in any department, we were evaluated on our knowledge of the safety procedures and processes. The scope of work done, and experience gained is analyzed below on each of the department visited in order of visitation.

3.2 Training department

3.2.1 Introduction

In our first few days in the training department, we were made to understand the design and working principles of computers' components, it is important to have the design knowledge of both laptop and desktop computers before proceeding into their hardware repair and software installations. The manufacturer of computers must know what brand of computer to produce for a targeted market. We were made to understand that there are three components of a computer, these are:

i. Hardware

ii. Software

iii. Human ware

3.2.1.1 COMPUTER HARDWARE

The hardware refers to the physical components and the devices which make up the visible computer. It can be divided into two: Central Processing Unit (CPU) and the Peripherals. The CPU is responsible for all processing that the computer does while the peripherals are responsible for feeding data into the system and for collecting information from the system. The CPU consists of Main Storage, Arithmetic and Logic Unit (ALU) and Control Unit. The main storage is used for storing data to be processed as well as the instructions for processing them.

The ALU is the unit for arithmetic and logical operations. The control unit ensures the smooth operation of the other hardware units. It fetches instruction, decode (interprets) the instruction and issues commands to the units responsible for executing the instructions.(Rossmann et al., 1975)

The Peripherals are in three categories: Input devices, Output devices and Auxiliary storage devices. The input device is used for supplying data and instructions to the computer. Examples are terminal Keyboard, Mouse, Joystick, Microphone, Scanner, Webcam, and so on. Output device is used for obtaining result (information) from the computer. Examples are Printers, Video Display Unit (VDU), loudspeaker, projector, and so on. Auxiliary Storage Devices are used for storing information on a long-term basis. Examples are hard disk, flash disk, magnetic tape, memory card, and so on (Babatunde, 2019).

Fig. 3.1 computer keyboard, mouse, and motherboard

3.2.1.2 COMPUTER SOFTWARE

Software basically refers to programs written to control the operations of computer hardware. A program consists of sequence of coded instructions showing the logical steps required to accomplish a well-defined task. It also refers to the instructions, programs, data, and protocols which run on top of hardware (Alfred, 2021). Examples of such tasks include:

1. Finding the average score of a student
2. Computing the net pay of an employee
3. Solving a set of simultaneous linear equations

It is the software that enables the hardware to be put into effective use; i. e the software that makes the computer versatile. There are two main categories of software – System software and Application software.

i. **System software** are programs commonly written by computer manufacturers, which have direct effect on the control, performance and ease of usage of the computer system. Examples are Operating System, Language Translators, and System Utilities Programs.

Fig. 3.2 System software (operating systems)

ii. **Application software** are programs written by a user to solve his/her own application problem. They do not have any effect on the efficiency of the computer system. An example is a program to calculate the grade point average of all the 100L students. Application software can be divided into two namely: **Application Package** and **User's Application Program**. When application programs are written in a very generalized and standardized nature such that they can be adopted by several different organizations or persons to solve similar problem, they are called **Application Packages**. There are a few micro-computer-based packages. These include word processors (such as MS-word, WordPerfect, WordStar); Database packages (such as Oracle, MS-access, Sybase, SQL Server, and Informix); Spreadsheet packages (such as Lotus 1-2-3 and MS-Excel); Graphic packages (such as CorelDraw, Fireworks, Photoshop etc.), and Statistical packages (such as SPSS). **User's Application Program** is a program written by the user to solve specific problem which is not generalized in nature. Examples include writing a program to find the roots of quadratic equation, payroll application program, and program to compute students' results (Babatunde, 2019).

Fig. 3.3 computer application packages

3.2.1.3 HUMANWARE

The human ware component refers to the person that uses the computer. More specifically, it is about the individual that makes hardware and software components productive. Typically, a great deal of testing is done on software packages and hardware parts to ensure they enhance the end-user experience to aid in creating documents, musical and video recordings, and all forms of raw and finished data (Alfred, 2021).

Fig. 3.4 human ware

3.2.2 A microprocessor

A **microprocessor** is any of a type of miniature electronic device that contains the arithmetic, logic, and control circuitry necessary to perform the functions of a digital computer's central processing unit. In effect, this kind of integrated circuit can interpret and execute program instructions as well as handle arithmetic operations.

In the early 1970s the introduction of large-scale integration (LSI)—which made it possible to pack thousands of transistors, diodes, and resistors onto a silicon chip less than 0.2 inch (5 mm) square—led to the development of the microprocessor. The first microprocessor was the Intel 4004, which was introduced in 1971. During the early 1980s very large-scale integration (VLSI) vastly increased the circuit density of microprocessors. In the 2010s a single VLSI circuit holds billions of electronic components on a chip identical in size to the LSI circuit (Gloria, et al., 2019).

Microprocessor consists of an Arithmetic and Logic unit (ALU), flag register, register array, instruction decoding unit, a control unit and PC/IP. ALU performs arithmetical and logical operations on the data received from the memory or an input device. Register array consists of registers identified by letters like B, C, D, E, H, L and accumulator. The control unit controls the flow of data and instructions within the computer.

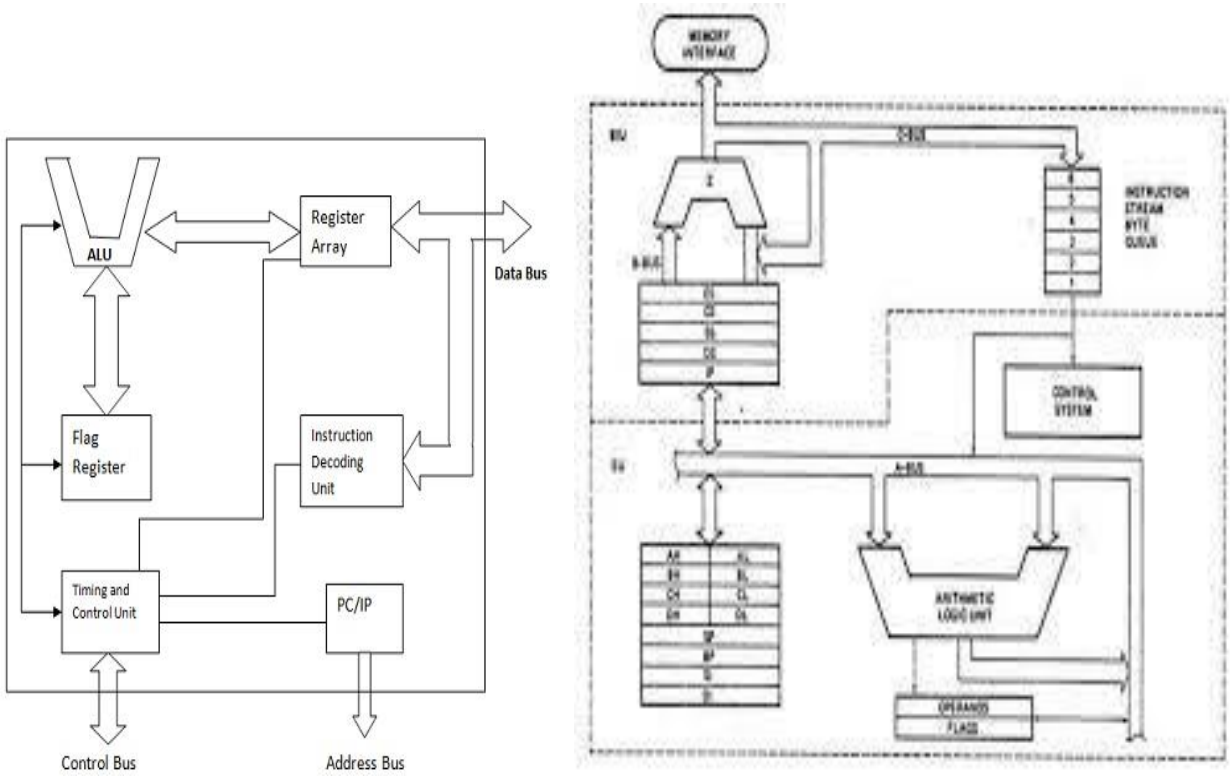


Fig. 3.5 Block diagram showing basic functional blocks of a microprocessor

3.2.2.1 Working principles of a microprocessor

Microprocessor is the master that controls all the operation performs perform in the system. In order to execute the program, the processor issues address and control signal to fetch the instruction and data from the memory one by one. After fetching each instruction, it decodes the instructions and perform the task/operation specified by the instruction.

A microprocessor works with the (Erasable programmable read-only memory) EPROM and RAM for data processing and storage.

Fig. 3.6 Microprocessor

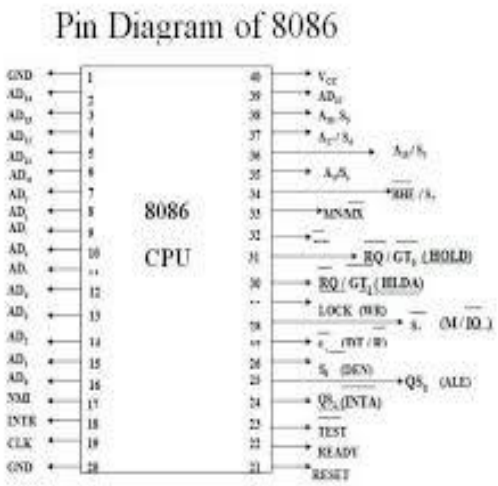


fig. 3.7 PIN assignment of 8086 microprocessor

3.2.3 EPROM, BIOS AND CMOS

Basic Input/output System and also known as the System **BIOS**, **ROM BIOS**, **BIOS ROM** or **PC BIOS**) is firmware used to perform hardware initialization during the booting process (power-on startup), and to provide runtime services for operating systems and programs. The BIOS firmware comes pre-installed on a personal computer's system board, and it is the first software to run when powered on. The name originates from the Basic Input/output System used in the CP/M operating system in 1975. The BIOS originally proprietary to the IBM PC has been reverse engineered by some companies (such as Phoenix Technologies) looking to create compatible systems. The interface of that original system serves as a de facto standard.

The BIOS in modern PCs initializes and tests the system hardware components (Power-on self-test), and loads a boot loader from a mass storage device which then initializes an operating

system. In the era of DOS, the BIOS provided BIOS interrupt calls for the keyboard, display, storage, and other input/output (I/O) devices that standardized an interface to application programs and the operating system. More recent operating systems do not use the BIOS interrupt calls after startup.

Most BIOS implementations are specifically designed to work with a particular computer or motherboard model, by interfacing with various devices especially system chipset. Originally, BIOS firmware was stored in a ROM chip on the PC motherboard. In later computer systems, the BIOS contents are stored on flash memory so it can be rewritten without removing the chip from the motherboard. This allows easy, end-user updates to the BIOS firmware so new features can be added or bugs can be fixed, but it also creates a possibility for the computer to become infected with BIOS rootkits. Furthermore, a BIOS upgrade that fails could brick the motherboard.

EPROM: EPROM(erasable programmable read-only memory) is a form of computer memory that does not lose its content when the power supply is cut off and that can be erased and reused. EPROMs are generally employed for programs designed for repeated use but that can be upgraded with a later version of a program. EPROMs are erased with ultraviolet light. The capabilities of EPROMs were extended with EEPROM (electrically erasable programmable read-only memory); flash memory, which is extensively used in computers in the early 21st century, is an EEPROM(Britannica, 2021).

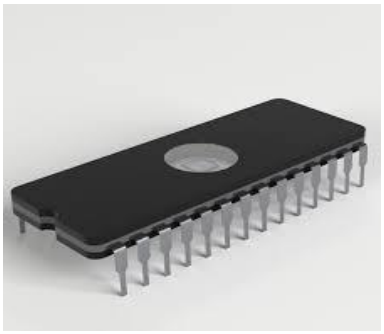


Fig. 3.8 EPROM

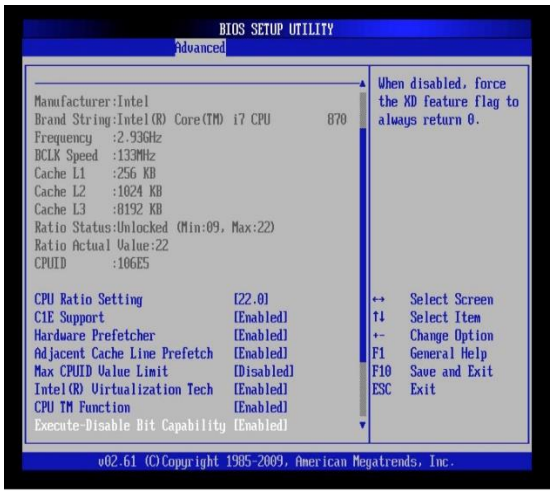


Fig. 3.9 BIOS firmware setup of intel core i7 DELL computer

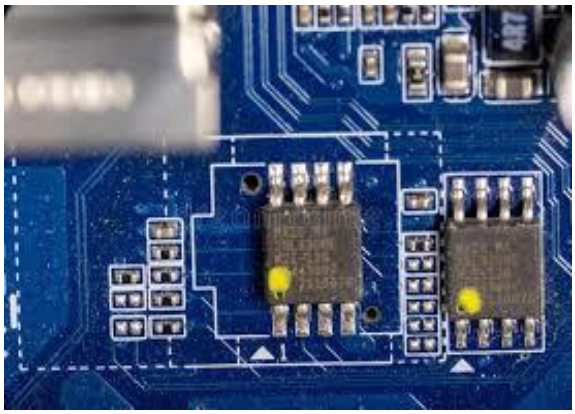


Fig. 3.10 BIO firmware Integrated circuit on a laptop motherboard

CMOS: CMOS (complementary metal-oxide semiconductor) is the semiconductor technology used in the transistors that are manufactured into most of today's computer microchips. Semiconductors are made of silicon and germanium, materials which "sort of" conduct electricity, but not enthusiastically. Areas of these materials that are "doped" by adding impurities become full-scale conductors of either extra electron with a negative charge (N-type transistors) or of positive charge carriers (P-type transistors). In CMOS technology, both kinds of transistors are used in a complementary way to form a current gate that forms an effective means of electrical control. CMOS transistors use almost no power when not needed. As the current direction changes more rapidly, however, the transistors become hot. This characteristic tends to limit the speed at which microprocessors can operate (TechTarget, 2005).

Difference between BIOS AND CMOS: The BIOS is the program that starts a computer up, and the CMOS is where the BIOS stores the date, time, and system configuration details it needs to start the computer. CMOS is a type of memory technology, but most people use the term to refer to the chip that stores variable data for startup.

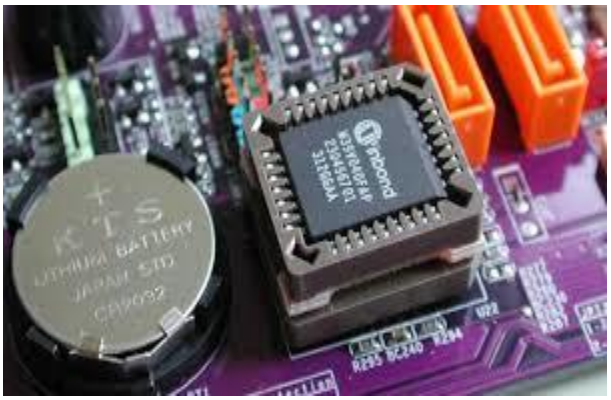


Fig. 3.11 CMOS battery and CMOS chips

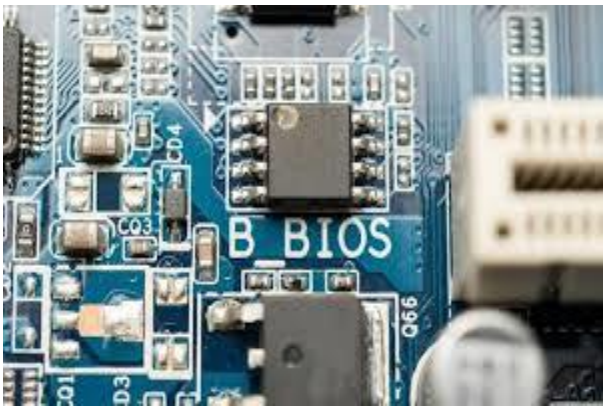


Fig. 3.12 BIOS chips

3.2.4 Repairing corrupted BIOS firmware

If your BIOS firmware has become corrupted, there are a few troubleshooting steps you can take to try to repair the corrupted BIOS. If your motherboard has a backup BIOS, you can boot into the backup BIOS and reflash the corrupted BIOS. If your motherboard does not have backup BIOS, you may be able to replace the BIOS chip. However, in some cases, the only option may be to replace the motherboard entirely. This guide explains how to repair a corrupted BIOS.

Step 1: Check if your computer is under warranty

Before attempting to make any repairs yourself, check to see if your computer is under warranty. In many cases, simply opening your computer will void your warranty. If your computer is still under warranty, then it is recommended that you contact the point of sale or manufacturer and have them repair your computer for you.

Fig. 3.13 Warranty check

Step 2: Boot from Backup BIOS (Gigabyte motherboards only)

Some Gigabyte motherboards come with a backup BIOS installed on the motherboard. If the main BIOS is corrupted, you can boot from the backup BIOS, which will automatically reprogram the main BIOS if there is anything wrong with it. If it does not boot into the backup BIOS automatically, you can use one of the following steps to force it to boot from the backup BIOS:

Method 1: Power your computer off. Then press and hold the power button until your computer powers back on. Continue to hold the power button until the computer powers off again. When you power it back on, it should boot from the backup BIOS.

Method 2: Power your computer off. Press and hold the Power button and the Reset button for about 10 seconds and release. When you power your computer on a third time, it should boot from the backup BIOS.

Method 3: Use this method as a last resort. If you are unable to get your Gigabyte motherboard to boot into the backup BIOS using either of the two methods above, you'll need to open your computer and access the motherboard directly. Look for a chip labeled "m-BIOS" or "Main BIOS" or something similar. Use a wire or a paperclip to short Pins 1 and 6 on the chip. There should be a triangle icon or a red dot next to pin 1 (it's usually the one on the bottom right). Pins 1, 2, 3, and 4 are all on the same side. Pin 5 is directly across from Pin 4 and Pin 6 is right next to Pin 5. Place a paperclip or short piece of wire on Pins 1 and 6 and hold it steady (be sure to touch something metal before touching the inside of a motherboard.) Have another person power the

computer on. Remove the paperclip or wire when you hear it beep. This should force your computer to boot into the backup BIOS.

Fig. 3.14 BIOS backup

Step 3: Remove the dedicated graphics card.

Some users have reported that problems with the BIOS can be fixed by removing the dedicated graphics card and connecting your PC to the integrated graphics card.[2]

Warning: Anytime you do repairs inside your computer, make sure your computer is powered off. Be sure to keep your hand on something metal outside your computer or wear static wristbands to keep yourself grounded. This prevents static discharge that can cause permanent damage to your computer.

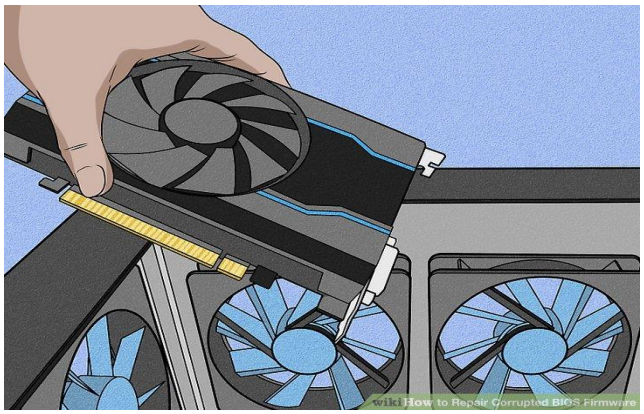


Fig. 3.15 Dedicated graphics card

Step 4: Reset the BIOS

In some cases, you may be able to fix problems with a corrupted BIOS by resetting the BIOS. You can do these one of three ways:

- Boot into the BIOS and reset it to the factory settings. If you are able to boot into the BIOS, go ahead and do so. Locate the option to "Load Setup Defaults", "Restore Factory Settings", or something similar. Select this option to reset the BIOS.
- Remove the CMOS battery from the motherboard. Unplug your computer and open your computer's case to access the motherboard. It's the large board that has all the cables, chips, and computer cards attached to it. Locate the CMOS battery. Generally, it is a type CR2032 battery that is about the size of a quarter. Carefully remove the battery and let it sit for 20 minutes. If your computer is a laptop, remove the laptop battery as well. If this doesn't fix the issue, try replacing the battery with a new one.
- Reset the jumper. This is typically done on older motherboards. Unplug your computer and open your computer's case to access the motherboard. Locate a jumper cable that says "CMOS" or something similar next to it. The jumper will be placed on two out of three pins. Remove the jumper and replace it one set of pins over. Press and hold the Power button on the computer for about 15 seconds. Replace the jumper back to it original position.
-

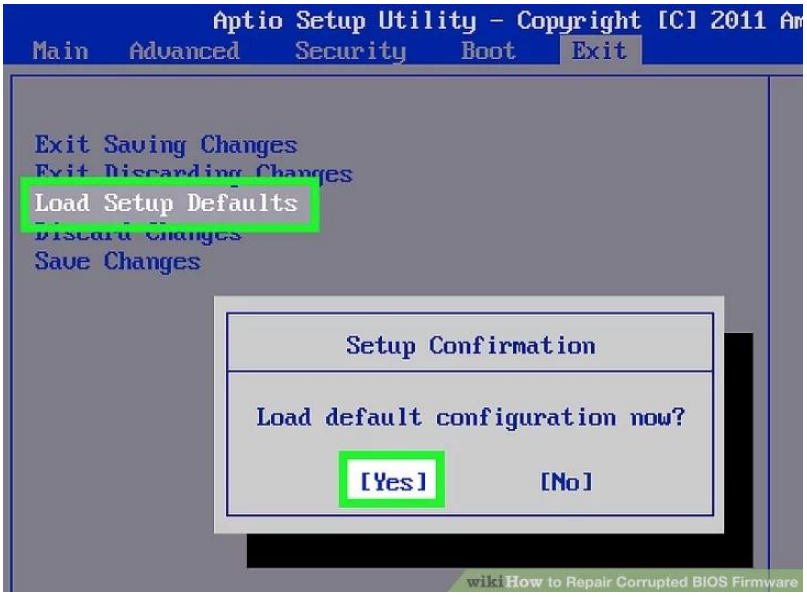


Fig. 3.16 BIOS reset

Step 5: Update your BIOS

In some cases, you may be able to fix problems with a corrupt BIOS by updating the BIOS. Make sure your computer has a consistent power source when you update your BIOS. If the update process is interrupted, it can cause permanent damage to your computer. You will need to know which version of BIOS you are running. Use the following steps to update your BIOS:

- Find out which version of BIOS you are running. If you are able to boot into your BIOS, it will tell you what version of BIOS it is running. If you can boot into Windows, click the Windows Start menu and type "System Information" and open the System Information app. Check what version of BIOS you are running next to "BIOS Version/Date." If you cannot boot into the BIOS or Windows, you most likely will not be able to update your BIOS.
- Consult your computer manufacturer's website. You can do this from a separate computer if need be.
- Download an updated BIOS file and copy it to a flash drive.
- Follow the manufacturer's instructions to update your BIOS. The process will be a little different from one computer manufacturer to another. In most cases, you will need to copy the BIOS update file to a flash drive or create a bootable flash drive. You will either boot from the bootable flash drive or boot into the BIOS and select the option to update the BIOS from a flash drive.
- If you have an HP computer, you may be able to update the BIOS shutting down your computer and then pressing Windows key + B + Power and hold them for about 3 seconds. Release the Power button but continue to hold the Windows key and B buttons until the BIOS update screen appears. Your computer screen may go blank, and you may hear more beeping sounds coming from your computer.

Fig. 3.17 BIOS update

Step 6: Replace the BIOS chips

This is only an option if your motherboard has a slotted DIP or PLCC BIOS chip. If the BIOS chip is soldered to the motherboard, your only option will be to replace the motherboard. If you are able to replace the BIOS chip, use the following steps to replace it.

- Take note of the make and model of your motherboard.
- Purchase a replacement BIOS chip for the motherboard model that you have. You can purchase BIOS chips online from eBay, or a specialty website like, Newegg, or BIOS-Chip24. Some places may require that you send them your old BIOS chip to be reprogrammed.
- Locate the BIOS chip on the motherboard and note which end the notch is facing.
- Carefully remove the old BIOS chip using an extraction tool or by carefully prying it loose using a small pick or jewelers flathead screwdriver.
- Insert the new BIOS chip so the notch faces the same direction as the notch on the old BIOS chip. If the prongs are too wide, you can carefully bend them inward by press pushing them against a solid flat surface.

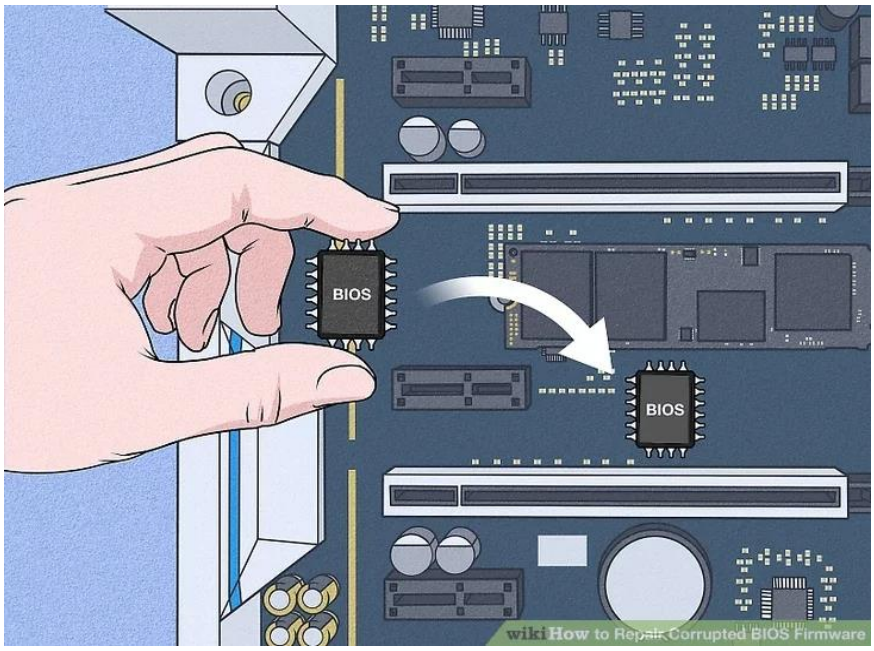


Fig. 3.18 BIOS chips replacement

Step 7: Replace the motherboard

If you cannot replace the BIOS chip, and you can't reprogram it or fix the problem by resetting it, then the only option is to replace the motherboard. You can purchase a new motherboard from Amazon, eBay, or any computer specialty store such as Newegg.com.

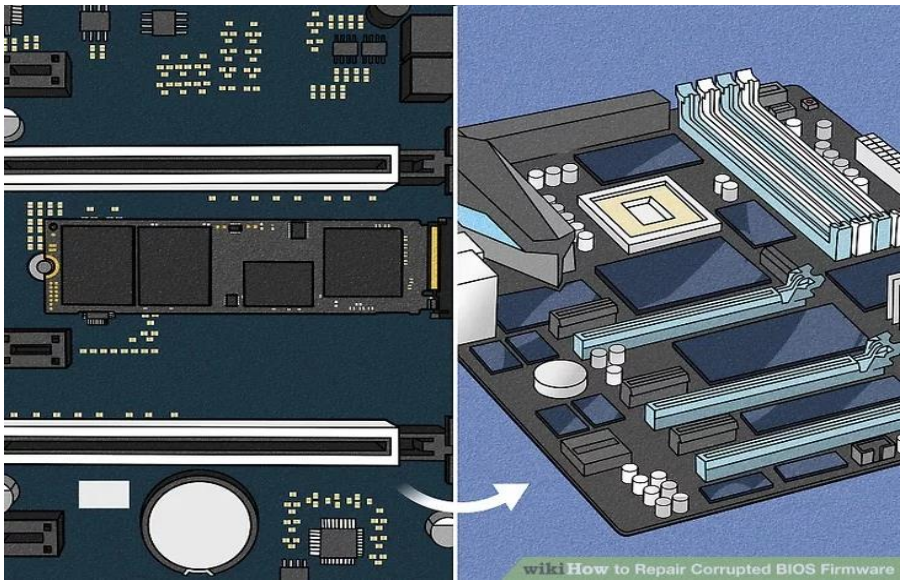


Fig. 3.19 Motherboard replacement

3.2.5 Programming a laptop BIOS(EEPROM) chip with an external programmer

A BIOS chip is a piece of Read-Only Memory (ROM), located on the surface of a computer motherboard, which contains the information necessary to boot up the computer. Reprogramming a BIOS chip means changing its settings, which can be accomplished by accessing the BIOS utility. It is pertinent to note that certain BIOS changes can undermine the stability of a system, one need to be careful when reprogramming a BIOS chip.

3.2.5.1 Guide in flashing a laptop BIOS chip

Materials needed for BIOS chip programming are:

- SPI CH341A mini programmer
- SOIC8 SOP8 test clip for EEPROM 93CXX - 25CXX - 24CXX
- Another second computer (whether portable or desktop).

Alternative to the clip: female male jumper cables for the JSPI1 connection.

This hardware is the same used by the producers of motherboards, be it MSI, Asus, Asrock, Gigabyt etc., to unlock the cards when they are out of service, provided that they have not had a short circuit and that they did not burn. It will save between 100 and 800 dollars, ie the price of an old motherboard, or a recent computer if you prefer to buy everything. It will cost between 5 and 25 dollars depending on whether you buy it from USA or from China; ofcourse with minimum 2 days transport time for USA and 1 month for China.

There are two versions of the miniSPI program: one black (the one I used, see image below), one blue. There is no difference except the voltage of the black which can be more powerful, from 3.3V to 5V against 3.3V for the blue version. It is indicated on the forums that the black has a voltage too strong and can burn the motherboard, it’s false; at least I did not see anything problematic in my case (desktop motherboard).

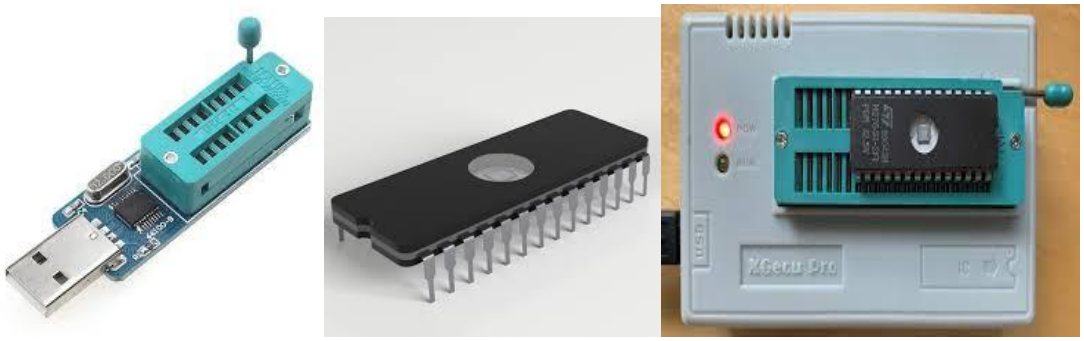


Fig. 3.20 CH341A EPROM programmer & Bios chip

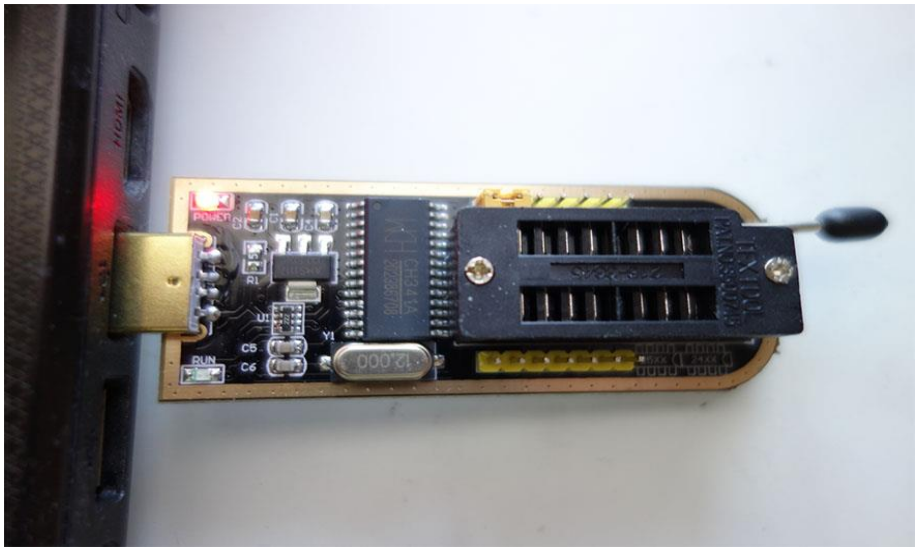


Fig. 3.21 CH341A EPROM programmer connected to computer

Guide – Part 1: Prepare the motherboard.

1. Open the computer case, take a picture of the connections so you do not get lost later when you will have to reconnect everything.
2. disconnect the power supply from the PC,
3. disconnect all devices,
4. remove the graphics card,
5. remove the memory modules,
6. remove the CPU cooler (you will need thermal paste later),
7. remove the processor,
8. disconnect all other connectors (USB, PS/2, SW Power, Reset SW, P Led +/-),
9. take the motherboard out of the computer,
10. put it near another working computer (whether it's a laptop or a desktop computer).

Fig. 3.22 Bios programming

Guide – Part 2: Prepare the CH341A SPI mini programmer.

1. connect the SPI CH341A mini programmer to your backup computer,
2. install the programmer's drivers. If the installation does not work, do a manual installation: control panel > system > device manager > right click on unknown device > update the driver > choose the location of the drivers. If that doesn't work, try other versions of the drivers on the net.
3. start the software of the CH341A programmer,
4. put the arm (which looks like an antenna) of the mini programmer upwards,
5. insert the clip's jumper into the mini programmer (with the numbers 1 2 3 4 on the left, 5 6 7 8 on the right) in the first part of the CH341A female connection (ie on the left, the part right being dedicated to EEPROM 24 chips),
6. Engage the mini programmer's arm by positioning it down.
7. connect the SOIC8 clip to the Bios (8-pin SPI memory chip); it is near a JSPI1 connection (see image below). The program recognizes that the programmer is connected.

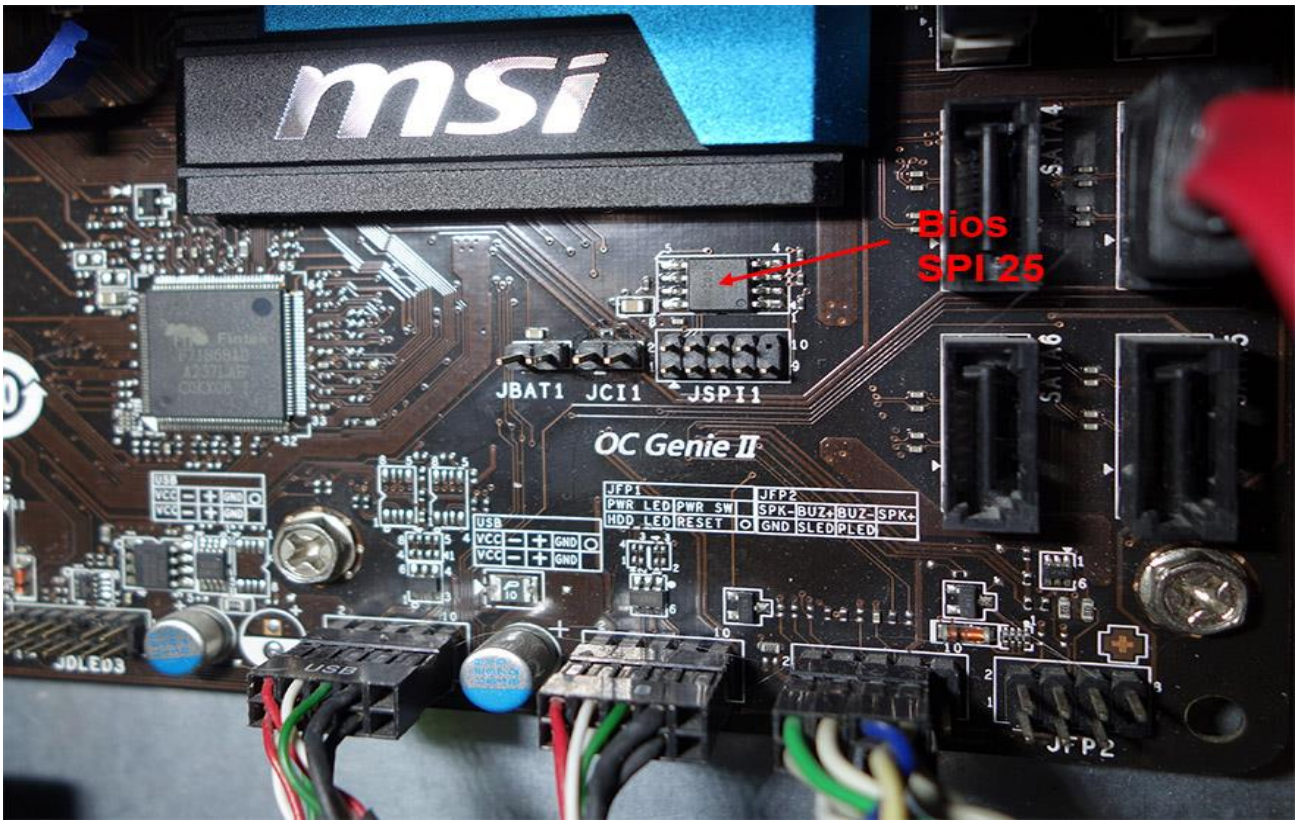


Fig. 3.24 Bios programming

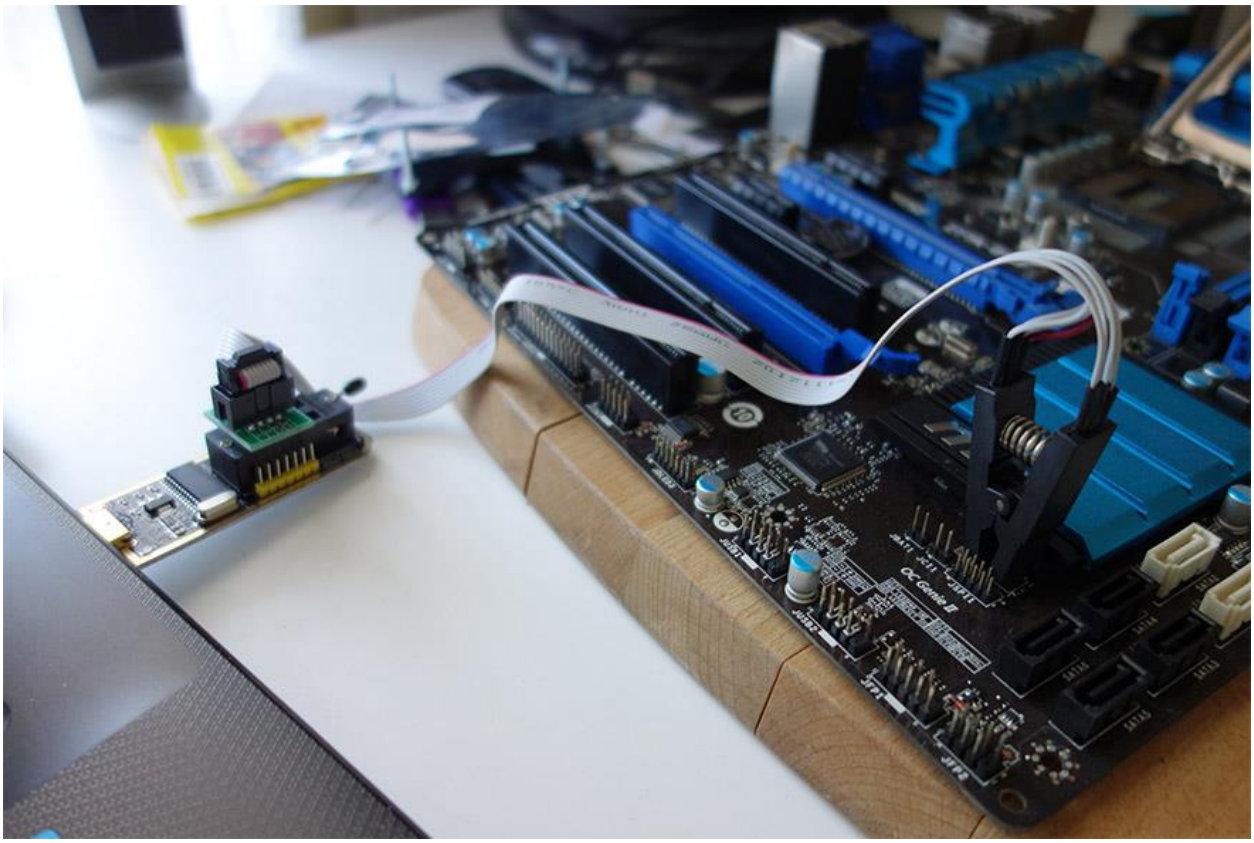


Fig. 3.25 Bios programming with CH341A mini programmer

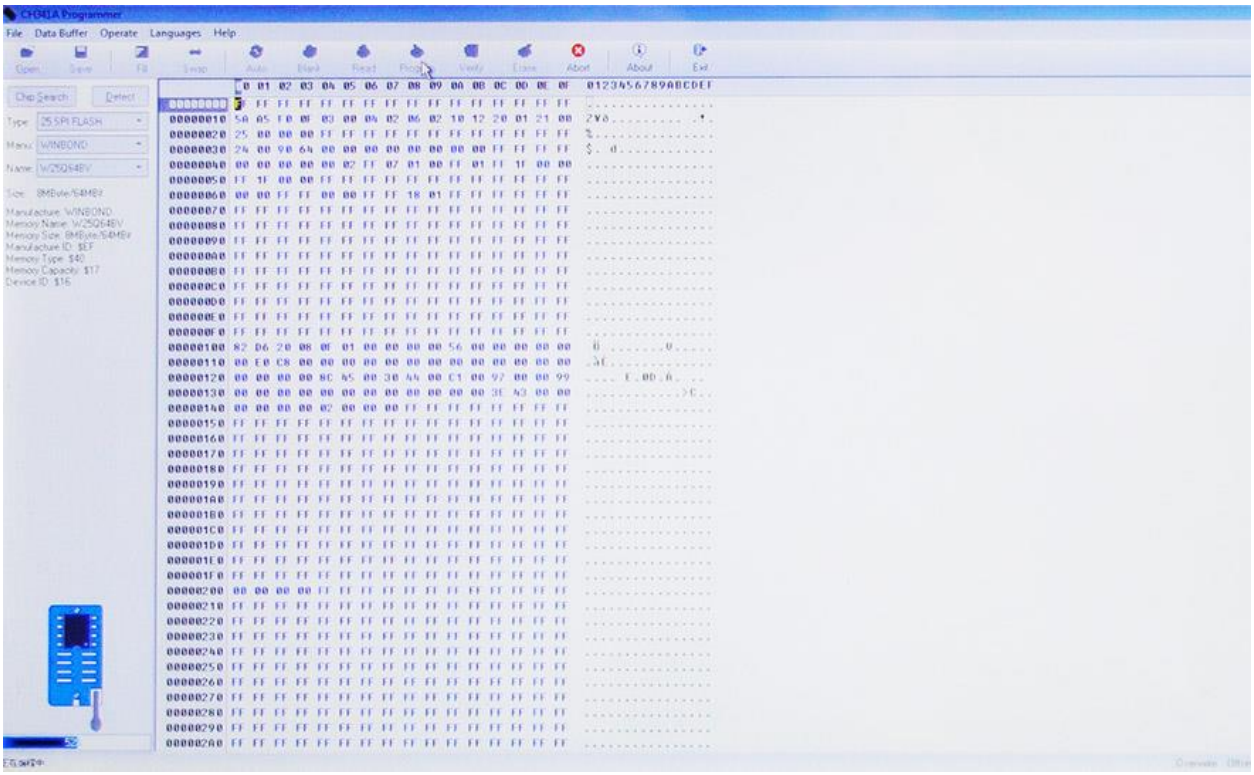
Guide – Part 3: Use the SPI CH341A mini programmer to read the SPI chip.

1. press the **Detect** button of the software to recognize the Bios. The program should recognize the type, the brand, and the model of the chip.
2. if the Bios is not recognized with Detect, then check that the clip is well installed on the Bios. It is important that the contact is perfect.
3. if the Bios is still not recognized with Detect, then reverse the jumper in the mini-SPI programmer and reverse the clamp on the motherboard's Bios. There is no risk of short circuit normally.
4. if the Bios is still not recognized with Detect, then manually enter the type, the brand, and the model.
5. If the software announces that the programmer is connected, then press the **Read** button. Normally the buffer should fill on the interface and the solid lines of FF should be replaced in large part by codes in hexadecimal. If all the lines only have FF codes, then it means that the software could not read the Bios properly. It is unlikely that the chip is completely empty. Why didn't it work? because the programmer must be able to send enough energy in at least half of the motherboard to actually read the Bios. It will easily read the Bios in small motherboards,

such as tablet, laptop, micro ATX. On the other hand, in motherboards of desktop, it will have to power this last one. If the software could not correctly read the Bios, then disconnect the clamp. Reconnect the PC power supply to the motherboard (with both pins), reconnect the power supply to the mains. Reconnect the clamp. Press the Read button. This time the software should read the chip correctly. That's what worked for me with a motherboard MSI Z77A-G43.

Guide – Part 4: Use the SPI CH341A mini programmer to write the Bios on the SPI chip.

1. Save the original Bios, file> Save, as Backup-in for example. In case of problems, you can always put it back.
2. Press the Erase button to erase the Bios from the SPI chip.
3. Press the Blank button to replace the SPI chip code with FFs.
4. press the Open button and select your Bios (ROM file). If your Bios has a weird extension, this is not a problem, select *. * In the choice of the format of the file to open. You can always rename it to Bios.bin if you want. You will find the latest Bios of your motherboard on the manufacturer's website by indicating the model of your motherboard (written on its face, as well as on the back).
5. press the Program button. The software will then write the Bios on the chip. It can take between 2 and 15 minutes.
6. Then, press the Verify button to verify that the BIOS has been correctly programmed, that there are no errors. The software should indicate that the memory buffer and the chip have the same code.
7. press the Read button, the Open button, select the Bios to flash, click ok, press the Verify button to be really sure it has been well programmed.



8. If so, that's it you're good at disconnecting the clip, the power supply and plugging everything back into your computer's case.
9. when everything is reconnected, start the computer, it should boot directly on Windows.
10. otherwise, you will have to go back to the BIOS to put the priorities back on the bootable UEFI disk with Windows. But also to set the time in the Bios.
11. if you could not read the chip with the CH341A programmer v1.30, then try another version of the software. The most popular version is the CH341 programmer v1.18. Try other drivers. Try other software.
12. if nothing works, then the procedure becomes more complex. If the software can not read the chip properly, it cannot also reprogram it, on the contrary it will further corrupt it. It will be necessary to disassemble the BIOS of the motherboard and put it directly on the small integrated circuit (as in the image below).

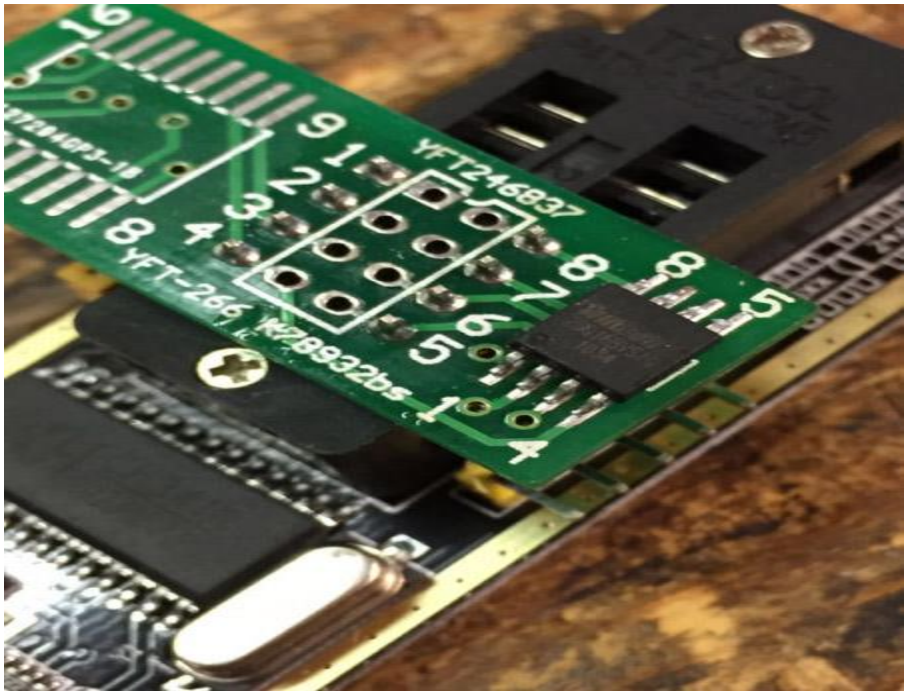
Necessary material :

1. Hot air welding station

2. Soldering kit with a fine head, including a desoldering wick, tin wire .

– a soldering kit with a fine head, including a desoldering wick, tin wire.

13. Note the layout of the Bios on the motherboard, with the numbers 1 4 5 8.
14. First use the hot air blower at 400°C for 3-4 minutes on the Bios to melt its solder. Look at integrated circuit soldering guides on Youtube to understand how to do it. The most important is not to melt the circuits with the soldering iron by coming into contact with them.
15. Once unsoldered, it will be necessary to mount the small integrated circuit sold with the SPI CH341A mini programmer, and to weld the two small jumper on the center where the figures are indicated.
16. Then place the Bios on the appropriate connections in order (1 4 5 8, see on the motherboard). The dot on the chip must be on the 1. Weld the Bios to the circuit. It will be useful to use the desoldering wick to remove excess tin or remove a tin bridge between two welds.
17. Lift the arm of the programmer, insert the result in the mini programmer. The Bios should be on the left of the programmer if we look at it with the USB connection at the top). Enable the arm.



3.2.6 Equipment and machines used in the training unit

The training department of the organization consists of different machines and equipment which are used to achieve the training aims and objectives.

I. EPROM programmer

II. soldering iron

III. Hard Drive (HDD) external connector

IV. Multimeter

v. Heat gun

EPROM programmer: EPROM programmers are used to program erasable programmable read-only memory (EPROM). EPROMs are a non-volatile memory type which once programmed, retain data for ten to twenty years and can be read an unlimited number of times.

Fig. 3.25 MINI TL866CS EPROM programmer

Soldering iron: A soldering iron is a hand tool used in soldering. It supplies heat to melt solder so that it can flow into the joint between two work pieces.

A soldering iron is composed of a heated metal tip and an insulated handle. Heating is often achieved electrically, by passing an electric current (supplied through an electrical cord or battery cables) through a resistive heating element. Cordless irons can be heated by combustion of gas stored in a small tank, often using a catalytic heater rather than a flame. Simple irons, less commonly used today than in the past, were simply a large copper bit on a handle, heated in a flame.

Soldering lead is a fusible metal alloy used to create a permanent bond between metal work pieces. It must be melted to adhere to and connect the pieces together.

Fig. 3.26 Soldering iron

Fig. 3.27 soldering lead

SATA connector: It is used for connecting an external hard drive with a computer for data sharing.

Fig. 3.28 SATA connector

Multimeter: A multimeter is a measuring instrument that can measure multiple electrical properties. A typical multimeter can measure voltage, resistance, and current, in which case it is also known as a volt-ohm-milliammeter (VOM), as the unit is equipped with voltmeter, ammeter, and ohmmeter functionality.

Fig. 3.29 Multimeter

Heat gun: A heat gun, often referred to as a hot air blower, is a must-have tool for professionals, crafts people and DIY masters. Heat guns are commonly known for their use to strip paint and weld or bend plastics. However, these handy tools are so much more versatile than just plastic welding tools.

Fig. 3.30 Heat gun

3.2.7 Experience Gained and Work Done in The Training Department

1. I was introduced to the parts of computer system, internal structure of a computer system, the motherboard architecture, and peripherals.
2. I was taught some computer engineering's project and resources management strategies, negotiation.
3. I participated actively in a team of interns that procured hardware components of some laptop computers for replacement and fixings.
4. I was lectured on the working principles of Basic Input and Output System (BIOS) of a computer system.
5. In a bid to detect and resolve faults on a computer motherboard component, I participated actively in a team of interns that did circuit circuits test and component replacement on the motherboard.

3.3 Operation and procurement Department

3.3.1 Introduction

Operations departments and employees have the authority to make a substantial impact on the production of products and services. Employees working in the operations department must be proactive in identifying and troubleshooting problems quickly and effectively.

The operations department of the company is responsible for smooth and profitable product and service delivery via repair and replacement of faulty computer hardware components. If the operations department of the company is running tightly, the company will produce what it needs to produce when it needs to produce it — and without undue stress or backtracking. The objectives of an operations department revolve around high-quality effective operations. If the operation is fulfilling its objectives, the company's customers will be happy, and company's businesses will be profitable. In my first few days in the operation department, I was taught different computers' hardware and software troubleshooting and repair techniques, motherboard repair strategies and other computer engineering approaches. I was also given some personal protective equipment for my health and safety.

3.3.2 Computer networking

A computer network is a system in which multiple computers are connected to each other to share information and resources.

Fig. 3.31 Computer networking

Characteristics of a Computer Network

- Share resources from one computer to another.
- Create files and store them in one computer, access those files from the other computer(s) connected over the network.
- Connect a printer, scanner, or a fax machine to one computer within the network and let other computers of the network use the machines available over the network.

Following is the list of hardware's required to set up a computer network.

- ❖ Network Cables
- ❖ Distributors
- ❖ Routers
- ❖ Internal Network Cards
- ❖ External Network Cards

3.3.2.1 Network Cables

Network cables are used to connect computers. The most commonly used cable is Category 5 cable RJ-45.

Fig. 3.32 Network cable

Distributors

A computer can be connected to another one via a serial port but if we need to connect many computers to produce a network, this serial connection will not work.

Fig. 3.33 A distributor

The solution is to use a central body to which other computers, printers, scanners, etc. can be connected and then this body will manage or distribute network traffic.

Router

A router is a type of device which acts as the central point among computers and other devices that are a part of the network. It is equipped with holes called ports. Computers and other devices are connected to a router using network cables. Now-a-days router comes in wireless modes using which computers can be connected without any physical cable.

Fig. 3.34 Pictorial representation of a router

Network Card

Network card is a necessary component of a computer without which a computer cannot be connected over a network. It is also known as the network adapter or Network Interface Card (NIC). Most branded computers have network card pre-installed. Network cards are of two types: Internal and External Network Cards.

Internal Network Cards

Motherboard has a slot for internal network card where it is to be inserted. Internal network cards are of two types in which the first type uses Peripheral Component Interconnect (PCI)

connection, while the second type uses Industry Standard Architecture (ISA). Network cables are required to provide network access.

Fig. 3.35 Internal network card

External Network Cards

External network cards are of two types: Wireless and USB based. Wireless network card needs to be inserted into the motherboard; however, no network cable is required to connect to the network.

Fig. 3.36 External network card

Universal Serial Bus (USB)

USB card is easy to use and connects via USB port. Computers automatically detect USB card and can install the drivers required to support the USB network card automatically.

Fig. 3.37 Universal Serial Bus (USB)

3.3.2.2 Network cable

Network cables are designed to carry data and information to and from computers, switches, storage area networks and routers. There are many kinds of communication cables available. Which cables are right for your circumstances depends on many different factors, such as the nature of your overall system and your specific requirements? Twisted pair cables are the most commonly used cables for businesses including companies working in industries like retail and the commercial sector.

Twisted pair cable is used in a vast range of ethernet networks. This cable features four pairs of conductors. The pairs are twisted into numerous additional twists. The twists exist to prevent interference from other cables and devices.

3.3.2.3 Fibre Optic Cabling

Fiber optic cabling offers significant benefits for the businesses of today, yet the fact that it remains a relatively new option means many companies remain hesitant to invest in it. Fiber optic cabling can deliver blisteringly fast data transmission for homes and businesses. Fibers transmits data via light rather than electricity, and this means faster internet connections which can manage much higher bandwidth are available. Even when demand peaks, providers of fiber optic connections can deliver over their advertised speeds, according to studies.

Fiber optic connectivity can provide vast benefits to companies of all sizes, especially businesses that work in the cloud and use it for data storage. Fiber optic cabling is often used by businesses who wish to make the most of VoIP telephony and can deliver speeds that beat what even CAT7 cabling has to offer. In fact, you may be able to experience speeds of up to a stunning 100 Gbps when you choose fiber optic cabling. Furthermore, even when there is a high demand for internet access, you shouldn't see slower speeds. One study said that businesses faced with slow internet connections lose one week of productivity each year, which explains why so many organizations are deciding to invest in fiber optic technology.

It's said that more than 80% of businesses and organizations are now using the cloud in some capacity. Fibre optic can provide exceptionally fast access to anything stored in the cloud, including applications and data. By opting for fiber optic, you can keep your customers and clients happy by keeping communication standards sky-high.

3.3.2.3.1 How to make ethernet cable

Ethernet cables can be quite expensive and pre-made lengths are not always the length you need. Making Ethernet cables is easy with a box of bulk Category 5e Ethernet cables and RJ-45 connectors that are attached to the cut ends of your preferred cable length. There are two kind of ethernet cables:

Straight through ethernet cable: Straight through Ethernet cables are the standard cable used for almost all purposes and are often called 'patch cables. It's highly recommended you duplicate the color order as shown on the left. Note how the green pair is not side-by-side, like the other pairs. This configuration allows for longer wire runs.

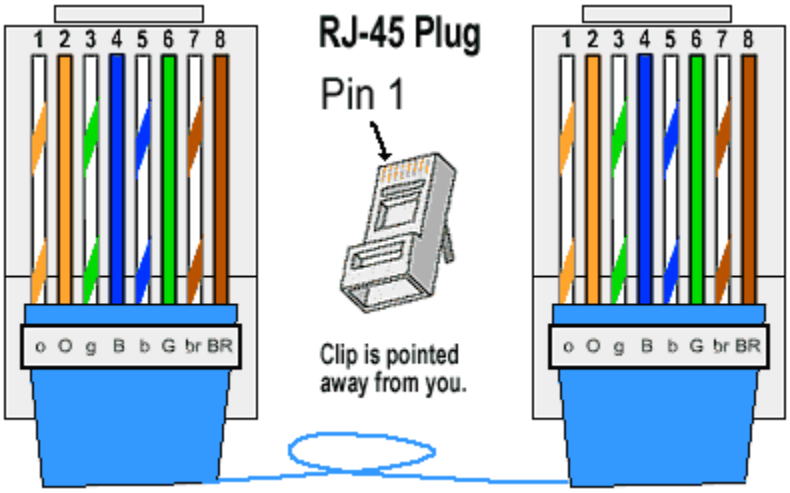


Fig. 3.38 Making a RJ-45 ethernet cable

Cross over ethernet cable: **Crossover Ethernet cables** directly connect one computer or device to another without going through a router, switch, or hub.

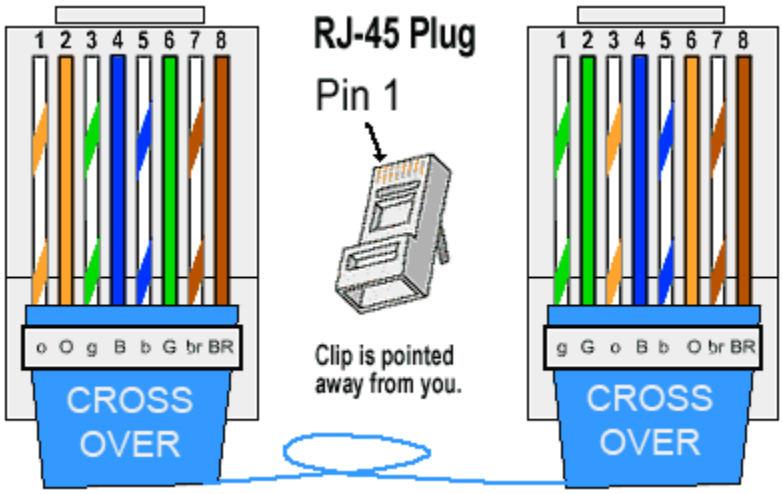


Fig. 3.39 Making a RJ-45 ethernet cable

How to make ethernet cable

1. Cut into the plastic sheath about **one inch (2.5 cm)** from the end of the cut cable. The crimping tool has a razor blade that will do the trick with practice.

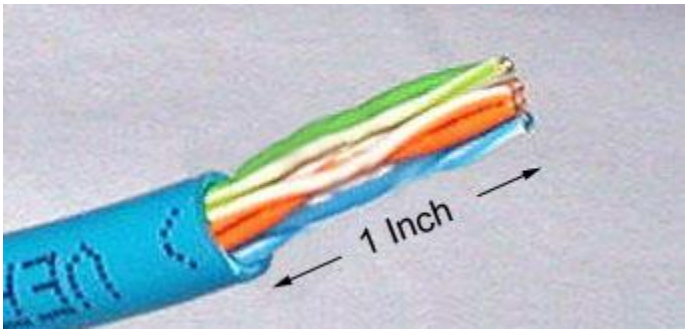


Fig. 3.40 the making of ethernet cable

2. Unwind and pair the similar colors.

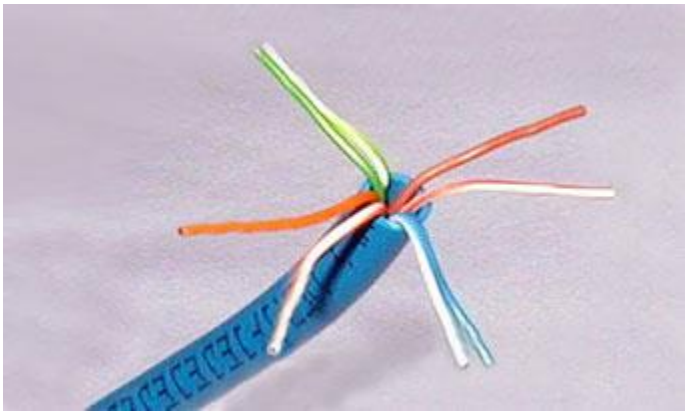


Fig. 3.41 the making of ethernet cable

3. Pinch the wires between your fingers and straighten them out as shown. The color order is important to get correct.

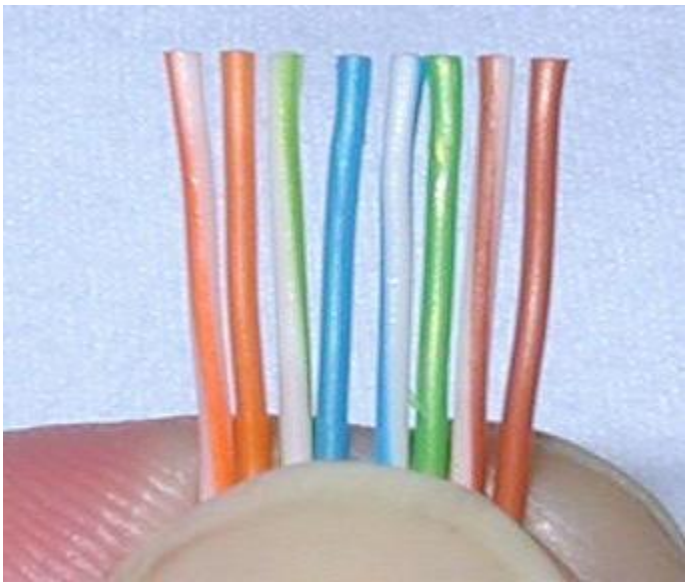


Fig. 3.42 the making of ethernet cable

4. Use scissors to make a straight cut across the eight wires to shorten them to **half an inch (1.3 cm)** from the cut sleeve to the end of the wires.

Fig. 3.43 Scissors

5. Carefully push all eight unstripped colored wires into the connector. Note the position of the blue plastic sleeve. Also note how the wires go all the way to the end.

Fig. 3.44 the making of ethernet cable

6. A view from the top. All the wires are all the way in. There are no short wires.

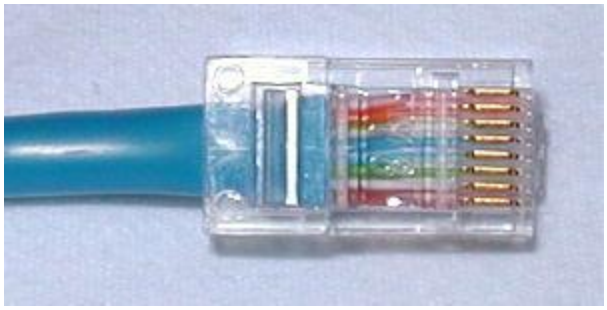


Fig. 3.45 the making of ethernet cable

7. **This is the wrong way.** Note how the blue plastic sleeve is not inside the connector where it can be locked into place. The wires are too long. The wires should extend only half an inch from the blue cut sleeve.

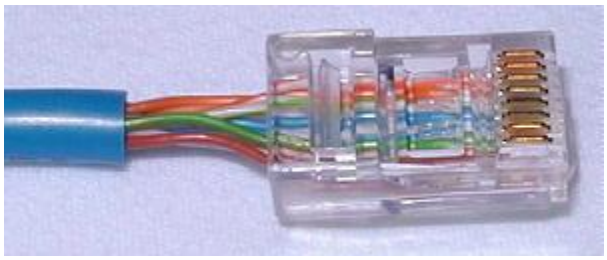


Fig. 3.46 the making of ethernet cable

8. **This is the wrong way.** Note how the wires do not go all the way to the end of the connector.

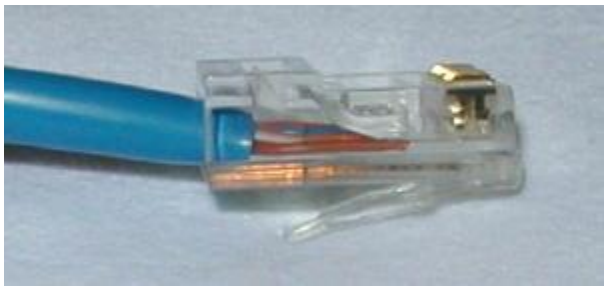


Fig. 3.47 the making of ethernet cable

9. **Crimping the cable.** Carefully place the connector into the Ethernet crimper and cinch down on the handles tightly. The copper splicing tabs on the connector will pierce into each of the eight wires. There's also a locking tab that holds the blue plastic sleeve in place for a tight compression fit. When you remove the cable from the crimper, that end is ready to use.

Fig. 3.48 the making of ethernet cable

10. For a standard 'straight through' cable, repeat all steps and wire color order on the other end of the cable. For a crossover cable, the other end will have a different color order as shown by the crossover picture above.

Fig. 3.49 the making of ethernet cable

11. Make sure to test the cables before installing them. An inexpensive Ethernet cable tester does this quite well.

Fig. 3.50 the making of ethernet cable

3.3.2.3.2 How to wire Ethernet Patch Cables:

Strip off about 2 inches of the ethernet cable sheath.

Untwist the pairs - don't untwist them beyond what you have exposed, the more untwisted cable you have the worse the problems you can run into.

Align the colored wires according to the wiring diagrams above.

Trim all the wires to the same length, about 1/2" to 3/4" left exposed from the sheath.

Insert the wires into the RJ45 plug - make sure each wire is fully inserted to the front of the RJ45 plug and in the correct order. The sheath of the ethernet cable should extend into the plug by about 1/2" and will be held in place by the crimp.

Crimp the RJ45 plug with the crimper tool.

Verify the wires ended up the right order and that the wires extend to the front of the RJ45 plug and make good contact with the metal contacts in the RJ45 plug

Cut the ethernet cable to length - make sure it is more than long enough for your needs.

Repeat the above steps for the second RJ45 plug.

How to wire fixed Ethernet Cables:

Run the full length of ethernet cable in place, from endpoint to endpoint, making sure to leave excess.

At one end, cut the wire to length leaving enough length to work, but not too much excess.

Strip off about 2 inches of the ethernet cable sheath.

Align each of the colored wires according to the layout of the jack.

Use the punch down tool to insert each wire into the jack.

Repeat the above steps for the second RJ45 jack.

If an ethernet cable tester is available, use it to verify the proper connectivity of the cable. That should be it, if your ethernet cable doesn't turn out, look closely at each end and see if you can find the problem. Often a wire ended up in the wrong place or one of the wires is making no contact or poor contact. Also, double check the color coding to verify it is correct. If you see a mistake or problem, cut the end off and start again. A ethernet cable tester is invaluable at identifying and highlighting these issues.

When sizing ethernet cables remember that an end-to-end connection should not extend more than 100m (~328ft). Try to minimize the ethernet cable length, the longer the cable becomes, the more it may affect performance. This is usually noticeable as a gradual decrease in speed and increase in latency.

Experience gained

I was in a team of interns that participated in the laying of ethernet cable.

3.3.3 Disassembling and assembling a laptop computer

The computer system is made up of following external devices:

- CPU cabinet
- Monitor
- Keyboard
- Mouse
- Printer/scanner (if attached)

However, the techniques of assembling and disassembling a computer system differ from a computer's type and model to the other. I was taught how to disassemble and assemble both laptop and desktop computer of any model, but some techniques that are peculiar to laptop computers only are explained here.

3.3.3.1 An introduction to laptop disassembly

The only time one would need to undertake full a complete laptop disassembly is perhaps if one is to replace a motherboard or laptop case. Most repairs or replacement will only require a few of these steps to be undertaken.

1. **Remove the power supply and battery**

Removing the battery and power adapter

- Move the locking slider to the 'unlock' position
- Move the other slider in the direction of the arrow
- Pull the battery out straight and not on an angle

Fig 3.51 laptop battery and power adapter section

1. **Remove the accessible components**

How to unscrew a laptop:

- Use an appropriate magnet tipped screwdriver, most of the time you will use a Philips screwdriver for this (see laptop disassembly tools)
- If you are removing a cover, e.g., a Hard Drive or RAM cover, it may help if you place masking tape over the screw hole to keep the screws in place once the cover is removed so as not to lose the screws.
- If the screw spins and does not come out first of all turn the laptop over and gently tap the underside, try using the magnetic tip of the screwdriver to pull the screw out if this helps
- If the threads on the screw have become worn, then consider using a Dremel tool to drill the screw out.

Fig. 3.52 RAM and HDD section

How to take the back / bottom of a laptop off:

- Undo the screws from all of the covers that house the components found on the underside of the laptop.
- The number of covers will vary from laptop to laptop. For neatness and efficiency put the screws back into their holes on the covers once removed from the laptop and consider putting some masking tape over the hole.
- There is also a single screw that retains the CD/DVD drive. On most laptops this appears as a small CD picture, in this case it is the picture of a padlock. Sometimes this screw is located underneath a cover. Try to imagine the size and length of a CD/DVD drive to get an idea where the screw will be located. Remove this also.

Fig. 3.53 CD ROM key

Remove the covers and lay them out upon a cleared area of your workbench in such a way that they are positioned in rough relation to each other as they were upon the laptop.

HARD DRIVE: – Remove this by pulling it in the opposite direction to its data pins. There may be screws or maybe not. The drive should pull out easily. Place it on top of its cover in the cleared area of your desk.

RAM: – There are clips either side of the sticks of RAM that push outward. It is advisable to use a plastic spudger tool whenever possible to prevent any static discharge from occurring. When release the RAM will pop up at an angle of 30 degrees. Remove both sticks of RAM and place them on top of their cover in the cleared area of your desk.

There may be more covers that you can remove or not. If you can see more then keep going until all covers and components have been removed.

WIRELESS CARD: – There is a small gold tipped cover which you can prise off with minimum effort. This is the wireless antennae. The wireless card itself can be removed in the same manner as the sticks of RAM. Remember to remove it at 30 degree angle.

For now, if you see a heat sink under a cover then leave it in place. If you remove it you could damage the CPU.

2. Remove the Hinge Plate Cover (HPC) / Keyboard Bezel and keyboard

With some laptops there are additional screws that retain the Hinge Cover Plate, (HCP) most of the time they will be indicated by a small picture of a keyboard (but not always). These screws will sometimes be located inside the removed battery area. Remove them and take a note of their position and type so you can differentiate them from other screws later on.

Sometimes there is an obvious notch where you can begin to remove the hinge plate cover. Using a small flat head screwdriver prise this up. Minimum force is always required and no more. When you do this with other laptops if you must use more than minimum force then there are likely to be retaining screws. STOP and remove them before you do any damage.

Once the hinge cover plate has been prized up, use your fingers to gently remove the whole part. Place it with the other covers on your work desk.
Remove the retaining screws found underneath the hinge cover plate. Check for any additional screws near the bottom of the keyboard too.

The keyboard will not simply lift, you need to push it forward toward the screen first.

THERE IS A RIBBON CABLE UNDERNEATH THE KEYBOARD – BE VERY CAREFUL NOT TO PULL IT OUT AT THIS POINT.

The ribbon cable is held in place by a plastic hinge which you can lift up using either your fingernails or a plastic spudger tool.

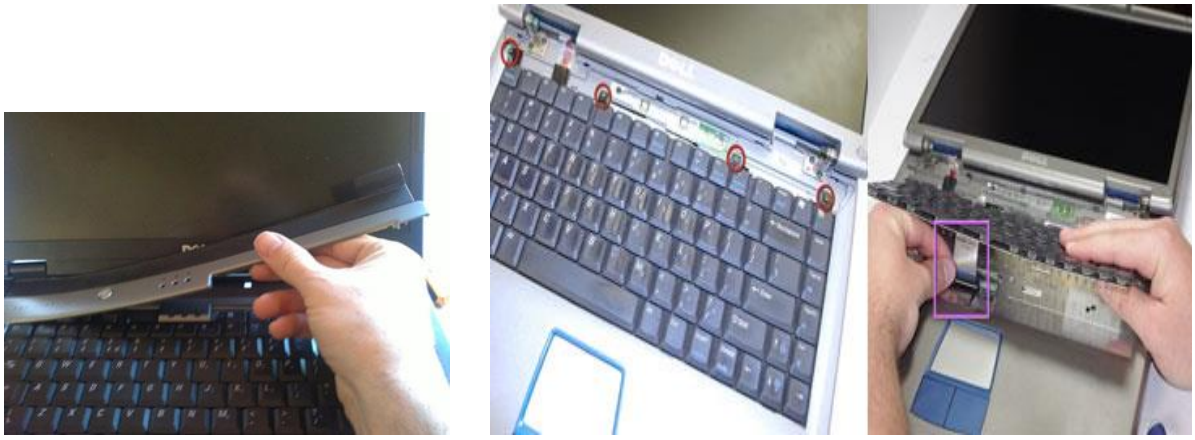


Fig. 3.54 Keyboard bezel

3. Remove any other cables under the keyboard that you see

Fig. 3.55 Mouse cables

It may be a good idea to take a picture or draw a diagram of where all the cables go. The ribbon cable connectors only come in a few varieties and they either prise forward or upward. You might also see small plastic plugs for some cables. They just pull out.

4. Remove the display unit

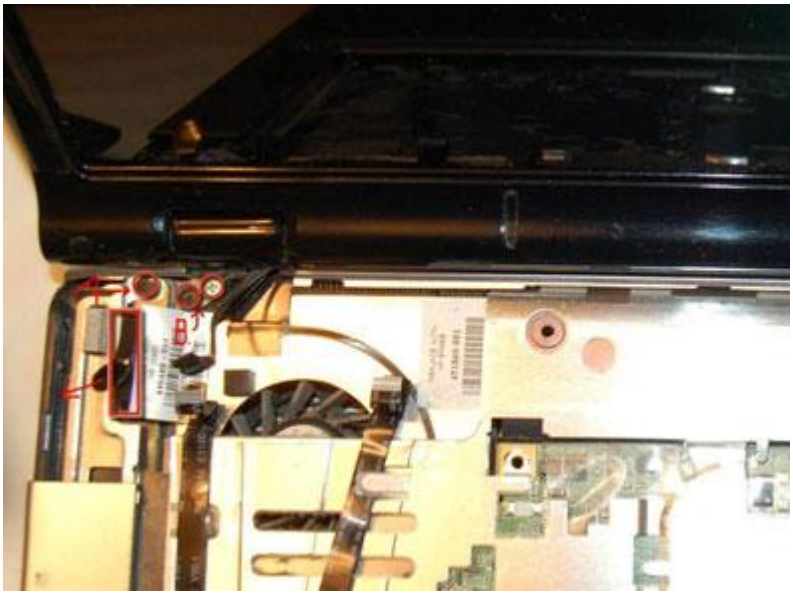


Fig. 3.56 VDU connector

Our next step will be to remove the display unit. As with most laptops before this can be done, we also need to remove the antennae cable and the LCD data cable. These cables can be connected in variety of manner, but removal is usually straight forward.

Take out the hinge screws for the display assembly. Sometimes they are on the back and others they are inside. Try to see where the hinges might be connected, they usually use longer screws.

Take out the hinge screws for the display assembly and gently removed the part.

Remove the black rubber pads from around the edge of the screen surround. The retaining screws are to be found under here. When removing the pads using as little force as possible as to not damage them. Try and use your fingernails at first before resorting to other tools.

Undo the screws and place them into a tub on your separate work area.

Using a spudger tool or your fingers pry the front cover away from the back part of the screen. Run the spudger tool around the outside if required but at no point should you feel resistance, you may have missed a screw if you do.

With the front cover removed the LCD screen is now exposed.

Remove the tiny screws from the side of the LCD screen and remove the screen taking care not to touch the back part of the screen that says, ‘DO NOT TOUCH’.

Most laptops allow you to just remove 2 screws from the top front part of the metallic arms that hold the LCD in place which allows you to tilt the screen and have access to the FL INVERTER.

5. Continue to remove any other screws from the case
Remove them all and place them either in pile so you can identify them later or into a small container. Make sure you label them, so you know where they came from later. Repeat this procedure for the other half of the laptop.

Fig. 3.57 Laptop back case

6. Pry case apart
Pry case apart – use spudger, fingernails or plastic tools. Again, if you feel resistance STOP and double check you have removed all of the screws.

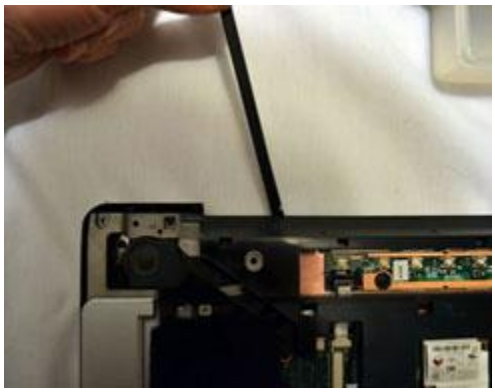


Fig. 3.58 Laptop case

7. Remove the motherboard and motherboard peripherals

Take note that the touchpad comes as part of an assembly and when you buy a replacement one of these it comes as the assembly and not just the touchpad.

Remove all screws securing the system board, the power board, the video board, etc. Disconnect all cables, connecting the boards.

Sometimes the screws on the motherboard have a letter assigned or white arrows. They are the ones you have to unscrew to get the motherboard off because you don't always have to take all the screws out.

Fig 3.59 laptop mouse pad

Slowly take the motherboard out and feel for where the pressure seems to keep the board in place. It should come out with no pressure.

Fig. 3.60 Laptop motherboard

3.3.3.2 Assembling a laptop

The process is simply the reverse.

i. Put the motherboard back into the case and reconnect the sound cable. Put all screws back into the white arrow holes. Put the case parts back together. Remember to thread the cables including the antennae cable back through. Make sure no cable is snagged or caught up anywhere.

ii. Put the retaining screws back into the bottom half of the laptop. Then put the top screws back in.

iii. Put the screen back in place and reconnect the antennae and the data cable. Replace the display hinge screws.

iv. Replace the keyboard. First of all, put the ribbon cable back in. Remember there is a plastic hinge which holds the ribbon in place, remember to lift this up first (gently). The ribbon has a darker side and a lighter side. It is the lighter side that faces upward, so there is no twist in the ribbon. Replace the keyboard retaining screws.

v. Click the Hinge Cover Plate (HCP) back into place. Use even pressure to ensure it fits properly.

vi. Replace the RAM. Remember it is fed into the slots at 30-degree angles and not straight on. Once it has been fed at a 30degree angle, click it downwards into place. Replace the other components such as the wireless card, again remember it has to inserted at a 30-degree angle. Click it into place and gently replace the gold connector. Replace the Hard Disk Drive (HDD) by sliding it in the opposite direction to the arrow. Make sure it fits securely and is not loose. Insert the CD/DVD drive and put the retaining screw back into the underside of the laptop.

vii. Finally, replace the component covers and replace all ofthe screws.

3.3.4 Computer motherboard

A motherboard (also called mainboard, main circuit board, or mobo) is the main printed circuit board (PCB) in general-purpose computers and other expandable systems. It holds and allows communication between many of the crucial electronic components of a system, such as the central processing unit (CPU) and memory, and provides connectors for other peripherals. Unlike a backplane, a motherboard usually contains significant sub-systems, such as the central processor, the chipset's input/output and memory controllers, interface connectors, and other components integrated for general use.

Motherboard means specifically a PCB with expansion capabilities. As the name suggests, this board is often referred to as the "mother" of all components attached to it, which often include peripherals, interface cards, and daughterboards: sound cards, video cards, network cards, host bus adapters; and a variety of other custom components.

Fig. 3.61 laptop motherboard

3.3.4.1 Design of a computer motherboard

The Fig3.20 is a circuit diagram of a laptop motherboard. A motherboard provides the electrical connections by which the other components of the system communicate. Unlike a backplane, it also contains the central processing unit and hosts other subsystems and devices.

A typical desktop computer has its microprocessor, main memory, and other essential components connected to the motherboard. Other components such as external storage, controllers for video display and sound, and peripheral devices may be attached to the motherboard as plug-in cards or via cables; in modern microcomputers, it is increasingly common to integrate some of these peripherals into the motherboard itself.

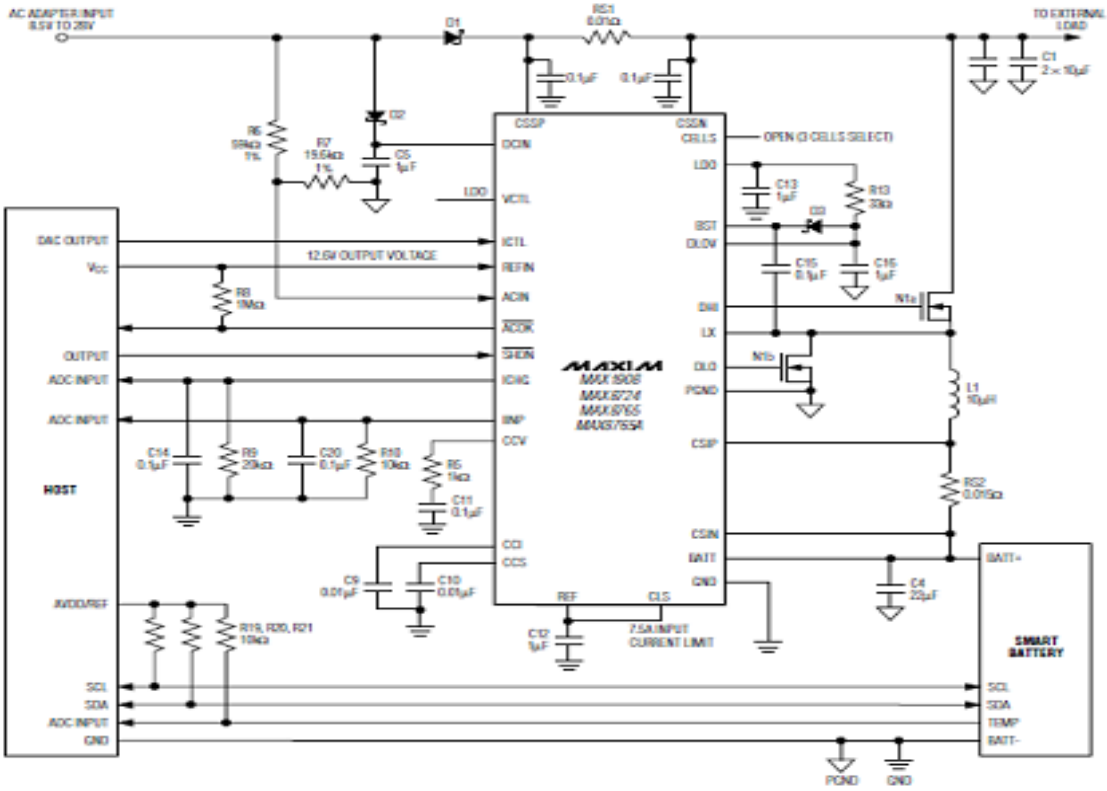


Fig 3.62 Circuit diagram of laptop motherboard

An important component of a motherboard is the microprocessor's supporting chipset, which provides the supporting interfaces between the CPU and the various buses and external components. This chipset determines, to an extent, the features, and capabilities of the motherboard.

Components of modern motherboards

- CPU sockets (or CPU slots) in which one or more microprocessors may be installed. In the case of CPUs in ball grid array packages, such as the VIA Nano and the Goldmont Plus, the CPU is directly soldered to the motherboard.
- Memory slots into which the system's main memory is to be installed, typically in the form of DIMM modules containing DRAM chips can be DDR3, DDR4 or DDR5.
- The chipset which forms an interface between the CPU, main memory, and peripheral buses
- Non-volatile memory chips (usually Flash ROM in modern motherboards) containing the system's firmware or BIOS

- The clock generator which produces the system clock signal to synchronize the various components
- Slots for expansion cards (the interface to the system via the buses supported by the chipset)
- Power connectors, which receive electrical power from the computer power supply and distribute it to the CPU, chipset, main memory, and expansion cards. As of 2007, some graphics cards (e.g. GeForce 8 and Radeon R600) require more power than the motherboard can provide, and thus dedicated connectors have been introduced to attach them directly to the power supply.
- Connectors for hard disk drives, optical disc drives, or solid-state drives, typically SATA and NVMe now.

Additionally, nearly all motherboards include logic and connectors to support commonly used input devices, such as USB for mouse devices and keyboards. Early personal computers such as the Apple II or IBM PC included only this minimal peripheral support on the motherboard. Occasionally video interface hardware was also integrated into the motherboard; for example, on the Apple II and rarely on IBM-compatible computers such as the IBM PC Jr. Additional peripherals such as disk controllers and serial ports were provided as expansion cards.

Given the high thermal design power of high-speed computer CPUs and components, modern motherboards nearly always include heat sinks and mounting points for fans to dissipate excess heat.

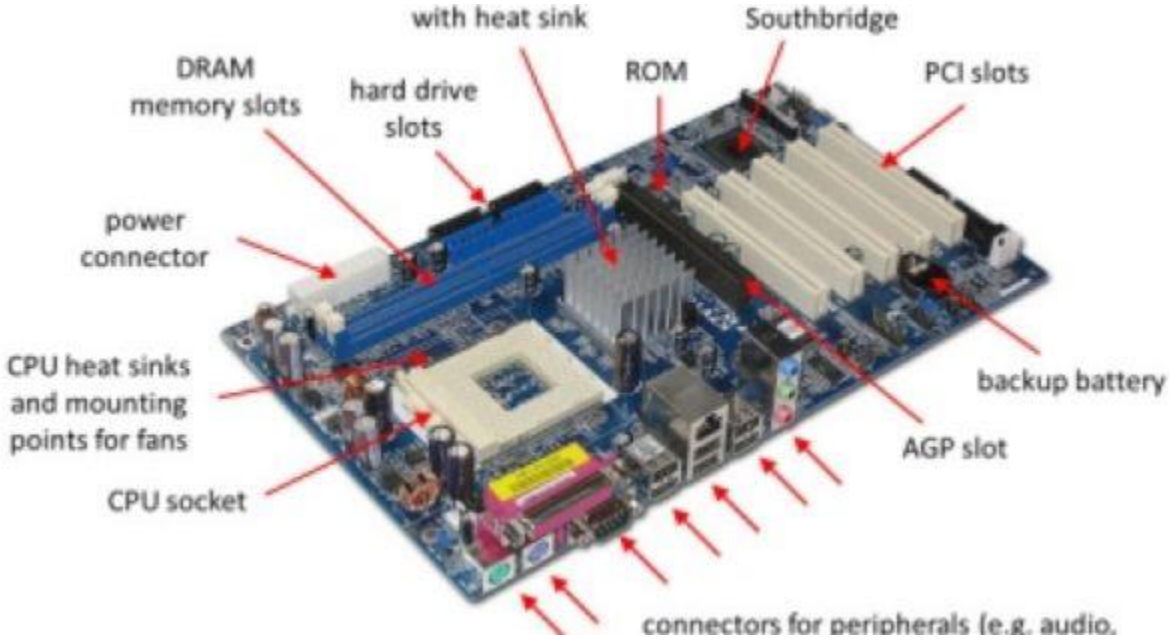


Fig 3.63 Diagram of desktop motherboard

WORKING PRINCIPLE OF A COMPUTER MOTHERBOARD

A motherboard is at the core of every computer system. In desktop models it usually lines the floor of the system. In tower and mini-tower models, it lies along one of the sides. A motherboard's components and features define a PC's potential and upgrade path. Virtually

every essential computer part, data bus, or electrical subsystem attaches to the motherboard in some way. If the motherboard fails, the computer will not function (Holzberg, 2002).

Also, a computer motherboard could be identified by the components that attach to it and the layout of its parts. The most important motherboard component is the microprocessor or CPU. Other significant components include the number of memory slots onboard, the maximum amount of memory the board supports, available PCI (Peripheral Component Interconnect) slots, the system bus or maze of wires connecting the CPU to the PC's numerous components, whether the board has integrated audio or modem circuitry, and the range of speeds supported by the processor.

As the motherboard works, data and timing signals transfer from one connected component to another by way of interconnected leads etched into the board. These leads are known as the system bus. The power supply (which also connects to the motherboard) distributes power to system components via the bus. The processor also communicates with motherboard components by sending and receiving instructions and data over the bus. A motherboard is designed to take advantage of particular technology. For example, certain processors function correctly only when installed on particular motherboards and chipsets. You won't be able to take advantage of new technology (a speedier processor or different type of graphics, for example) if the board installed in your computer lacks the appropriate circuitry.

MOTHERBOARD AND MICROPROCESSOR DIAGNOSTIC TESTS

The motherboard and processor are two of the most important hardware components inside the computer. The various pieces of hardware inside the PC communicate with one another through the circuits on the motherboard, while the CPU stores and executes programming instructions. However, they can malfunction at any point in time. Diagnosing a defective motherboard or CPU isn't an exact science, however, as most hardware components exhibit similar symptoms when failing. The following are simple techniques in diagnosing a computer motherboard for faults:

1. **Turn off the computer**

   Turn off the computer. Disconnect the power cable from the back of the PC. Unscrew and remove the cover from the case.

2. **Touch a bare metal surface**

   Touch a bare metal surface, such as the computer chassis, to ground yourself.

3. **Turn on the computer**

   Reconnect the power cable and then turn on the computer. Listen to the internal speaker for a sequence of beeps (call beep codes) that the motherboard produces when the system detects a problem with a critical hardware component.

4. **Navigate to motherboard manufacture's website**

   Open a browser and navigate to the motherboard manufacturer's website. Look up the motherboard model and review the documentation for the component to find out which device is responsible for the beep code, if applicable. Confirm that the device is properly

installed to the motherboard. If resetting the hardware fails to fix the problem, you might need to replace the component.

5. **Turn off the computer**

   Power off the computer if the PC fails to emit a beep code. Disconnect the power cable and all peripheral components connected to the rear of the PC.

6. **Uninstall hardware**

   Uninstall all hardware from the computer except for the motherboard, CPU, power supply, hard drive and video card.

7. **Loose the heat sink and processor fan**

   Loosen and remove the brackets securing the heat sink and processor fan to the CPU. Twist the heat sink back and forth to weaken the seal binding the component to the top of the processor.

8. **Touch the processor**

   Extract the heat sink from the PC. Put a finger on the processor. If the component is too hot to touch for longer than a couple seconds, the CPU might be overheating. Upgrading the heat sink assembly will improve cooling and stop sudden system shutdowns.

9. **Lift out the CPU**

   Release the bar securing the CPU to the motherboard. Lift the CPU out of the computer and check the surface of the component for bent or broken pins, which indicate that the hardware should be replaced.

10. **Lock the CPU in place**

    Line up the triangle on the edge of the processor with the triangle on the processor slot. Place the CPU on top of the slot and then push down the bar to lock the component in place.

11. **Reconnect the power**

    Reconnect the power cable and press the power button. Check the power indicator light and listen for the spinning of the system fan. If the indicator light remains off and the system fan fails to power up, the power supply unit might be defective. Replace the PSU; if the computer still fails to power on, the motherboard might be at fault.

12. **Check for damage on the motherboard**

    Shine a flashlight on the motherboard and check for broken onboard chips, damaged capacitors (which look similar to an AA battery), burnt traces (the lines traveling along the surface of the board), or cracks or fractures in the board itself. If the motherboard has incurred physical damage, it must be replaced.

13. **Remove the CLRTC jumper**

Turn off the computer. Locate a jumper labeled "CLRTC" or similar. Use a pair of tweezers to remove the shunt from the first two pins. Place the shunt on pins two and three, wait 10 seconds, and then return the jumper to its original configuration.

14. Reconnect the keyboard

Reconnect the keyboard to the computer and then restart the PC. Follow the instructions on the boot screen to go to setup.

15. Load fail-safe defaults

Press the button as shown on the main menu to load fail-safe defaults or use the directional pad to select the appropriate option and then press "Enter."

16. Restart the computer

Press the button as shown on the main menu to load fail-safe defaults or use the directional pad to select the appropriate option and then press "Enter."

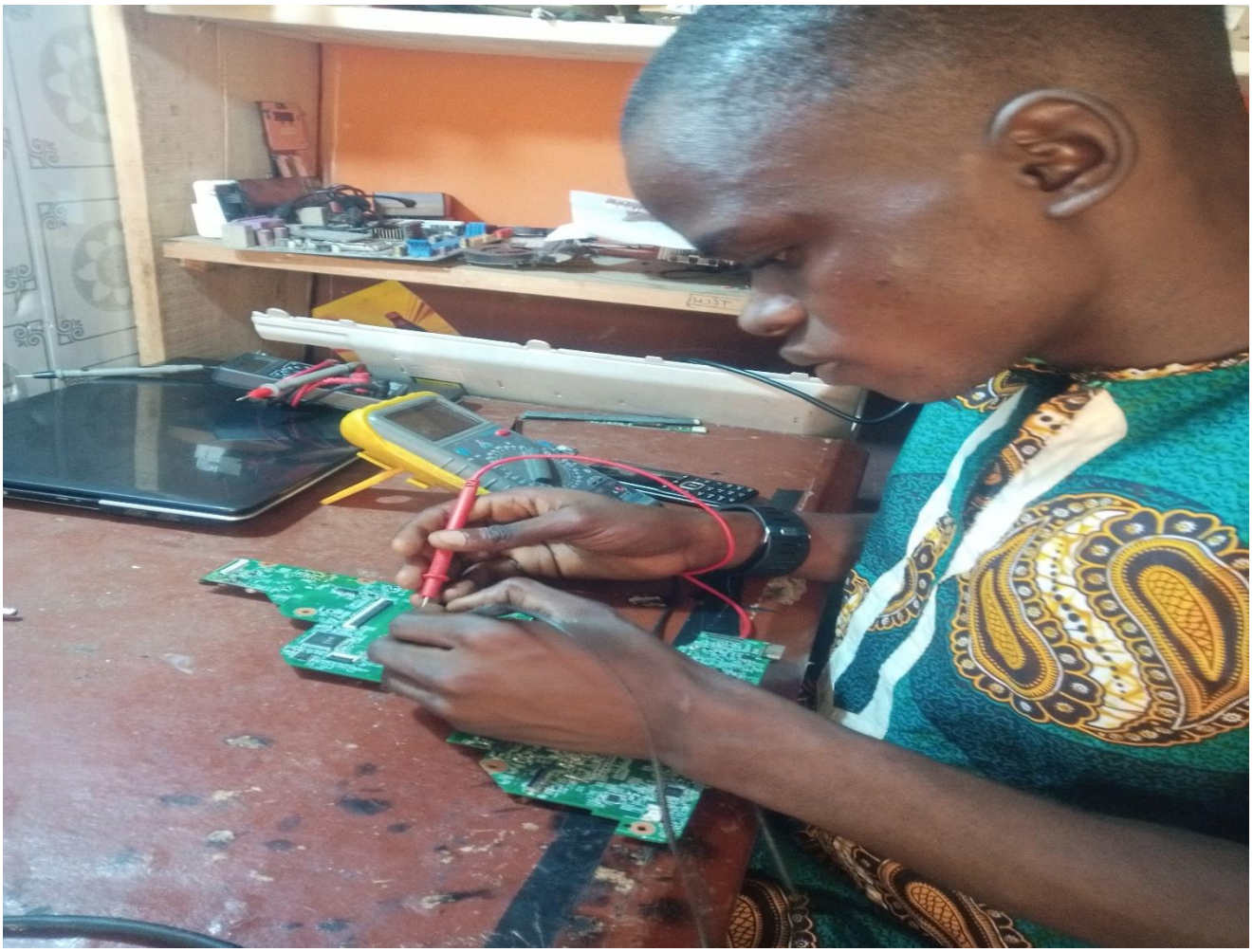


Fig. 3.40 image of an intern troubleshooting a laptop motherboard

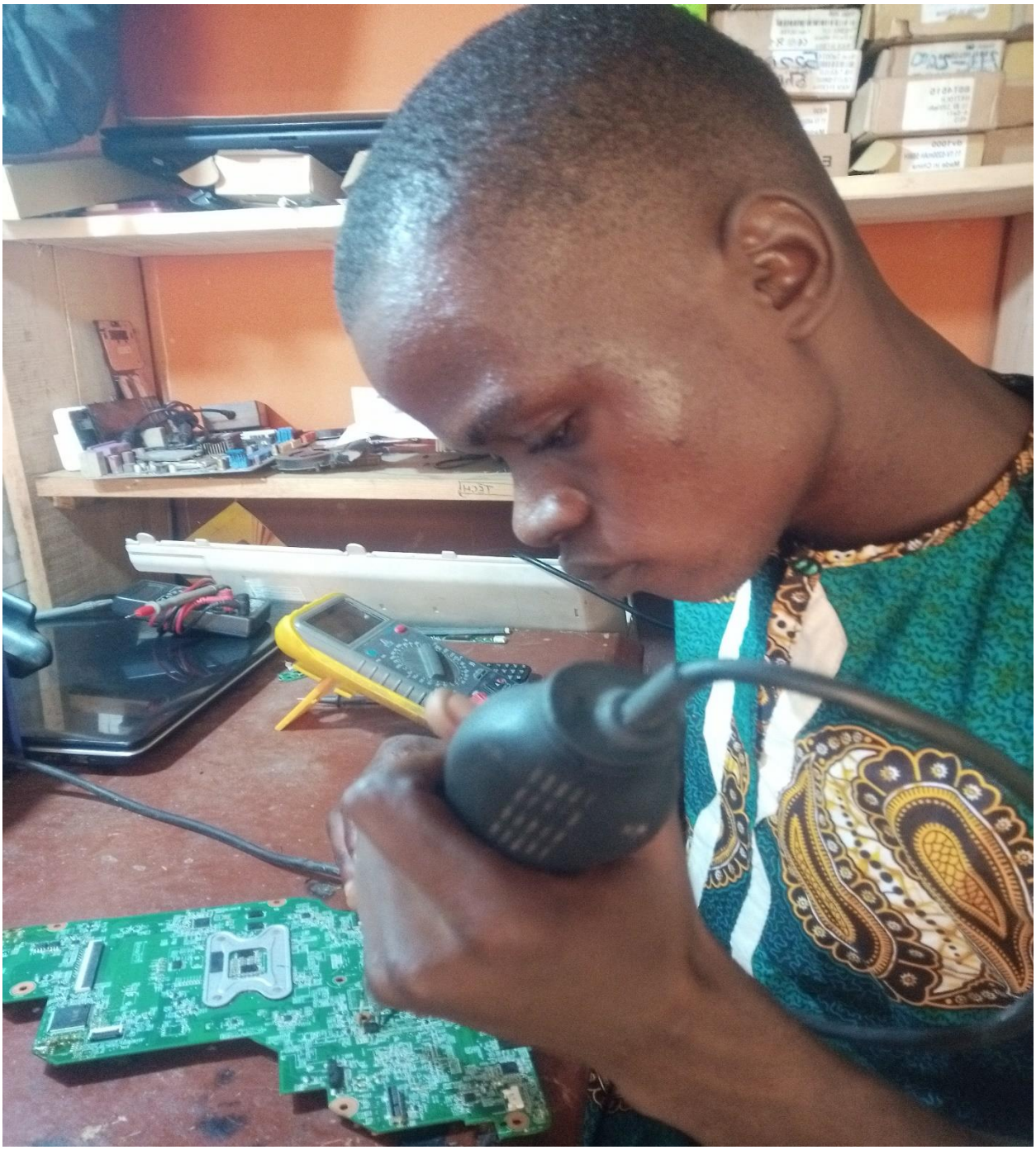


Fig. 3.41 Image of an intern DE soldering a component on the motherboard

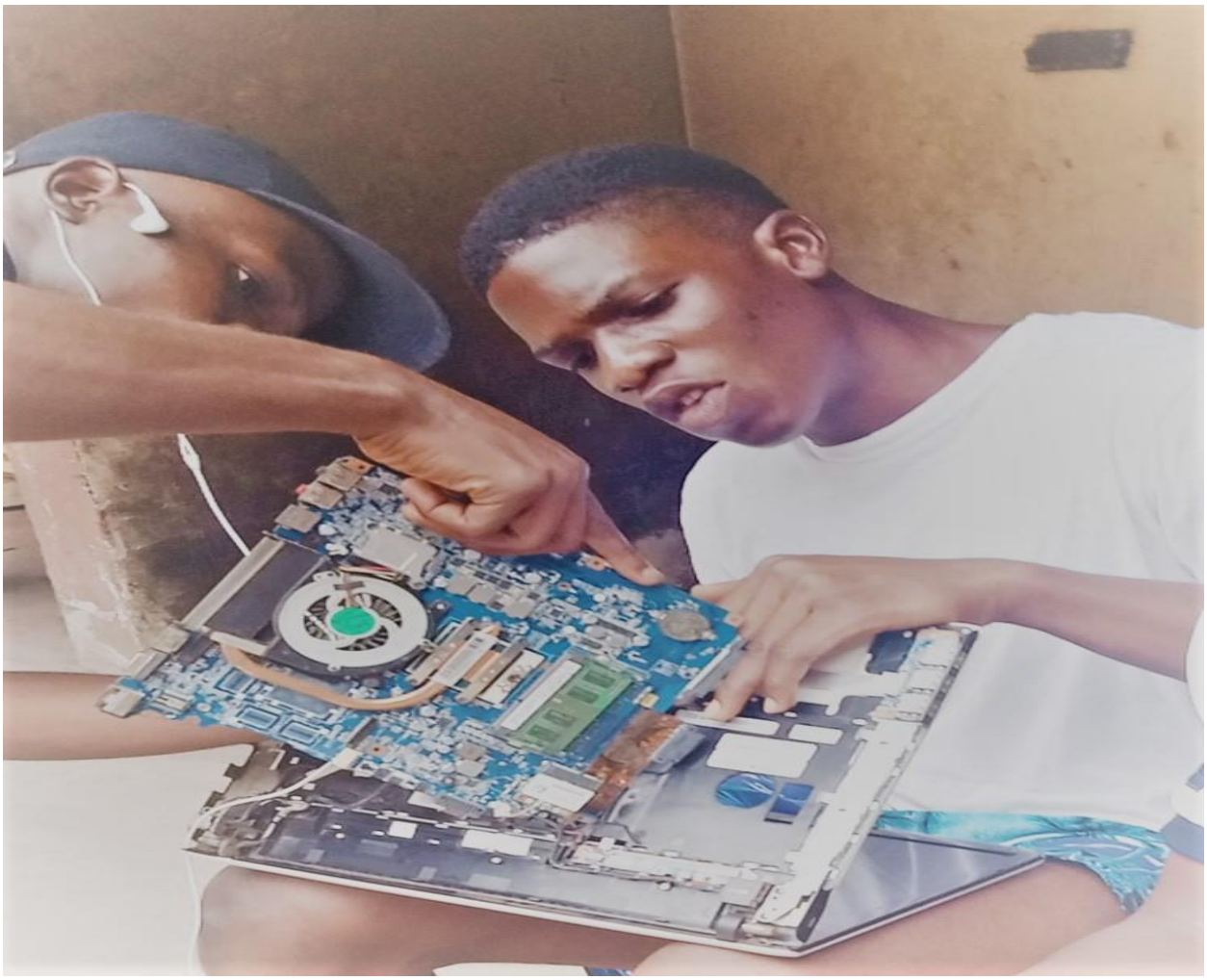


Fig. 3.42 Image of Interns disassembling a laptop computer system

3.3.5 Experience Gained and Work Done in The Training Department

1. I actively participated in troubleshooting, and repair faults on laptop motherboards. This involves the tracing faults on a motherboard with the aid of the motherboard architectural diagram using a digital multimeter, DC power supply etc., fixing the motherboard faults by replacing any detected faulty components with the help of rework station which has a soldering iron and a heat gun. This allowed me to see on firsthand basis how a computer motherboard is analyzed for fault detections and fixed for normal functioning.
2. I also participated in the hardware and software installation of computer systems. This includes replacing faulty or malfunctioning hardware components such as screen, Hard drive, RAM module, keyboard, mousepad, battery etc. of any model of a computer system, formatting and installing operating systems and fundamental software and rectification of software glitches on both laptop and desktop computers.

Fig 3.43 Image of interns assembling a laptop computer system

Fig 3.44 Replacement and fixing of hardware components of a laptop computer system

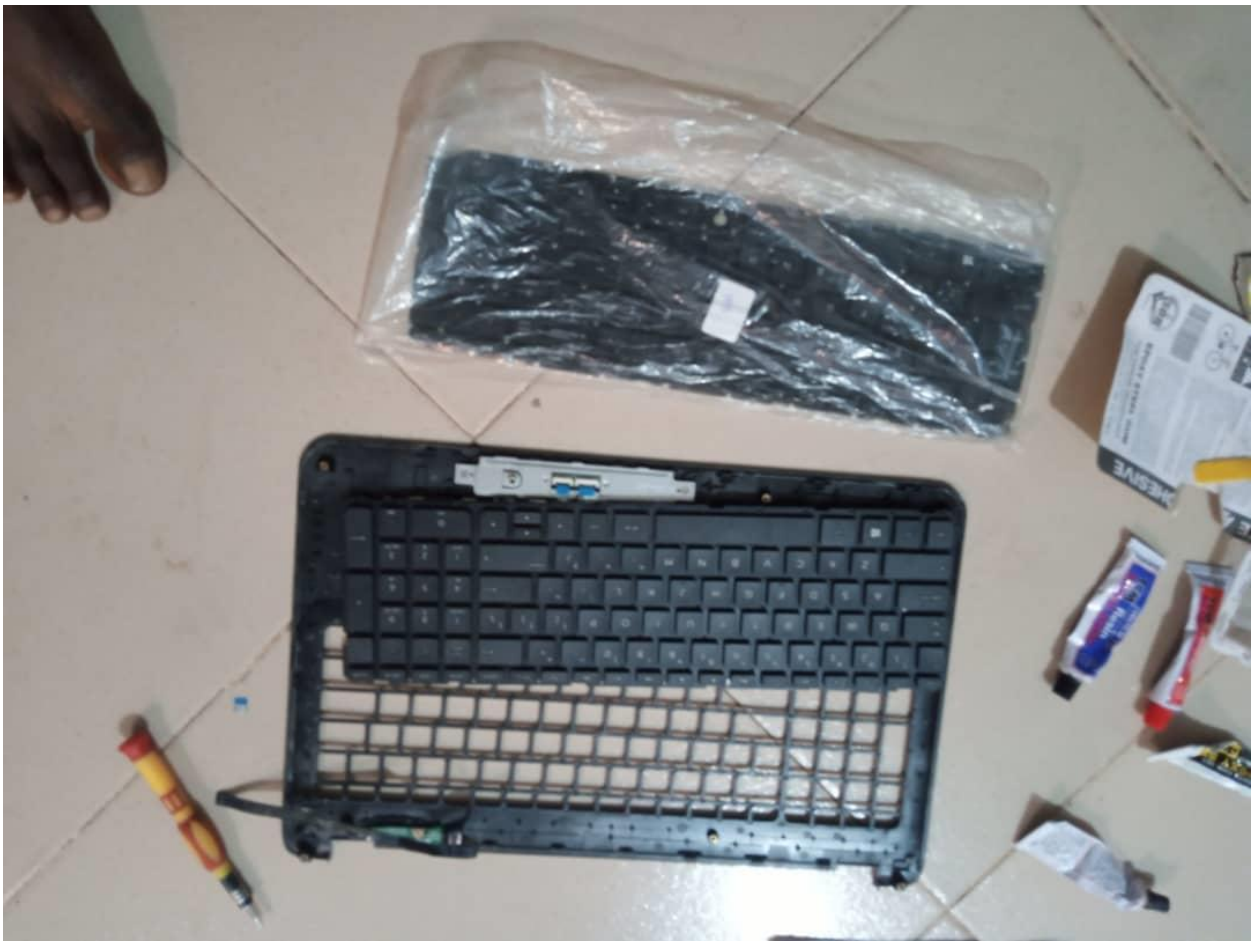


Fig 3.45 Image of a laptop keyboard replaced

Fig 3.46 Testing of replaced laptop keyboard

3.4 Marketing and logistics department

3.4.1 Introduction

I had the opportunity of spending some weeks of my internship in the marketing department. This department is also known as the publicity department, it is saddled with the responsibility of promoting the company's business and drives sales of her products or services. It provides the necessary research to identify their target customers and other audiences.

Logistics department: role of the logistic department includes the delivery and storage of products and goods. They ensure that the right products are delivered to the right location at the time. They are also involved in transportation, stock control, warehousing and monitoring the flow of goods.

Fig 3.47 computer store

3.4.2 Publicity and advertising

In marketing, publicity is the public visibility or awareness for any product, service, person, or organization (company, charity, etc.). It may also refer to the movement of information from its source to the public, often (but not always) via the media. The

subjects of publicity include people of public interest, goods and services, organizations, and works of art or entertainment.

Advertisement is a marketing communication that employs an openly sponsored, non-personal message to promote or sell a product, service, or idea. Sponsors of advertisement are typically businesses wishing to promote their products or services. Advertisement is differentiated from public relations in that an advertiser pays for and has control over the message. It differs from personal selling in that the message is non-personal, i.e., not directed to a particular individual. Advertisement is communicated through various mass media, including traditional media such as newspapers, magazines, television, radio, outdoor advertising or direct mail; and new media such as search results, blogs, social media, websites or text messages. The actual presentation of the message in a medium is referred to as an advertisement: advert or ad for short.

In a bid to promote a company's business, free publicity and advertisement could be generated via:

1. **Social Media Marketing**: The term social media marketing (SMM) refers to the use of social media and social networks to market a company's products and services. Social media marketing provides companies with a way to engage with existing customers and reach new ones while allowing them to promote their desired culture, mission, or tone. Social media marketing has purpose-built data analytics tools that allow marketers to track the success of their efforts. Sites like Facebook, Twitter, and Instagram are commonly used to execute social media marketing.

Fig. 3.48 social media marketing

2. **Viral Marketing**: Viral marketing seeks to spread information about a product or service from person to person by word of mouth or sharing via the internet or email. The goal of viral marketing is to inspire individuals to share a marketing message to friends, family, and other individuals to create exponential growth in the number of its recipients. The internet and the advent of social media have greatly increased the number of viral messages in the form of memes, shares, likes, and forwards. Once something goes viral, it is an easy and cheap way for a message to gain popularity.

Example of viral marketing is Hotmail, the free web-based email service launched in 1996 that included in its users' outgoing messages an embedded advertisement and direct link inviting recipients to sign up for an account. This practice led to the fastest growth among user-based media companies at the time.

Fig 3.49 viral marketing

2. Press Release: A press release is an official statement delivered to members of the news media for the purpose of providing information, creating an official statement, or making an announcement directed for public release. Press releases are also considered a primary source, meaning they are original informants for information. A press release is traditionally composed of nine structural elements, including a headline, dateline, introduction, body, and other

components. Press releases are typically delivered to news media electronically, ready to use, and often subject to "do not use before" time, known as an news embargo.

A special example of a press release is a communiqué, which is a brief report or statement released by a public agency. A communiqué is typically issued after a high-level meeting of international leaders.

Fig. 3.50 Press release

4. **Radio and television ads marketing:** Generally speaking, **broadcast advertising is radio, television, and Internet advertising**. The commercials aired on radio and televisions are an essential part of broadcast advertising (MSG, 2021).

The broadcast media like radio and television reaches a wider audience as opposed to the print media. The radio and television commercials fall under the category of mass marketing as the national as well as global audience can be reached through it.

The role of broadcast advertising is to persuade consumers about the benefits of the product. It is considered as a very effective medium of advertising. The cost of advertising on this channel depends on the time of the commercial and the specific time at which it is aired. For example, the cost of an ad in the premium slot will be greater than in any other slot.

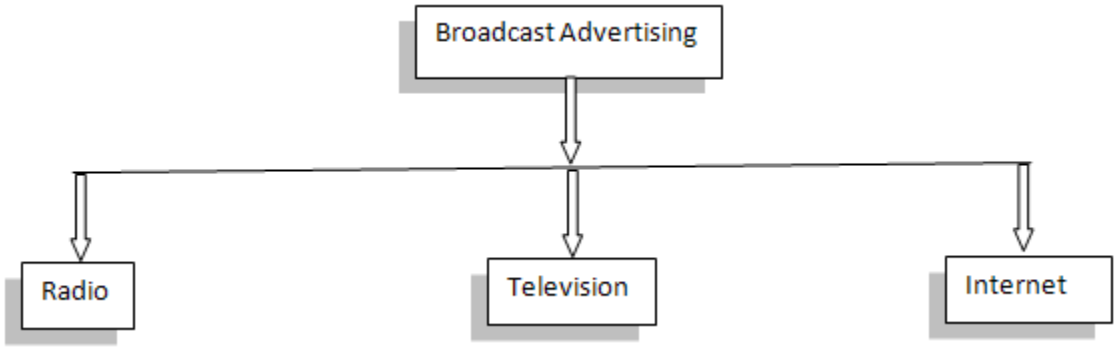


Fig. 3.51 Broadcast advertising

Fig. 3.52 Standard radio studio

5. **website:** Online advertising, also known as online marketing, Internet advertising, digital advertising or web advertising, is a form of marketing and advertising which uses the Internet to deliver promotional marketing messages to consumers. Many consumers find online advertising disruptive and have increasingly turned to ad blocking for a variety of reasons.

When software is used to do the purchasing, it is known as programmatic advertising.

Online advertising includes email marketing, search engine marketing (SEM), social media marketing, many types of display advertising (including web banner advertising), and mobile advertising. Like other advertising media, online advertising frequently involves a publisher,

who integrates advertisements into its online content, and an advertiser, who provides the advertisements to be displayed on the publisher's content. Other potential participants include advertising agencies who help generate and place the ad copy, an ad server which technologically delivers the ad and tracks statistics, and advertising affiliates who do independent promotional work for the advertiser.

Fig 3.53 Online advertising

3.4.2.1 Advantages of advertising to business

A well-advertised product is easier to be sold by the salesman in the market. If a brand is popular and well-known, people respond favorably to the salesman's efforts. It provides a support to salesmanship, as the audience understands the product and its uses more clearly through the advertisement and the salesman's effort is reduced to convince the buyers. The following are some important advantages of advertising to fast growing businesses:

i. Increase in sales: The main object of the manufacturer in advertising his products is to promote the sale of his products. Goods produced on a mass scale are marketed by the method of mass persuasion through advertising.

ii. Supplementing salesmanship: It creates a ground for the efforts of the salesmen. When a salesman meets its prospect, they have just to canvass for a product with which the consumer may already have been familiarized, through advertisements. Therefore, the salesman's efforts are supplemented, and his task is made easier by advertising.

iii. Lower costs: Sales turnover and encourage mass production of goods are enhanced by advertising that results in large scale production, average cost of production reduces and results in higher profits. At the same time, when the cost of advertising and selling costs

gets distributed over a larger volume of sales, the average cost of selling also lowers down.

iv. Greater dealer interest: Advertising creates demand by which every retailer gets an opportunity to share with others. Hence, the retailers who deal in advertised goods are materially assisted by advertising in the performance of their functions. The retailers have not to bother much about pushing-up the sale of such products. Therefore, they evidence more interest in advertised products.

v. Steady demand: Seasonal fluctuations on demands for products are smoothened by advertising generally, the manufacturers try to discover and advertise new possible uses of which a seasonal product maybe put.

3.4.2.2 Disadvantages of advertising to business

i. Loading the price: Advertising is expected to reduce total costs due to mass production and mass distribution and ultimately enable consumers to buy at lower prices. Experience proves otherwise. Advertising increases the prices of goods.

ii. Creating wastes: Advertising is wasteful. It can never appeal accurately to the target market like salesmanship. Many people may not read, hear, or view your advertisement. Press, radio, and TV advertisements have short life span and relatively costly persuade unit of space or time.

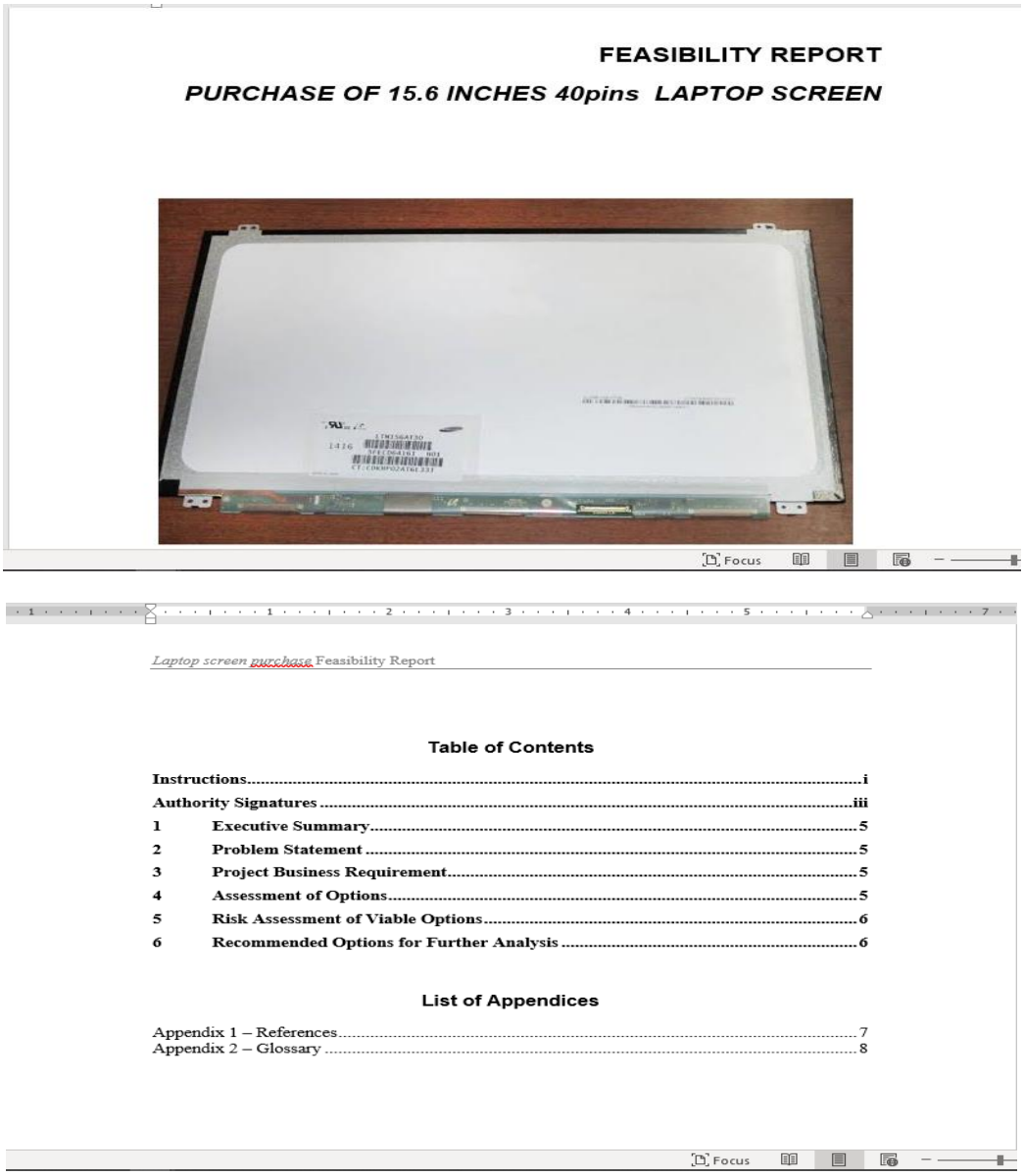
iii. Monopoly: A few firms in an industry do utilize the weapon of advertising to prevent entry of small firms in the market and thus advertising enables creation of monopoly or oligopoly in the market. It kills competition and to that extent consumers' interest is sacrificed. Only giant manufacturers can afford to spend lavishly on extensive and intensive advertising to retain and even enlarge their market share.

iv. Fraud on customers: Some advertising is fraudulent, misleading, or deceptive. Advertising causes us to buy goods, we do not want, at prices we cannot pay, and on terms we cannot meet. It is true that hard-sell, high pressure advertising does coerce the innocent and ignorant buyers to purchase many unwanted and shoddy goods. It is true that advertising often persuades people to buy things they should not buy, they do not need, nor they can afford.

3.4.3 Experience Gained and Work Done in marketing and logistics Department

1. I participated actively in a team of interns that made research on broadcast advertising, a report was written on the cost implication and feasibility of the research. I also led a

group of interns that conduct market feasibility study on some of the company's products and services.



FEASIBILITY REPORT

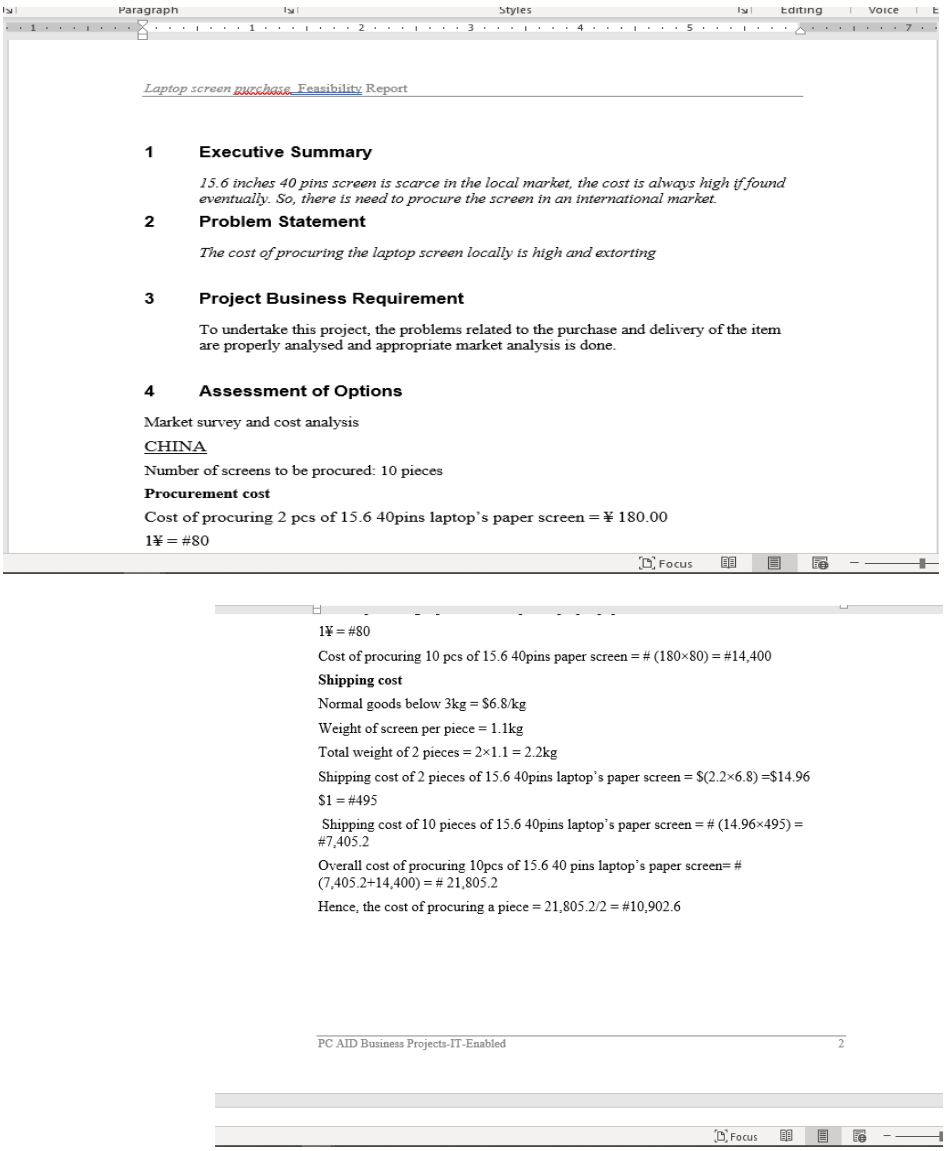
PURCHASE OF 15.6 INCHES 40pins LAPTOP SCREEN

Laptop screen purchase Feasibility Report

Table of Contents

List of Appendices

Fig 3.54 Images of PC AID Feasibility reports



Laptop screen purchase Feasibility Report

1 Executive Summary

15.6 inches 40 pins screen is scarce in the local market, the cost is always high if found eventually. So, there is need to procure the screen in an international market.

2 Problem Statement

The cost of procuring the laptop screen locally is high and extorting

3 Project Business Requirement

To undertake this project, the problems related to the purchase and delivery of the item are properly analysed and appropriate market analysis is done.

4 Assessment of Options

Market survey and cost analysis

CHINA

Number of screens to be procured: 10 pieces

Procurement cost

Cost of procuring 2 pcs of 15.6 40pins laptop's paper screen = ¥ 180.00

1¥ = #80

1¥ = #80

Cost of procuring 10 pcs of 15.6 40pins paper screen = # (180×80) = #14,400

Shipping cost

Normal goods below 3kg = $6.8/kg

Weight of screen per piece = 1.1kg

Total weight of 2 pieces = 2×1.1 = 2.2kg

Shipping cost of 2 pieces of 15.6 40pins laptop's paper screen = $(2.2×6.8) =$14.96

$1 = #495

Shipping cost of 10 pieces of 15.6 40pins laptop's paper screen = # (14.96×495) = #7,405.2

Overall cost of procuring 10pcs of 15.6 40 pins laptop's paper screen= # (7,405.2+14,400) = # 21,805.2

Hence, the cost of procuring a piece = 21,805.2/2 = #10,902.6

PC AID Business Projects-IT-Enabled 2

LOCAL STORES

cost of procuring a piece = #36,000

Cost of procuring 10 pcs of 15.6 40pins laptop's paper screen = 10× #36,000 = #360,000

CONCLUSION

Procuring the screen in the international market is cheaper than getting it in the local market

Fig 3.55 Images of PC AID Feasibility reports

2. I was among the team of interns that was lectured on the importance of marketing, some marketing tools, and their usages.

Fig 3.56 marketing tools

3. I participated in a team of interns that worked in the logistics department of the organization in branding, sorting and delivery of ordered company goods (Laptop computers) via express delivery services.

Fig. 3.57 sorted laptop computers in a shelve

Fig. 3.58 Delivery of goods by logistics department

4 CHAPTER FOUR: THE EQUIPMENT

4.1 Introduction

This chapter entails the equipment used, the functions of the equipment used and the descriptions of their usage while this attachment at PC AID, Ibadan. The equipment used are as follow.

1. Oscilloscope

2. DC power supply

3. Rework station

4. Personal protective equipment (PPE)

5. Multi-meters and Clamp meters

6. Operating system OS) Installation Flash drive and Hard drives

7. Allen key and a set of screw drivers

8. Light testers

4.2 Oscilloscope

An oscilloscope, formally known as oscillography, is an instrument that graphically displays electrical signals and shows how those signals change overtime. It measures these signals by connecting with a sensor, which is a device that creates an electrical signal in response to physical stimuli like sound, light and heat. For instance, a microphone is a sensor that converts sounds into electrical signal. Oscilloscopes are often used when designing, manufacturing or repairing electronic equipment. Engineers use an oscilloscope to measure electrical phenomena and solve measurement challenges quickly and accurately to verify their designs or confirm that a sensor is working properly.

Fig 4.1 Oscilloscope

4.3 DC power supply

A **DC power supply**, also known as a bench power supply, is a type of power supply that gives direct current (DC) voltage to power a device. A DC power supply management subsystem can use AC, DC, battery, or ultralow voltage as inputs. They generate the output power by converting an input signal into an output signal (in this case, a DC output).

4.2 DC power supply

4.3.1 Composition and operation

To illustrate the general structure of a power supply, we will use a typical DC power supply. A basic DC power supply can be built with four circuits (or sections), as shown in the following diagram, where each block represents a particular circuit that performs a specific function.

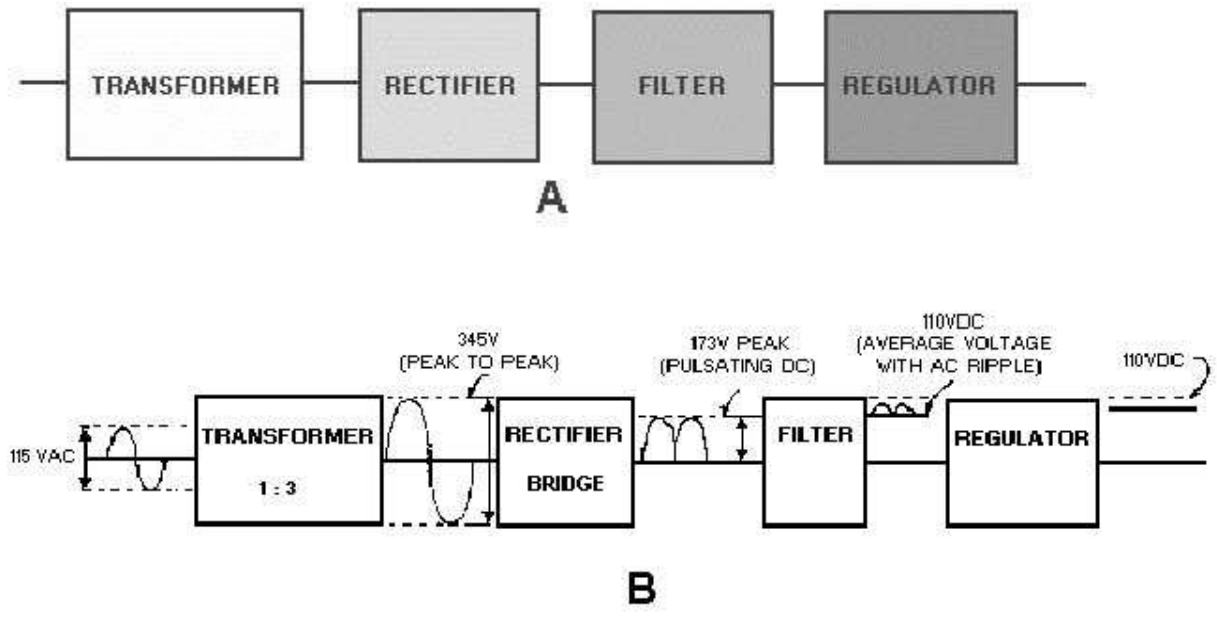


Fig.4.3 Block diagram of a dc power supply

4.3.2 Components of a DC power supply

The basic components of the DC power supply are the transformer, rectifier, filter and regulator.
Transformer: The input to the transformer is – normally – an AC signal that is generated by a line voltage such as the power from an electric outlet. The transformer's main function is to step-down (lower the amplitude) or step-up (increase the amplitude) the signal to produce the desired DC level required at the output of the power supply. The transformer also plays the role of an isolator. In many applications it is important to isolate the input AC signal from the signals generated internally by the device.
Rectifier: The signal at the output of the transformer is fed to the rectifier. This device provides a rectified pulsating DC signal. The rectifier can be a half-wave or full-wave rectifier. A pulsating DC signal is a signal (voltage or current) that does not change polarity, but its magnitude is a function of time. Typical rectifiers are built with diodes and resistors.
Filter: In order to convert the pulsating DC signal into a non-pulsating DC signal, a filter is needed. Normally a simple capacitor filter suffices. The output of the filter is DC voltage, which usually has some ripple or small AC variations.

Regulator: The regulator has two functions: (1) To smooth the signal from the filter producing a DC signal with no ripple, and (2) to produce a constant voltage at the output. The voltage at the output of the regulator remains constant even with variations in the input voltage or variations in the load.

4.4 Hot air welding station (Rework station)

Rework (or re-work) is the term for the refinishing operation or repair of an electronic printed circuit board (PCB) assembly, usually involving desoldering and re-soldering of surface-mounted electronic components (SMD). Mass processing techniques are not applicable to single device repair or replacement, and specialized manual techniques by expert personnel using appropriate equipment are required to replace defective components; area array packages such as ball grid array (BGA) devices particularly require expertise and appropriate tools. A hot air gun or hot air station is used to heat devices and melt solder, and specialized tools are used to pick up and position often tiny components. controls dwell pressure after molten plastic fills out

cavities. The position of change from speed control to pressure control is set at the point where either screw position or injection pressure reaches a certain fixed value.

A hot air welding station also known as **rework station** is a place to do this work—the tools and supplies for this work, typically on a workbench. Other kinds of rework require other tools.

Fig 4.3 SMD Rework station soldering station

4.4.1 Reasons for rework

Rework is practiced in many kinds of manufacturing when defective products are found.[2]

For electronics, defects may include:

- Poor solder joints because of faulty assembly or thermal cycling.
- Solder bridges—unwanted drops of solder that connect points that should be isolated from each other.
- Faulty components.
- Engineering parts changes, upgrades, etc.
- Components broken due to natural wear, physical stress or excessive current.
- Components damaged due to liquid ingress, leading to corrosion, weak solder joints or physical damage.

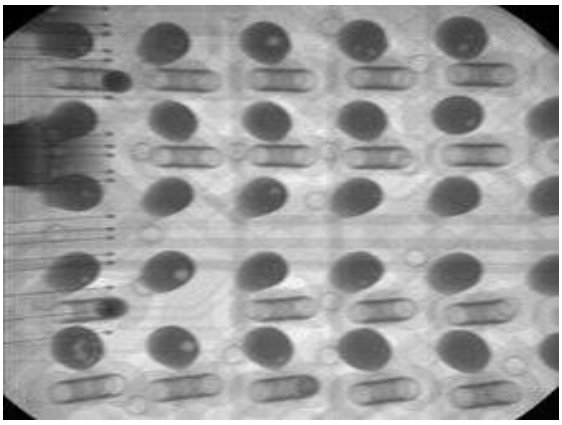


Fig 4.4 X-ray picture of inadequate solder joints.

4.4.2 The process

The rework may involve several components, which must be worked on one by one without damage to surrounding parts or the PCB itself. All parts not being worked on are protected from heat and damage. Thermal stress on the electronic assembly is kept as low as possible to prevent unnecessary contractions of the board which might cause immediate or future damage.

In the 21st century, almost all soldering is carried out with lead-free solder, both on manufactured assemblies and in rework, to avoid the health and environmental hazards of lead. Where this precaution is not necessary, tin-lead solder melts at a lower temperature and is easier to work with.

Heating a single SMD with a hot-air gun to melt all solder joints between it and the PCB is usually the first step, followed by removing the SMD while the solder is molten. The pad array on the conductor board should then be cleaned of old solder. It is quite easy to remove these residues by heating them to melting temperature. A soldering iron or hot air gun can be used with de-soldering braid.

The precise placement of the new unit onto the prepared pad array requires skillful use of a highly accurate vision-alignment system with high resolution and magnification. The smaller the pitch and size of the components, the more precise working must be.

Finally, the newly placed SMD is soldered onto the board. Reliable solder joints are facilitated by use of a solder profile which preheats the board, heats all the connections between the unit and the PCB to the melting temperature of the solder used, then properly cools them.

High quality demands or specific designs of SMDs require the precise application of solder paste before positioning and soldering the unit. The surface tension of the molten solder, which is on the board's solder pads, tends to pull the device into precise alignment with the pads if not initially positioned totally correctly.

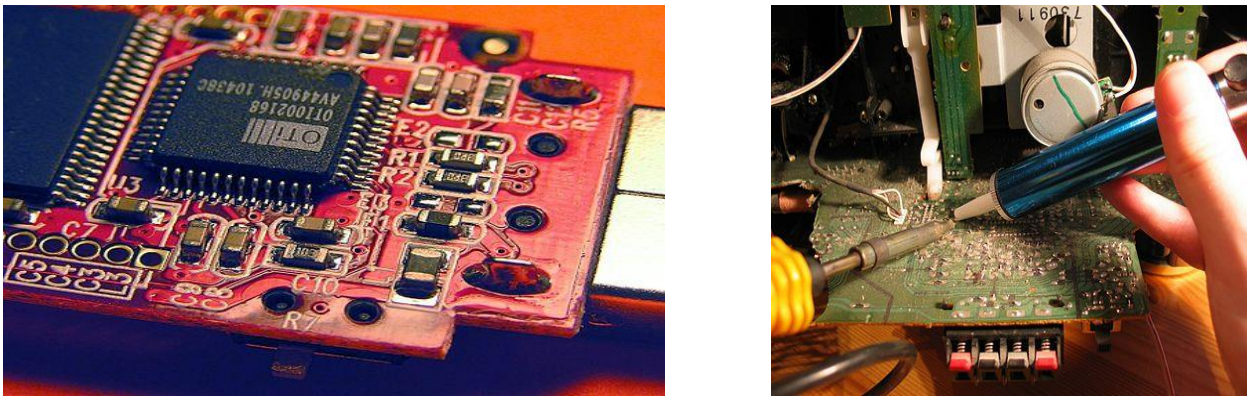


Fig 4.5 Surface Mounted Device (SMD) & de-soldering braid

4.4.3 Reflowing

Reflowing as a rework technique, similar to the manufacturing process of reflow soldering, involves dismantling the equipment to remove the faulty circuit board, pre-heating the whole board in an oven, heating the non-functioning component further to melt the solder, then cooling, following a carefully determined thermal profile, and reassembling, a process which is hoped will repair the bad connection without the need to remove and replace the component. This may or not resolve the problem; and there is a chance that the reflowed board will fail again after some time. For typical devices (PlayStation 3 and Xbox 360) one repair company estimates that the process, if there are no unexpected problems, takes about 80 minutes. Reflowing can be done non-professionally in a domestic oven or with a heat gun. While such methods can cure some problems, the outcome is likely to be less successful than is possible with accurate thermal profiling achieved by an experienced technician using professional equipment.

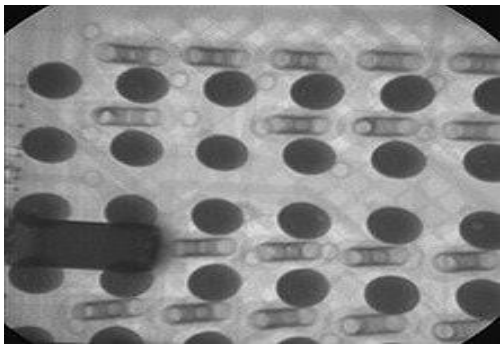


Fig 4.7 X-ray picture of good solder joint.

4.4.4 Re-balling

Re-balling involves dismantling, heating the chip until it can be removed from the board, typically with a hot-air gun and vacuum pickup tool, removing the device, removing solder remaining on the device and board, putting new solder balls in place, replacing the original device if there was a poor connection, or using a new one, and heating the device or board to solder it in place. The new balls can be placed via several methods, including:

- Using a stencil for both the balls and the solder paste or flux,
- Using a BGA "preform" with embedded balls corresponding to the device pattern, or

- Using semi-automated or fully automated machinery.

Fig 4.80 mask and spheres for re-balling & good solder joints between BGA and PCB

4.5 Personal Protective Equipment (PPE)

Personal protective equipment (PPE) are protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury or infection. The hazards addressed by protective equipment include physical, electrical, heat, chemicals, biohazards, and airborne particulate matter. Protective equipment may be worn for job-related occupational safety and health purposes, as well as for sports and other recreational activities. "Protective clothing" is applied to traditional categories of clothing, and "protective gear" applies to items such as pads, guards, shields, or masks, and others.

fig 4.9 PPE

4.6 Multi-meters and Clamp meters

Analog multi-meters use a micro-ammeter with a moving pointer to display readings. **Digital multi-meters** (DMM, DVOM) have a numeric display, and may also show a graphical bar representing the measured value. Digital multi-meters are now far more common due to their cost and precision, but analog multi-meters are still preferable in some cases, for example when monitoring a rapidly varying value.

A clamp meter is convenient for measuring instruments that allows the measurement of current simply by clamping a wire while being energized without cutting a circuit. In cases of measurement by a multi-tester and digital multi-meter, the circuit must be cut to measure current. In contrast, with a clamp meter, current can be measured simply by clamping a live wire over its sheath. In addition to its simple operation, it allows safe measurement of a higher current.

Clamp allows measurement of AC and DC current in wires without disturbing the circuits or contacting live terminals.

fig 4.9 multi-meters

4.7 Operating system (OS) Installation Drive

A flash drive is a small, ultra-portable storage device which, unlike an optical drive or a traditional hard drive, has no moving parts.

Flash drives connect to computers and other devices via a built-in USB Type-A or USB-C plug, making one a kind of combination USB device and cable.

Flash drives are often referred to as pen drives, thumb drives, or jump drives. The terms *USB drive* and *solid-state drive (SSD)* are also sometimes used but most of the time those refer to larger, not-so-mobile USB-based storage devices like external hard drives.

However, it is could be converted to a bootable device for operating system {windows (10,8,7,vista) OS, Linux OS etc} installation using some software. The process of formatting and software installations on computers are professionally done with the knowledge of software engineering.

Fig. 4.50 Installation drive

4.8 Allen key

Allen key is a simple tool used to drive bolts and screws with hexagonal sockets in their heads. The tool is usually formed of a single piece of hexagonal rod of hard steel, with blunt ends that are meant to fit snugly into the screw's socket, bent in an "L" shape with unequal arms.

The tool is usually held and twisted by the long arm, creating a large torque at the tip of the short arm. Reversing the tool lets the long arm reach screws in hard-to-reach places.

Fig. 4.50 Allen key

4.9 Light tester

A test light, test lamp, voltage tester, or mains tester is a piece of electronic test equipment used to determine the presence of electricity in a piece of equipment under test. A test light is simpler and less costly than a measuring instrument such as a multi-meter, and often suffices for checking for the presence of voltage on a conductor. Properly designed test lights include features to protect the user from accidental electric shock. Non-contact test lights can detect voltage on insulated conductors.

Fig. 4.51 light tester

5 CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary and Conclusions:

The whole experience gained during the attachment at PC AID was very enlightening. The practical skills we were exposed to and the opportunity to relate with typical situations relating to computer engineering industry. These experiences have successfully broadened my understanding and interest in Electrical and Electronics Engineering as a profession especially in the field of Control and Automation engineering.

The training was worthwhile, has it accorded me the privilege of gaining insight into job preparation as well as what it meant to carry out proper inspection and also working condition under stress which in a way prepares undergraduates for the outside world after school.
The program gave me the privilege to relate with senior professionals and other students from different institutions and this experience made me appreciate the nature, benefits, and intricacies of my chosen field of study both in the classroom and in the society at large while also gives me the opportunity to put into practice the theoretical knowledge acquired throughout my stay in school. The program has given me the rare privilege of gaining practical knowledge and widened my knowledge about the application of Electrical and electronics engineering in the world.

5.2 Problem Faced During SIWES Program

Some the problems experienced during the SIWES program. These are as stated below.

1. Limited orientation before starting the program.
2. There is also difficulty in getting a placement since placement letter was not issued on time.
3.The workload is too broad to the extent that engineers were unable to explain the importance of work done on particular equipment to me as well as how it relates to the theoretical knowledge gathered.

5.3 Recommendations

Based on the experience and knowledge acquired at the course of the SIWES training, I hereby give the following recommendation based on my observations.
1. Proper orientation should be given to the students by the university before they go on SIWES at least before mid-semester break of first semester.

2. The placement letter should be given to students early enough so as to avoid attachment in irrelevant organization.

3. I recommend that substantial percent of the National budget should go into the development, improvement and sustenance of the power sector. Doing this would help improve Electricity production and in turn improve development and industrialization and subsequently, the income the country generates.

4. Student should avoid prioritizing money over work and experience and should develop a good attitude, good work ethics and be a good ambassador of the university they are representing.

5. Institution and ITF should ensure that students are attached at relevant establishment for effective training, experience and exposure related to their course of study in the university.

REFRENCES

Adams A. (2021, July 29). Social media marketing. Retrieved from https://www.investopedia.com/terms/s/social-media-marketing-smm.asp

Alfred A. (2021, January 14). Components of a computer system. Retrieved from https://turbofuture.com/computers/Components-of-Computer

Atlas Copco. (n.d.). Retrieved from www.atlascopco.com

Britannica, T. Editors of Encyclopaedia (2019, November 14). microprocessor. Encyclopedia Britannica. https://www.britannica.com/technology/microprocessor

Britannica, T. Editors of Encyclopaedia (2021, June 25). EPROM. Encyclopedia Britannica. https://www.britannica.com/technology/EPROM

C. Tomlinson, Ed., Solder, Cyclopædia of useful arts & manufactures, Vol. 7, George Virtue, London, 1852; pages 662-666, page 664 discusses soldering irons.

Composition of DC power supply. (2021, September 22). Retrieved from https://www.globalspec.com

DC power supply. (2021, September 22). Retrieved from https://www.iqsdirectory.com/articles/power-supply/dc-power-supply.html

Duch Group. (n.d.). Retrieved from

"Editorial Guidelines for News Releases | PRWeb". PRWeb. Retrieved 5 September 2016.

Electrical4U. (2020, October 28). Retrieved from http://www.electrical4u.com/star-delta-starter/

Guide to flash a Bios with a SPI CH341A mini programmer. Retrieved from *https://w3ask.com/guide-flash-bios-spi-ch341a-mini-programmer/*

Hameed, B. (2019). *SIWES REPORT held at kam wire* . kwara state.

"IEEE Milestone in Electrical Engineering and Computing - CP/M - Microcomputer Operating System, 1974" (PDF). *Computer History Museum. 2014-04-25. Archived*(PDF) *from the original on 2019-04-03*. Retrieved 2019-04-03.

Jason, M. (2018, March). Retrieved from 28: https://www.jasonmolding.com/four-basic-parts-of-injection-moldingmachine/

Jordan T. (2021, November 10). How to program a bios chip. Retrieved from https://itstillworks.com/reprogram-bios-chip-5891755.html

Jiguparimar. (2012, April 10). Retrieved from http://electrical-engineering-portal.com/star-delta-motor-starter

Kagan J. (2021, May 10). Marketing essentials. Retrieved from https://www.investopedia.com/terms/v/viral-marketing.asp

Kildall, Gary Arlen (June 1975), CP/M 1.1 or 1.2 BIOS and BDOS for Lawrence Livermore Laboratories

Miller, Paul (July 8, 2006). "Apple sneaks new logic board into whining MacBook Pros". Engadget. Archived from the original on October 4, 2013. Retrieved October 2, 2013.

Oscilloscope.(2021, September 22). Retrieved from https://www.tek.com/blog/what-is-an-oscilloscope

Quincy Compressors. (2020, october 08). Retrieved from quincycompressors.com

"Product Rework | Rework Process in Manufacturing". Lean Supply Solutions - Innovative Supply Chain Solutions. Retrieved 2020-06-02.

Rework Analysis of PS3 YLOD & Xbox RROD: Reflow vs Reball

Ring, I. (2016, June). Retrieved from http://medium.com@indiapistonring/air-compressor-parts-and-their-functions

Rossmann, G. E., Flynn, M. J., Fuller, S. H., Bell, C. G., Brooks, F. P., & Hellerman, H. (1975). A Course of Study in Computer Hardware Architecture. *Computer*, *8*(12), 44–63. https://doi.org/10.1109/C-M.1975.218835

SA'AD, O. T. (2018). *SIWES REPORT held at Transmission Company of Nigeria (TCN), 330/132/33kV.* kwara state.

SHENZEN PENGLAI Industrial Coperation Limited. (n.d.). Retrieved from www.pengaichina.com

Tekmoz, T. (2019, May). Retrieved from https://www.tekmoz.com/how-to-disassemble-a-laptop/