

# Designing a Personal Computer (PC) Module as a Learning Media

Muliadi  
*Faculty of Engineering*  
*Universitas Negeri Makassar*  
 Makassar, Indonesia  
 mul\_se@yahoo.com

**Abstract**—This study aims to design a Personal Computer (PC) learning module that can be used as a learning media in Hardware course. This type of research is an experimental study. Data retrieval is done by measuring the voltage at the measurement point by using Multimeter. The results show that the Personal Computer (PC) learning module can be used for measurement of voltage using a multimeter, setting of damage indication on power supply circuit, Motherboard, DVD ROM, and Hardisk Driver.

**Keywords**—*learning module, personal computer (PC), hardware*

## I. INTRODUCTION

The hardware course is one of the courses in the Department of Informatics and Computer Education, Faculty of Engineering, Makassar State University, which consists of several basic material, namely recognizing IT and computers, hardware, motherboards, processors, memory, VGA, sound adapters, monitors, devices external, PC installation, computer work principles and PC computer maintenance and repair. The implementation of learning in Hardware courses is generally in theoretical material and tends towards the study of literature. This is quite confusing for students, especially those who have a very limited knowledge base about computers and parts. A practical learning media is needed that can help students to recognize and understand the basic material learned in hardware courses, especially those related to the Personal Computer (PC). The Study Program Laboratory only has a neatly installed Personal Computer (PC) that makes it difficult to become a medium of learning in teaching hardware courses.

Based on these problems, it is necessary to design a module of Personal Computer Learning (PC) that can be used as a learning media in the course. The intended learning module is a module that can be used to know, identify, install and make troubleshooting components of the Personal Computer (PC). In addition, it can also be used to measure input and output voltage components of the Personal Computer (PC). The learning module can also be used to find out which part is damaged based on the symptoms of damage given.

Computers are formed from standardized parts, including additional components and expansion cards to perform certain functions on the computer [1]. The main purpose of a computer system is to process data to produce information. In order for the main objective to be carried out, there must be elements that support it. These elements are brainwave (human), hardware (hardware) and software (software). The

three elements of a computer system must be interconnected and form a unity [2].

Hardware without software, it will not function as expected, only inanimate objects. Software that will operate the hardware. Hardware that has been supported by software also will not work if there are no humans operating it [3]. Practically, computer systems divide software into three main classes, namely: (1) software systems, (2) programming software, (3) application software [4]. The basic error in computers or what is often called computer troubleshooting is the presence of a problem or abnormality on the computer. Computer or troubleshooting problems are divided into two, namely: hardware and software troubleshooting [5]. The goals to be achieved in this study are to design a Personal Computer (PC) learning module that can be used as a learning media in the Hardware course.

## II. METHOD

This type of research is experimental research. The experimental method is done in designing a personal computer learning module that can be used as a learning media in the Hardware course. Data retrieval is done by measuring the voltage at the measurement point using a Multi-meter.

The design procedure is as follows: (1) preparing tools and materials, (2) designing the panel design of the learning module, (3) creating a framework for learning the personal computer (PC) module, (4) making a panel in the framework of the personal learning module, (5) connecting the parts of the module with the measuring point panel, (6) Testing the learning module, (7) performing data retrieval [6].

The testing procedure is carried out by measuring the voltage using a multimeter performed on (1) power supply input, (2) power supply output, (3) HDD voltage input (4) DVD Rom voltage input, (5) input motherboard. Data retrieval techniques are carried out after testing the learning module of a personal computer (PC) by following the testing methods and procedures. The data taken is the result of voltage measurement. After retrieving them, the data from the next observation are analyzed by comparing the results of the theory presented in the literature study with the results obtained during the testing. The analyzed data then described in the section below.

**III. RESULTS AND DISCUSSION**

**A. Results**

At this stage, the design results of the personal computer learning module are shown in accordance with the design of the personal computer learning module. The design of the personal computer (PC) learning module are shown in Figure 1 which consists of 21 Measurement Points (TP-1 to TP-21) serves as the points in each series of personal computer (PC) learning modules, 13 switches (S -1 to S13) as the circuit breaker or connection connector for each circuit in the learning module, 13 indicator lights (L-1 to L-13) function as indicators and a LCD monitor. The switch is in ON / OFF states The switch is ON if the switch position is up and the switch is OFF if the switch position is down. Furthermore, the LCD monitor serves as a display of the image produced by the learning module.



Fig. 1. Front panel Personal Computer Learning Module (PC)

The design of the design results of the personal computer (PC) learning module side view is shown in figure 2 which uses angled iron as a framework of the practicum module.



Fig. 2. Learning Module Personal Computer (PC) side view

The design results of the Personal Computer (PC) Learning Module from the above view is shown in Figure 3.



Fig. 3. Learning Module for Personal Computer (PC) (shown above)

The trial results of the Personal Computer (PC) learning module consist of the results of trials in normal conditions with the arrangement of all switches in the upward position or ON. In this condition, the image displayed on the LCD monitor is normal because all the circuits are functioning properly.



Fig. 4. Learning Module for Personal Computer (PC) under normal conditions, all switches are in ON or up position

The results of voltage measurement using an AC voltmeter at the power supply input circuit are shown in table 1.

TABLE I. THE RESULTS OF VOLTAGE MEASUREMENTS USING AN AC VOLTMETER ON THE INPUT OF THE POWER SUPPLY CIRCUIT

No	Circuit	Measurement Point (TP)	Results in AC Voltage (Volt)
1	Power Supply Input	TP-1 and TP-2	220

The results of voltage measurements using a DC voltmeter at the Power supply circuit output are shown in table 2.

TABLE II. THE RESULTS OF VOLTAGE MEASUREMENTS USING A DC VOLTMETER AT THE OUTPUT OF THE POWER SUPPLY CIRCUIT

No	Circuit	Measurement Point (TP)	Results in DC Voltage (Volt)
1	Output Power Supply	TP-3 and Gnd	4.4
2	Output Power Supply	TP-4 and Gnd	3.2
3	Output Power Supply	TP-5 and Gnd	0.4
4	Output Power Supply	TP-6 and Gnd	-11.5
5	Output Power Supply	TP-7 and Gnd	12
6	Output Power Supply	TP-8 and Gnd	4.5
7	Output Power Supply	TP-9 and Gnd	4.8

The results of voltage measurements using a DC voltmeter in the Motherboard circuit are shown in table 3.

**TABLE III. THE RESULTS OF VOLTAGE MEASUREMENTS USING A DC VOLTMETER AT THE INPUT OF THE MOTHERBOARD CIRCUIT**

No	Circuit	Measurement Point (TP)	Results in DC Voltage (Volt)
1	Input Motherboard	TP-10 and Gnd	4.2
2	Input Motherboard	TP-11 and Gnd	3.1
3	Input Motherboard	TP-12 and Gnd	11.5
4	Input Motherboard	TP-13 and Gnd	-11.5
5	Input Motherboard	TP-14 and Gnd	0
6	Input Motherboard	TP-15 and Gnd	4.6

Voltage measurement results using a DC voltmeter on the DVD ROM input circuit are shown in table 4.

**TABLE IV. THE VOLTAGE MEASUREMENT RESULTS USING A DC VOLTMETER ON THE DVD ROM INPUT**

No	Circuit	Measurement Point (TP)	Results in DC Voltage (Volt)
1	Input DVD ROM	TP-16 and Gnd	4.3
2	Input DVD ROM	TP-17 and Gnd	3.1
3	Input DVD ROM	TP-18 and Gnd	11.5

The voltage measurement results using a DC voltmeter at the input of the Harddisk Drive circuit are shown in table 5.

**TABLE V. THE RESULTS OF VOLTAGE MEASUREMENTS USING A DC VOLTMETER ON THE INPUT OF THE HARD DRIVE DRIVE CIRCUIT**

No	Circuit	Measurement Point (TP)	Results in DC Voltage (Volt)
1	Input Harddisk Drive	TP-19 and Gnd	4.3
2	Input Harddisk Drive	TP-20 and Gnd	3.1
3	Input Harddisk Drive	TP-21 and Gnd	11.5

The results of setting the symptoms of damage to the power supply circuit are shown in table 6.

**TABLE VI. RESULTS OF SETTING SYMPTOMS OF DAMAGE TO THE SUPPLY POWER CIRCUIT**

No	Switch	State ON/OFF	Measurement Point (TP)	Results (Volt)
1	S-1	OFF	TP-1 and TP-2	0

The results of setting the damage symptoms on the motherboard circuit are shown in table 7.

**TABLE VII. RESULTS OF SETTING SYMPTOMS OF DAMAGE TO THE MOTHERBOARD CIRCUIT**

No	Switch	State ON/OFF	Measurement Point (TP)	Results (Volt)
1	S-2	OFF	TP-10 and Gnd	0
2	S-3	OFF	TP-11 and Gnd	0
3	S-4	OFF	TP-12 and Gnd	0
4	S-5	OFF	TP-13 and Gnd	0
5	S-6	OFF	TP-14 and Gnd	0
6	S-7	OFF	TP-15 and Gnd	0

The results of setting the damage symptoms in the DVD ROM series are shown in table 8, 9, and table 10.

**TABLE VIII. THE RESULTS OF THE DAMAGE SYMPTOM SETTINGS IN THE DVD ROM CIRCUIT AT S-8 POSITION ARE OFF**

No	Switch	State ON/OFF	Measurement Point (TP)	Results (Volt)
1	S-8	OFF	TP-16 and Gnd	0
2	S-9	ON	TP-17 and Gnd	3.1
3	S-10	ON	TP-18 and Gnd	11.5

**TABLE IX. THE RESULTS OF THE DAMAGE SYMPTOM SETTINGS IN THE DVD ROM CIRCUIT AT S-9 POSITION ARE OFF**

No	Switch	State ON/OFF	Measurement Point (TP)	Results (Volt)
1	S-8	ON	TP-16 and Gnd	4.3
2	S-9	OFF	TP-17 and Gnd	0
3	S-10	ON	TP-18 and Gnd	11.5

**TABLE X. THE RESULTS OF SYMPTOM SETTINGS IN THE DVD ROM CIRCUIT AT S-10 POSITION ARE OFF**

No	Switch	State ON/OFF	Measurement Point (TP)	Results (Volt)
1	S-8	ON	TP-16 dan Gnd	4.3
2	S-9	ON	TP-17 dan Gnd	3.1
3	S-10	OFF	TP-18 dan Gnd	0

The results of symptom settings in hard drive drives are shown in table 11, table 12, and table 13.

**TABLE XI. THE RESULTS OF SETTING SYMPTOMS OF DAMAGE ON THE HARD DRIVE DRIVE CIRCUIT AT POSITION S-11 IN THE OFF CONDITION**

No	Switch	State ON/OFF	Measurement Point (TP)	Results (Volt)
1	S-11	OFF	TP-19 and Gnd	0
2	S-12	ON	TP-20 and Gnd	3.1
3	S-13	ON	TP-21 and Gnd	11.5

**TABLE XII. RESULTS OF SETTING THE SYMPTOMS OF DAMAGE ON THE DRIVE HARD DRIVE CIRCUIT AT POSITION S-12 IN THE OFF CONDITION**

No	Switch	State ON/OFF	Measurement Point (TP)	Results (Volt)
1	S-11	ON	TP-19 and Gnd	4.3
2	S-12	OFF	TP-20 and Gnd	0
3	S-13	ON	TP-21 and Gnd	11.5

**TABLE XIII. RESULTS OF SETTING THE SYMPTOMS OF DAMAGE ON THE HARD DRIVE DRIVE CIRCUIT AT POSITION S-13 IN THE OFF CONDITION**

No	Switch	State ON/OFF	Measurement Point (TP)	Results (Volt)
1	S-11	ON	TP-19 and Gnd	4.3
2	S-12	ON	TP-20 and Gnd	3.1
3	S-13	OFF	TP-21 and Gnd	0

### B. Discussion

Based on the test results of the learning module Personal Computer (PC) by setting all switches in the upward position or the ON display the normal image is shown on the LCD Monitor.

The test results of the Personal Computer (PC) learning module by measuring voltage using an AC voltmeter at the power supply input circuit as in table 1, voltage measurement using a DC voltmeter at the output power supply as in table

2, voltage measurement using a DC voltmeter on the motherboard input as in table 3, voltage measurement using a DC voltmeter on the DVD ROM input as in table 4, and voltage measurement using a DC voltmeter on the hard drive input as in table 5, generally the same as the voltage in the theory of power supply circuits and motherboards.

The test results of the Personal Computer (PC) learning module by setting the symptom of damage to the power supply circuit by setting the S-1 switch in the OFF condition so that the L-1 indicator lights off causing no symptoms of light damage on the LCD monitor as in table 6. This happened due to a voltage of 220 volt AC electricity from the grid of electricity which was cut off to the power supply.

The result of setting symptoms of damage in the Motherboard circuit by setting the switch S2, S-3, S-4, S-5, S-6, and S-7 in the OFF condition so that the L-2, L-3, L-4 indicator lights, L-5, L-6, and L-7 are extinguished causing no symptoms of light damage on the LCD monitor as in table 7, because there was no working voltage on the motherboard which consists of a voltage of 3.1V, + 4.3V, + 11.5V, and - 11.5V.

The result of setting the damage symptoms on the DVD ROM circuit by setting the S-8 switch in the OFF condition was the L-8 indicator light goes off. It showed that the DVD ROM was not working and was not detected in the BIOS menu as in table 8. It was because there was no working voltage about 4.3 Volt on DVD ROM. The result of setting the damage symptoms on the DVD ROM circuit by setting the S-9 switch in the OFF condition so that the L-9 indicator lights go out causing DVD ROM was not working and was not detected in the BIOS menu as in table 9, because there was no working voltage by 3.1 Volt on DVD ROM.

The result of setting the damage symptoms on the DVD ROM circuit by setting the S-10 switch in the OFF condition so that the L-10 indicator light goes out causing the DVD ROM damage not working and was not detected in the BIOS menu as in table 10, because there is no working voltage of 11.5 on the DVD ROM. The result of setting the symptoms of damage on the Drive Hard drive circuit by setting the S-11 switch in OFF condition so that the L-11 indicator light went out causing the Hard Drive failure and was not detected in the BIOS menu as in table 11. Similarly because there is no working voltage of 4.3 Volts on the Hard Drive.

The result of setting the symptoms of damage on the Drive Hard drive circuit by setting the S-12 switch in OFF condition so that the L-12 indicator light goes out causing symptoms of Hard Drive failure not working and not detected in the BIOS menu as in table 12, because there is no working voltage of 3.1 on the Drive.

The result of setting the symptoms of damage on the Hard drive circuit by setting the S-13 switch on OFF condition so that the L-13 indicator light goes out causing symptoms of Hard Drive was a failure and not detected in the BIOS menu as in table 13. This was also because there is no working voltage of 11.5 Volts on the Hard Drive.

#### IV. CONCLUSION

Based on the results and discussion of the previous chapter, conclusions can be drawn as follows: the personal computer (PC) learning module consists of a learning panel of personal computer (PC) and LCD monitors which are arranged and developed into learning modules measuring 100 cm long, 41 wide cm and height 101 cm. The personal computer (PC) learning module can be used to operate a personal computer (PC) by arranging all S-1 to S-13 switches on the ON so that all L-1 indicator lights to the L-13 lights were in Up Condition and personal LCD monitors computer (PC) showed the normal image. The learning module of a personal computer (PC) can be used for voltage measurement using a Multimeter, and set the symptoms of damage to the power supply circuit, motherboard, DVD ROM, and driver of the hard drive.

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