Basic Electronics Communication and Multimedia Equipment Servicing

Level - II

Learning Guide #16

Unit of Competence: Implement Maintenance Procedures

Module Title: Implementing Maintenance Procedures

MO Code: **EEL BEC2 MO2 16 0919 LO3**

TTLM Code: **BEC2 LG3 1609 19 V1**

LO3: **Identify and analyze IT system components to be maintained**

Instruction Sheet	Learning Guide #3

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Identify critical components and software.
- System architecture and configuration
- Symptoms of software & hardware faults.
- Analyze & maintain IT system components.

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Identify critical components and software.
- Perform Maintaining hardware and software faults in computer and IT system.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number.
3. Read the information written in the information “Sheet ----, Sheet ---, and Sheet --”.
4. Accomplish the information “Sheet ---, Sheet ----, in page .
5. Try to answer self-check, you can ask your trainer for correction. If you finished answering the Self-check, take correction or explanation from your trainer if it is not clear.
6. If you scored a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, discuss with your trainer for further instructions or go back to learning operation sheet----------.
7. Submit your accomplished Self-check. This will form part of your training portfolio.
8. Read the information written in the “Information Sheet 2”. Try to understand what are being discussed. Ask you Instructor for assistance if you have hard time understanding them.

9. Accomplish the “Self-check 2” in page_____.
   Ask from your teacher for correction (key answers) if any.
10. Read the information written in the “Information Sheets 3. Try to understand what are being discussed and ask you teacher for assistance if you have hard time understanding them.
11. Accomplish the “Self-check ---------” in page _____.
12. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (To get the key answer only after you finished answering the Self-check 3).
13. If you scored a satisfactory evaluation proceed to “Operation Sheet 1” in page_____, however, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
14. Read the “Operation Sheet 1” and try to understand the procedures discussed.

Information Sheet #1	**Identify and Analyze IT System Components to be maintained**

LO3: Identify and Analyze IT System Components to be maintained

3.1 Identify Critical Components and Software

Common Hardware Problem and Trouble Shootings

Troubleshooting method: troubleshooting is the process of identifying and correcting problems. The best troubleshooting are usually people who have been exposed to most problems. They have seen difference type of problem and their solution therefore; if they run into a particular problem, they might see it before and cab quickly addresses the problem.

Most of the solutions are quite simple. So you don’t have to be a technical export to work with your PC in good condition. If you want be a good troubleshooter, just follow the procedure in this book.

Starting point for trouble shooting

Every technical [computer user] has his or her own way to be a troubleshooter. Some people use their instincts while others need an advice from other people. **But let** us see a common troubleshooting method

Point 1.Gathering Information

Ask the customer the following question to define the problem.

- ✓ Can tell me something about the problem.
- ✓ What did you do to your computer lastly [before it stopped working?]
- ✓ How often does this happen? Have you installed new software? Have you delete some files?
- ✓ Have you added a new hardware device?
- ✓ Have you made any other change to your computer recently?

Point 2.Check the power and cable connection

- Check the power line
- Check the wall outlet power
- Check the power sockets
- Check the cable
- It is plugged in
- It is turned on
- Is the computer ready to accept command from the user?
- Open the case covers and reset chips and cable

Point 3.Check if the error is user's error

- Because the user cannot print
- Because the user cannot save the files
- Because the user cannot run application etc

If the user is wrong, show him/her how to use the computer.

Point 4.Restart the computer

This process is the "Cold Boot" (since the machine was off or cold when it started) A "warm boot" is the same excepts it occurs when the machine is rebooted using {Ctrl + Alt +Del}

NOTE:-Reboot can solve or show the problem. Rebooting doesn't work, try to power down the system completely and then power it up.

Point 5.Define if the problem is a hardware or software re related

- It is a startup problem
- It is windows problem
- It is a program problem
- It is a device problem

Startup problem: an error occurs before or during boot process

Windows problem: An error occurs with windows system itself

Program problem: An error occurs with a specific program

Device problem: An error occurs with a specific piece of hardware part.

Point 6.Find out the problem and solve it

- If the problem is hardware related, determine which component is failing and try to solve problem.
- Is the problem is software related; determine which is corrupted or missed and try to solve the problem

Replacement Method

When you troubleshooter, make one change at a time is my favorite troubleshooting method). If the change does not solve the problem, change it back to its original state before making another change.

For Example, you may have trouble on your monitor. If you can get another monitor, attach to your system and try it. If the other monitor works, you know that the problem is with your monitor. But if the other monitor does not work, change it back to its original state and try to find other possible causes.

Common hardware problem and their solution

1. Mouse
2. Keyboards
3. Power supply
4. Motherboard

5. Main memory
6. Hard disk
7. Sound card
8. Modem card
9. Monitors

Mouse problem and their solution

Problem: The mouse may hang up or may not move in the correct way d to dust. [Doesn't work properly]

Solution

- ✓ Clean the mouse [mechanical mouse]:
- ✓ Shutdown the PC
- ✓ Remove the mouse cable from its connection at the back of your PC.
- ✓ Turn the mouse upside –down and remove the securing screws from the mouse case
- ✓ Remove the mouse ball from the cavity
- ✓ Clean the cavity and the mouse ball with proper available materials.[use dry cloth]
- ✓ Look inside the mouse housing. You will see the two perpendicular bars. Use your finger nail to scrap along each bar, removing any dirt.
- ✓ Reconnect the cable to the computer
- ✓ Turn on the pc and see that if it is activated.

Problem: The new PS/2 or serial mouse doesn't work when plugged on the system running windows XP

Solution

- ✓ Plug the new mouse firmly
- ✓ Restart the PC
- ✓ The new mouse will be active
- ✓ Else-use a replacement method

Keyboard problem and solution

Problem:-While working on PC, something (liquid) spilled into the keyboard

Solution

- ✓ Remove the keyboard cable form its connection at the back of the PC. Do not wait! You need to cut power to the device in order to avoid a possible short circuit
- ✓ Shutdown the PC using mouse
- ✓ Tip the keyboard upside down and drain out as much of the liquid as you can.
- ✓ Try to dry the inside part of the keyboard properly by using blow dryer or direct sunlight.
- ✓ Reconnect the keyboard cable to the computer.
- ✓ Power up the computer and manipulate the keyboard tom assure proper functioning

Problem: Some keys on the keyboarder doesn't work

Solution

- ✓ For the current help Use on screen keyboard [win XP]
- ✓ Turn off the PC and remove the keyboard cable from its connection at the back of the PC
- ✓ Turn the keyboard upside –down and remove the securing screws properly
- ✓ Select the key that you want to remove. Just be careful not to damage the other key
- ✓ Clean or adjust the Site of the key properly
- ✓ If you remove multiple keys, be sure to return them to their proper seats.
- ✓ Make sure that the keyboard is dry while cleaning
- ✓ Reconnect the cable to the computer
- ✓ Boot up the pc and check that if activated

CPU problem and trouble shooting

Problem:-Both the CPU and power supply but the system shows a black screen

Solution

The CPU might be damaged. Use the replacement method

CPU problem possible cause:

- Overheating
- Static discharge
- Bent of broken pens.

3.2 System Architecture and Configuration

IntroductiontoSingleChipMicrocomputer

Basic Units of Microcomputer System

Fig 3.1 shows the five basic units of microcomputer system.

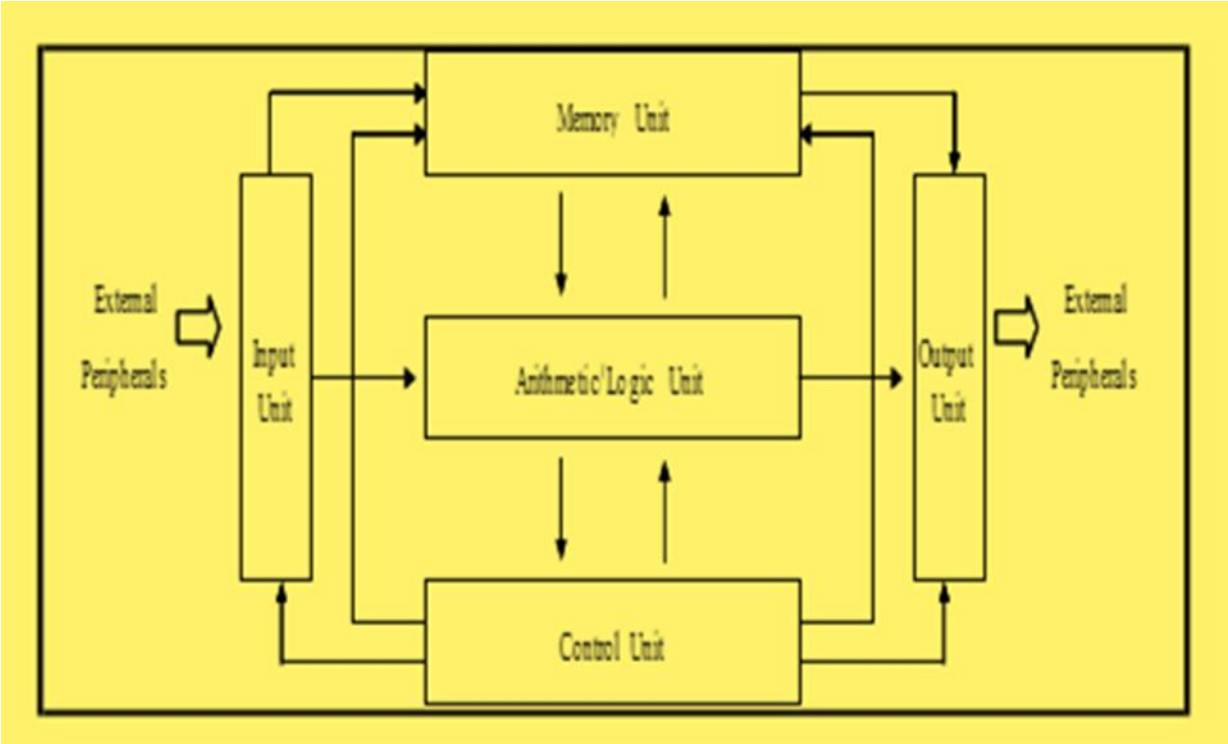


Fig.3.1 Block diagram of a microcomputer system

1. Arithmetic Logic Unit (ALU)

The arithmetic and logical unit (ALU) performs arithmetic operations such as addition, subtraction, multiplication, and or division, and logical operation

such as AND, OR, NOT and XOR needed to carry out the instructions.

2. Control Unit (CU)

The control unit (CU) is responsible for fetching instructions from main memory and determining their type.

3. Memory Unit (MU)

The memory unit (MU) is used to store information such as number or character data. By store we mean that the memory has the ability to hold this information for processing or for outputting at a later time.

The memory unit is divided into primary storage memory and secondary storage memory. Typically, Primary storage memory is implemented with semiconductor memories: read-only memory (ROM) and random access read/write memory (RAM) integrated circuits. Secondary storage memory is used for long-term storage of information that is not currently being used such as disk and CD ROM.

SemiconductorMemories

Rom (Read-Only memory)

By using ROM, the information is made nonvolatile; that is, the information is not lost if power is turned off. ROMs can be divided into:

1. Mask ROM

Mask ROMs cannot be changed or erased, internationally or otherwise. The data in a mask ROM are inserted during its manufacture, essentially by exposing a photosensitive material through a mask containing the desired bit pattern and then etching away the exposed or unexposed surface. The only way to change the program in a mask ROM is to replace the entire chip.

2. PROM

The PROM (Programmable) is like a mask ROM, except that it can be programmed once in the field.

3. EPROM

The EPROM (Erasable PROM) cannot only be field – programmed but also field erased. When the quartz window in an EPROM is expressed to storage ultraviolet light for 15-20 minutes, all the bits are sets to 1. If many changes are expected during the design cycle, EPROMs are far more economical than PROMs because they can be reused.

4. EEPROM

The EEPROM (Electrically Erasable PROM) or E^2PROM can be erased by applying pulses to it instead of requiring it to be put in a special chamber for exposure to ultraviolet light . The new type of ROM called Flash memory is similar to EEPROM in configuration. Flash memory can be programmed on a circuit board by the use of ISP (In-System Programming).

RAM (Random access Memory)

By using RAM, the information is made volatile; that is, the information is lost if power is turned off. RAMs come in tow varieties: static and dynamic.

1. SRAM

SRAMs are constructed internally using circuits similar to the basic D latch. These memories have the property that their continents are retained as long as the power is kept on.

2. DRAM (Dynamic RAM)

DRAMs, in contrast, do not use latch – like circuits. Instead, a dynamic RAM is an array of tiny capacitors, each of which can be charged or discharged, allowing 0 and 1 to be stored. Because the electric charge tends to leak out, each bit in a dynamic RAM must be refreshed every few milliseconds to prevent the data from leaking away.

Because external logic must take care of the refreshing, dynamic RAMs require more complex interfacing than static ones, although in many applications this disadvantage is compensated for by their large capacities. Some dynamic RAMs have on-chip refresh logic, providing both high capacity and simple interfacing.

4. Input unit (IU)

The input unit (IU) is used to input the information to be processed from external input device such as a card reader, keyboard, or switch.

5. Output Unit (OU)

The output unit (OU) is used to output the processed results of computer to the external output devices such as a printer, monitor, 7- segment display, and LED.

The five units in Fig.3.1 can be simplified to three units as shown in Fig.3.2. The input/output unit, or usually just I/O unit, is a combination of input unit and output. The central processing unit (CPU) is formed by combining the ALU and CU together. The CPU is the brain of the microcomputer.

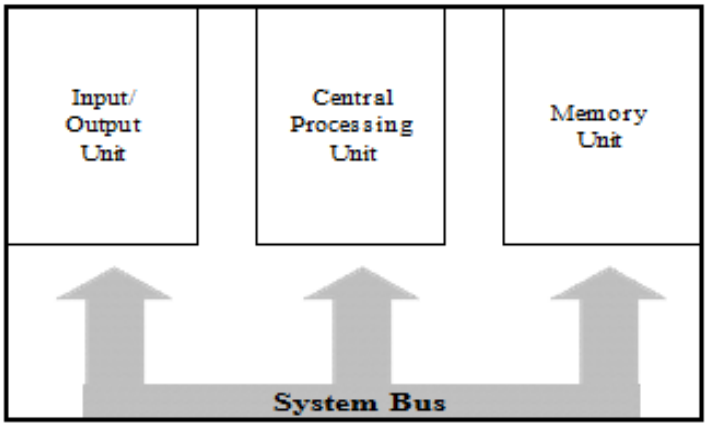


Fig. 3.2 Three basic units of microcomputer system

A bus is a collection of wires used to transmit signals in parallel. According to the purpose, the buses of a microcomputer can be divided into three types: address bus, data bus, and control bus. Three buses are shown are shown in Fig.3.3.

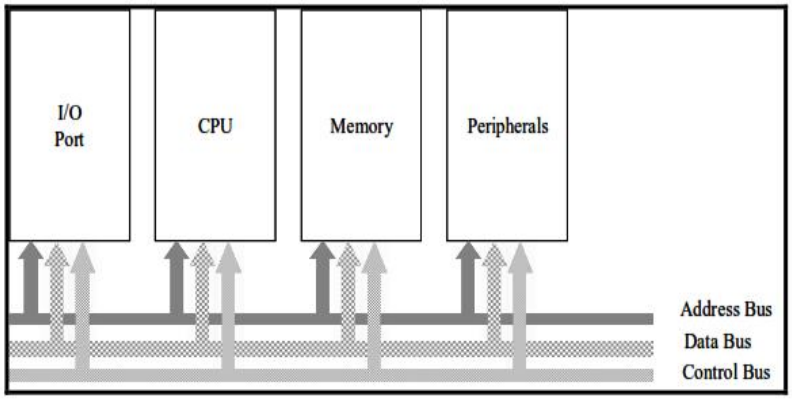


Fig. 3.3

1. Address Bus

The unidirectional address bus transmits the address signals emitted from CPU to memory and I/O port.

2. Data Bus

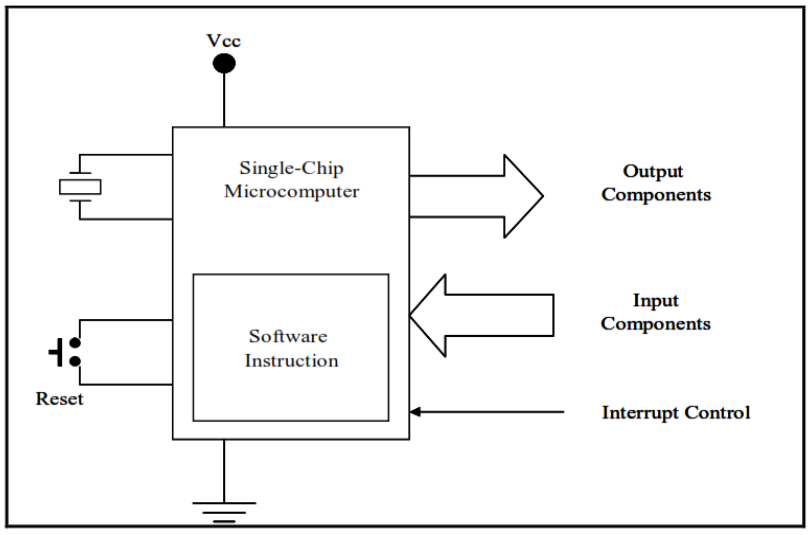
The signal on the bidirectional data bus is the data either from CPU to memory and I/O or from memory and I/O to CPU.

3. Control Bus

The control bus is used to transmit the control signals such as read, write, and interrupt control signal.

Single-Chip Microcomputer

Microcomputer control system such as air-conditioner, clothes washer-dryer, and security system, etc, are widely used in our everyday life. How to build up a microcomputer control system? The earlier multi-chip 8088 solutions were initially replaced by highly integrated 8-bit single-chip microcomputer devices such as the 8048 and 8051. These devices were tailored to work best as event controllers. For instance, the 8051 offers one-order-of-magnitude higher performance than the 8088, a more powerful instruction set , and special on-chip function such as ROM, RAM, timer/counters, universal asynchronous receiver/transmitter (UART), programmable parallel I/O ports, DAC, and ADC. Today these



types of single-chip microcomputers are also called microcontroller. The microcontrollers are widely used in industrial control systems as shown in Fig. 3.4.

Fig.3.4. Shows the architectural structure of a single-chip microcomputer system.

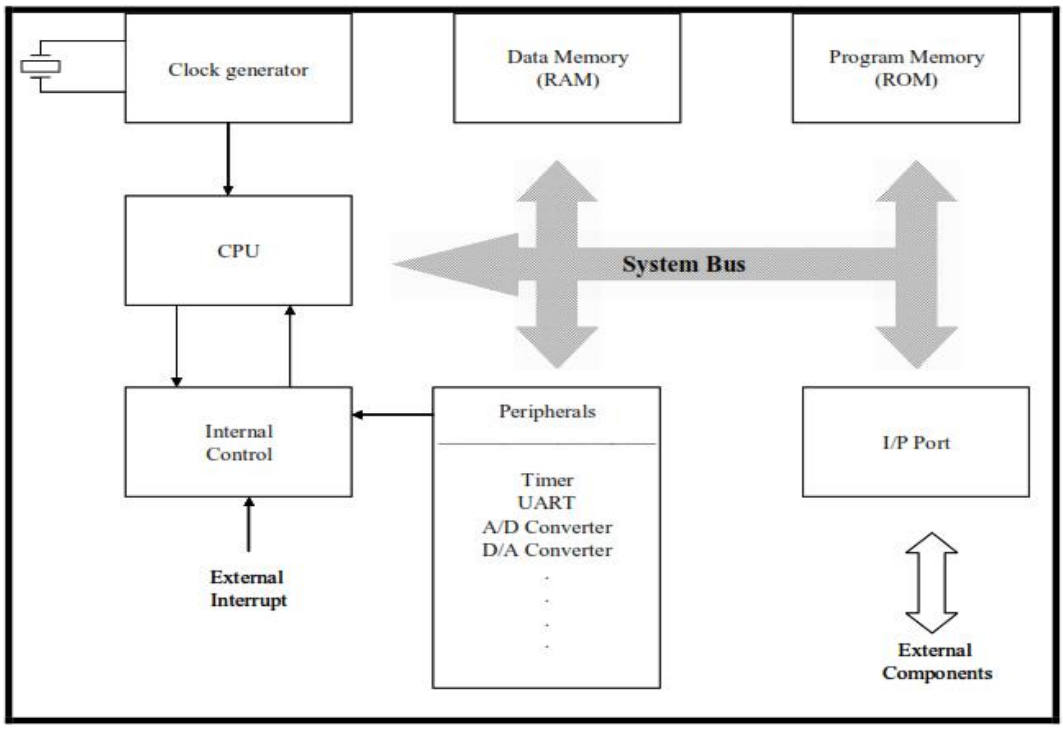


Fig. 3.5 Shows Architectural structure of a single-chip microcomputer

1. Clock Generator

Single-chip microcomputer is a sequential logic circuit normally driven by a clock generator, a device that emits a periodic sequence of pulses. These pulses

define machine cycles. During each machine cycle, some activity occurs, such as the execution of an instruction.

2. CPU

The CPU is the brain of the single-chip microcomputer. Its function is to execute programs stored in the program memory by fetching their instructions, examining them, and then executing one after another. The CPU is composed of several distinct parts. The control unit is responsible for fetching instructions from program memory and determining their type. The ALU performs arithmetic and logical operations.

3. Interrupt control

Interrupt request signals may come from the on-chip peripheral such as timer/counter or external device such as keyboard. The interrupt control circuit receives these requests and determines which request is acknowledged according to the priority level specified.

4. Data Memory

The data memory or RAM is used to store data. A part of on-chip data memory is used to store temporary results and certain control information. This memory consists of a number of registers, each of which has a certain function.

5. Program Memory

The program memory or ROM is used to store program instructions. IT is divided into the following categories: PROM, EPROM, EEPROM, and Flash.

6. I/O Port

The I/O port is an interface between CPU and external devices such as switches and LEDs. Compared with general-purpose microcomputers, single-chip microcomputers provide more I/O ports and more powerful instructions for I/O handling. The more the I/O ports, the more I/O devices can be connected.

7. On-chip Peripherals

On-chip peripheral circuits are a single-chip microcomputer offer various special control functions such as timer/counters. Serial ports, PWM, even ADCs

and DACs. In general, the more the on-chip peripheral, the higher the system performance.

1.3 Symptoms of Software and Hardware Faults

Sorting Hardware/Software/ Configuration Problems

One of the first steps in troubleshooting a computer problem (or any other programmable system problem) is to determine whether the problem is due to a hardware failure or to faulty software. In most PCs, you can use a significant event that occurs during the startup process as a key to separate hardware problems from software problems: the single beep that most PCs produce between the end of the power-on self test (POST) and the beginning of the startup process.

Errors that occur, or are displayed, before this beep indicate that a hardware problem of some type exists. Up to this point in the operation of the system, only the BIOS and the basic system hardware have been active. The operating system side of the system does not come into play until after the beep occurs.

If the system produces an error message (such as “The system has detected unstable RAM at location x”) or a beep code before the single beep occurs, the system has found a problem with the hardware. In this case, a bad RAM memory device is indicated.

Typically, if the startup process reaches the point at which the system’s CMOS configuration information is displayed onscreen, you can safely assume that no hardware configuration conflicts exist in the system’s basic components. After this point in the boot up process, the system begins loading drivers for optional devices and additional memory.

If the error occurs after the CMOS screen displays and before the boot up tone, you must clean boot the system and single-step through the remainder of the boot up sequence.

You can still group errors that occur before the beep into two distinct categories:

- ➢ Configuration errors

➢ Hardware failures

A special category of problems tends to occur when a new hardware option is added to the system, or when the system is used for the very first time.

These problems are called *configuration problems*, or *setup problems*. These problems result from mismatches between the system's programmed configuration held in CMOS memory and the actual equipment installed in the system.

It is usually necessary to access the system's CMOS setup utility in the following three situations:

➢ When the system is first constructed.

➢ When it becomes necessary to replace the CMOS backup battery on the system board.

➢ When a new or different option is added to the system (such as memory devices, hard drives, floppy drives, or video display), it might be necessary to access the setup utility to accept the changes that have been implemented.

In most systems, the BIOS and operating system use plug-and-play techniques to detect new hardware that has been installed in the system. These components work together with the device to allocate system resources for the device. In some situations, the PnP logic is not able to resolve all the system's resource needs and a configuration error occurs. In these cases, the user must manually resolve the configuration problem.

When you are installing new hardware or software options, be aware of the possibility of configuration errors occurring. If you encounter configuration (or setup) errors, refer to the installation instructions found in the new component's installation/user documentation.

If you cannot confirm a configuration problem, you most likely have a defective component. The most widely used repair method involves substituting known-good components for suspected bad components. Other alternatives for isolating

and correcting a hardware failure that appears before the boot up depend on how much of the system is operable.

Normally, symptoms can be divided into three sections: configuration problems, boot up problems, and operational problems.

The system's configuration settings are normally checked first. It is important to observe the system's symptoms to determine in which part of the system's operation the fault occurs. The error messages described in Table 3.1 are errors that occur and are reported before the single beep tone is produced at the end of the POST routines.

Configuration error Massage	Meaning
CMOS System Option not yet	Failure of CMOS battery or CMOS Check sum set
CMOS Display Mismatch	Failure of display type verification
CMOS Memory Size Mismatch	System Configuration and set up failure
Press F1 to continue	Invalid Configuration Information
CMOS time and date not set	Failure of CMOS Battery

Table3.1 System configuration problem

After the beep tone has been produced in the startup sequence, the system shifts over to the process of booting up and begins looking for and loading the operating system. Errors that occur between the beep and the presentation of the operating system's user interface (command prompt or GUI) generally have three possible sources. These sources are summarized in the following list that includes the typical error messages associated with each source.

- ➢ Hardware failure (physical problem with the boot drive)
- ➢ General Failure Error Reading Drive x

Corrupted or missing boot files

- ➢ Bad or Missing Command Interpreter
- ➢ *Non system Disk or Disk Error*

- *Bad File Allocation Table*
- Corrupted or missing operating system files

Both configuration problems and boot up problems can be caused by a hardware or operational failure. If the configuration settings are correct, but these symptoms are present, a hardware problem is indicated as the cause of the problem. Conversely, Boot up problems are typically associated with the operating system.

Hardware Troubleshooting Tools

The level of troubleshooting most often performed on PC hardware is exchanging *Field Replaceable Units* (*FRU*s). Due to the relative low cost of computer components, it is normally not practical to troubleshoot failed components to the IC level. The cost of using a technician to diagnose the problem further, and repair it, can quickly exceed the cost of the new replacement unit. However, a few hardware diagnostic tools can be very helpful in isolating defective hardware components. These tools include

- Software diagnostic disk
- Multi-meter
- Cable tester
- POST card

Software Diagnostic Packages

Several commercially available disk-based diagnostic routines can check the system by running predetermined tests on different areas of its hardware.

The diagnostic package evaluates the response from each test and attempts to produce a status report for all of the system's major components. Like the computer's self-tests, these packages produce visual and beep-coded error messages.

Self Check #1	Written Test

Name: _____ Date: _____

Time Start: _____ Time Finish: _____

Instruction: Answer all the questions provided correctly, if you have some clarification regarding the test just raise your hand and ask the assistance of the teacher.

I. Explain the following question

1. Write the possible cause and solution when the computer has No sound?(4 points)
2. What is Troubleshooting? (2 point)
3. What are the five basic units of microcomputer system? (5 points)
4. A special category of problems tends to occur when a new hardware option is added to the system, or when the system is used for the very first time is?(1 point)
5. Write at least three Common hardware problems and their solution?(5 points)

Note: **Satisfactory rating –8.5 points** **Unsatisfactory - below 8.5 points**

You can ask your teacher for the copy of the correct answers.

Answer Sheet

Scored Points | |

Part I.

1. _____

_____

_____

_____

2. _____

_____

_____

3. _____

_____

_____

4. _____

5. _____

_____

_____

_____

_____

Operation Sheet #1	CPU problems and trouble shootings

Operation Title: - CPU problems and trouble shootings:

Purpose: - The trainee's will be able to: troubleshoot & give solutions to CPU, adapter cards problems & give the solution, troubleshoot power problems& give the solution, use power protection devices

Conditions or situations for operation: - Have a clean workspace with all necessary tools and equipment

Equipment, Tools &Materials: - Maintenance room, computer, cpu, Maintenance tool kit, table, chair etc.

Procedure1. General power problems & troubleshooting

The general power problems can be categorized in three types:

1) Power Quality problem

Possible causes:

- EMI (Electro-Magnetic Interference] .
- Variable rate [frequency] from the power line.,

2) Too much power

Possible causes:

- Power spike [for few milliseconds].
- Power surge [for several seconds].

3) No-enough power

Possible causes:

- Power sag [for few mill second]
- Brownout [if sag lasts for longer than a second]
- Blackout [a complete of power failure]

Protection against power problems

You can use the following devices for proper: Line conditioner, Stabilizer, Surge suppressor, UPS

Note: UPS is Uninterrupted Power Supply. *T*he UPS is also known as battery backup

Problem

- Monitor's power indicator lights but no power lights on the system unit.

Solution

- Check the system unit's power connection.
- Check your power supply DC volt outlet.
- Use a replacement method for power supply.
- Check also the motherboard.

Power supply symptoms

- Fan noise sounds rough or louder than usual.
- Fan noise is absent altogether.
- The power supply chassis is unusually hot to touch.

General troubleshooting methods

- Check the power cable.

- Check the power supply [you can use a Multi- meter to test electronic components]. Check the power outlet voltage.
- Replace the power supply unit.

Problem

- A PC accidentally reboots or shutdown

Solution

- Check your power line.
- Make sure that your power supply is rated [watt" to handle all the peripherals that it powers [30Owatt or above is better]
- Check the power supply fan movement. • Use a replacement method.

Procedure1. CPU problems and trouble shootings:

Problem

Both the CPU and power supply fan work Properly but the system shows a blank screen.

Solution

The CPU might be damaged. Use the replacement method.

CPU problem Possible causes:

- Overheating.
- Static discharge.
- Bent or Broken pins.

General symptom of CPU

- The system fails to Boot (start).
- Black Screen.
- The system boots, but the operating system (windows) fails to load.
- The system locks-up or dies after several minutes of operations.
- The system says "hardware monitor error .....”

Procedure2. Sound Card problems and trouble shootings:

Sound card

Usually built-in the motherboard and is used to give sound through the speakers.

Problem

- No sound from the Computer

Possible cause:

- Software related problem.
- Speaker connection failure.

Solution

- Check your speaker and its connection.
- Check the volume control in the windows system
- Check the driver software for the sound card.

Problem

- **No sound from the CD drive**

Solution

- Check the disc into another system.
- The audio cable connecting the CD drive to Sound card is detached. Therefore, unplug off] the PC and reattach the audio cable to sound card.
- Run any sound card diagnostic software.
- Use the replacement method.

Procedure 2. Modem Card problems and trouble shootings:

In order to connect· the computer ·to the Internet connection, you must have a modem card between the motherboard and Telephone line.

Problem

- Modem cannot dial and "no Dial tone" message appears on the monitor

Solution

- Check the phone card connection.
- Make sure the jack on the modem labeled "line" is connected to phone line wall jack.

Precautions:-

- Take ESD precautions.
- Power all devices and disconnect them from the main power supply.

Quality Criteria:-

- The trainee's use safety for components.
- The trainee's make troubleshoot & solve problems.

LAP TEST #1	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: You are required to perform the following individually with the presence of your teacher.

1. From the given Computer/PC:
    A. demonstrate the major probable faults
    B. identify faults
    C. rectify or troubleshoot the problems on it

- *Your teacher will evaluate your output either satisfactory or unsatisfactory. If unsatisfactory, your teacher shall advice you on additional work. But if satisfactory, you can proceed to the next topic.*