POLITEKNIK SEBERANG PERAI

BASIC WIRING TRAINER KIT

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JABATAN KEJURUTERAAN ELEKTRIK

JUNE 2016

DECLARATIONS

"We hereby declare that this report entitle "BASIC WIRING TRAINER KIT" is the result of my own expect for quotes as cited in the references."

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"I hereby declare that I have read this report and in my opinion this report is Sufficient in terms of the scope and quality for the award of Diploma in Electronic (Computer) Engineering"

Signature : 

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Apart from that, we want to thank all our friends for helping us to finish this project. They have also helped us by giving an extra ideas for our project. The discussion about our final year project is a meaningful and useful moment it is because we have gathered a lot of ideas. Our mind are also open after gathered a lot of idea to make the project.

Next we want to thank to our parents for encourage us on this project. They support us very well for this project because they give us some money to buy the important material and component for our project.

Lastly, I offer my regards and blessings to my colleagues and all of those who supported us in any respect during the completion of the project.

ABSTRACT

The name of our final year project is Basic Wiring Trainer Kit. We got an idea to create this basic wiring trainer kit to make it easily for student to learn the concept of electrical wiring. This project based on course that students learned from Semester One. The importance of this project was the ability to make the student understand about the basic of lighting circuit and power circuit. As from our observation in class when we were in semester 1, the process of learning the knowhow of wiring is only based on illustration. Thus with the kit, it will make the learning process easier to be understand for the student. The kit also show the basic of single phase wiring system. Beside, this basic wiring kit also have complete wiring circuit and an example of usage of appliance. With the extra connection from the appliance, its make easier to us to testing the circuit.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

The usage of electricity cannot be separated from human being. It is an essential things that we use daily. There is two phases in electricity. For home usage, mostly we use a single and the three phase is usually for industrial usage. The actual voltage received is normally slightly less than 240 volts. This is for single phase power. The power to supply the home usage is called alternating current. The alternating current is used to allow electricity to be transported over long distances.Basic Wiring Training Kit presented here is based on single phase power and only can supply about 240 volts. Its commonly use in home as we state above. So it is easier to us to create this trainer kit based on the housing wiring system. The purpose of this kit is commonly for the usage of education. From our experience when we were in semester 1, the process of learning wiring is only based on illustration thus making it difficult for

some of us to understand. With the kit, it will make it easier for the student to understand the wiring process and it also will make teaching easier for the lecturers.

1.2 PROBLEM STATEMENT

In semester 1, PSP student will be required to take one courses that is related to wiring. DET 1012 or also known as Electrical Wiring is a subject that is required for the semester 1 student to take. The learning process for the subject is only by illustration thus make it difficult for student to understand the process of wiring. By using illustration, student cannot see the wiring circuit and can end up doing wrong connection when doing their practical work. Students also can have a hands on experience in wiring with the kit before doing their practical work in wiring bay.

1.3 OBJECTIVE OF RESEARCH

This kit is used as a platform for student to learn the basic of lighting circuit and power circuit for single phase. This kit also already has a complete wiring circuit with an example of suitable appliance in wiring circuit system. The process of testing also easier as there is an additional wiring connection to the kit thus making it easier for student to know whether the connection is right or wrong.

1.4 SCOPE OF STUDY

The project scope involves a learning process of single phase electrical wiring using the basic wiring trainer kit. The project starts from our own observation in class when we were in semester 1. We also get a help from our supervisor on the knowhow of the electrical circuit wiring and those information given to us is proven to be helpful in the completion of the project. Then we started a sketch of the how the kit would be look from the information that we obtained through the help of our supervisor and some research. The kit is powered by 240V AC and will be suplied to the lighting and power circuit. After completion of the design we do the wiring circuit on a board and troubleshoot any problem to make it functioning. After proven it is capable of functioning, the board is given a little touch up to make it look good and interesting. The kit will be operational when we connect it to any 13 ampere socket. After we switch on the distribution box, we only need to reconnect the circuit as the purpose for this kit is for the education of electrical wiring.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter we will cover the literature review of our project itself, the Basic Electrical Wiring Trainer. From the review until the product that we use, we will cover of the sub chapter. The electricity is needed to power up any devices. It becomes the main priority before the devices is developed. It is important to someone to know how the basic wiring works. Thus for this chapter, we will make a literature review for the Basic Electrical Wiring Trainer and how we get the idea to design such a device.

2.2 REVIEW

For electrical student, it is main priority to know basic wiring connection. There must be understanding on how to connect between each wire and port, but sometimes, student can't understand the wiring connection perfectly based on the theory only. They need something that can their see with their eyes and can do a practical works with it.

2.2.1 IEEE Standard

2.2.1.1 The standardization process

Each year, the IEEE-SA conducts over 200 standards ballots, a process by which proposed standards are voted upon for technical reliability and soundness. In 2005, IEEE had close to 900 active standards, with 500 standards under development.

One of the more notable are the IEEE 802 LAN/MAN group of standards, with the widely used computer networking standards for both wired (ethernet, aka IEEE 802.3) and wireless (IEEE 802.11 and IEEE 802.16) networks.

2.2.1.2 The IEEE standards development process can be broken down into seven basic steps:

Securing Sponsorship: An IEEE-approved organization must sponsor a standard. A sponsoring organization is in charge of coordinating and supervising the standard development from inception to completion. The professional societies within IEEE serve as the natural sponsor for many standards.

Requesting Project Authorization: To gain authorization for the standard a Project Authorization Request (PAR) is submitted to the IEEE-SA Standards Board. The New Standards Committee (NesCom) of the IEEE-SA Standards Board reviews the PAR and makes a recommendation to the Standards Board about whether to approve the PAR.

Assembling a Working Group: After the PAR is approved, a working group of individuals affected by, or interested in, the standard is organized to develop the standard. IEEE-SA rules ensure that all Working Group meetings are open and that anyone has the right to attend and contribute to the meetings.

Drafting the Standard: The Working Group prepares a draft of the proposed standard. Generally, the draft follows the IEEE Standards Style Manual that sets guidelines for the clauses and format of the standards document.

Balloting: Once a draft of the standard is finalized in the Working Group, the draft is submitted for Balloting approval. The IEEE Standards Department sends an invitation-to-ballot to any individual who has expressed an interest in the subject matter of the standard. Anyone who responds positively to the invitation-to-ballot becomes a member of the balloting group, as long as the individual is an IEEE Standards Association member or has paid a balloting fee. The IEEE requires that a proposed draft of the standard receive a response rate of 75% (i.e., at least 75% of potential ballots are returned) and that, of the responding ballots, at least 75% approve the proposed draft of the standard. If the standard is not approved, the process returns to the drafting of the standard step in order to modify the standard document to gain approval of the balloting group.

Review Committee: After getting 75% approval, the draft standard, along with the balloting comments, are submitted to the IEEE-SA Standards Board Review Committee (RevCom). The RevCom reviews the proposed draft of the standard against the IEEE-SA Standards Board Bylaws and the stipulations set forth in the IEEE-SA Standards Board Operations Manual. The RevCom then makes a recommendation about whether to approve the submitted draft of the standard document.

Final Vote: Each member of the IEEE-SA Standards Board places a final vote on the submitted standard document. In some cases external members are invited to vote. It takes a majority vote of the Standards Board to gain final approval of the standard. In general, if the RevCom recommends approval, the Standards Board will vote to approve the standard.

2.2.1.3 Notable IEEE Standards committees and formats:

IEEE 260	Standard Letter Symbols for Units of Measurement, IEEE-260-1978 (now 260.1-2004)
IEEE 488	Standard Digital Interface for Programmable Instrumentation, IEEE-488-1978 (now 488.1)
IEEE 610	Standard Glossary of Software Engineering Terminology
IEEE 754	Floating point arithmetic specifications
IEEE 802	LAN/MAN
IEEE 802.1	Standards for LAN/MAN bridging and management and remote media access control (MAC) bridging
IEEE 802.2	Standards for Logical Link Control (MAC) standards for connectivity
IEEE 802.3	Ethernet Standards for Carrier Sense Multiple Access with Collision Detection (CSMA/CD)

IEEE 802.4	Standards for token passing bus access
IEEE 802.5	*Standards for token ring access and for communications* between LANs and MANs
IEEE 802.6	Standards for information exchange between systems
IEEE 802.7	*Standards for broadband LAN cabling*
IEEE 802.8	Fiber-optic connection
IEEE 802.9	Standards for integrated services, like voice and data
IEEE 802.10	Standards for LAN/MAN security implementations
IEEE 802.11	Wireless Networking – "WiFi"
IEEE 802.12	Standards for demand priority access method
IEEE 802.14	Standards for cable television broadband communications
IEEE 802.15.2	Bluetooth
IEEE 802.15.4	Wireless Sensor/Control Networks – "ZigBee"
IEEE 802.15.6	Wireless Body Area Network[12] (BAN) – (e.g. Bluetooth low energy)
IEEE 802.16	Wireless Networking – "WiMAX"
IEEE 802.24	Standards for Logical Link Control (LLC) standards for connectivity
IEEE 828	Configuration Management in Systems and Software Engineering
IEEE 829	Software Test Documentation
IEEE 830	Software Requirements Specifications
IEEE 896	Futurebus

IEEE 1003	Unix compatibility programming standard – POSIX
IEEE 1016	Software Design Description
IEEE 1028	Standard for Software Reviews and Audits
IEEE 1044.1	Standard Classification for Software Anomalies
IEEE 1059	Software Verification And Validation Plan
IEEE 1073	Point of Care Medical Device Communication Standards
IEEE 1074	Software Development Life Cycle
IEEE 1076	VHDL – VHSIC Hardware Description Language
IEEE 1149.1	JTAG
IEEE 1149.6	AC-JTAG
IEEE 1180	Discrete cosine transform accuracy
IEEE 1233	System Requirements Specification
IEEE 1275	Open Firmware
IEEE 1284	Parallel port
IEEE P1363	Public key cryptography
IEEE 1394	Serial bus – "FireWire", "i.Link"
IEEE 1471	software architecture / system architecture
IEEE 1541	Prefixes for Binary Multiples
IEEE 1584	Guide for Performing Arc Flash Hazard Calculations
IEEE 1588	Precision Time Protocol
IEEE P1619	Security in Storage Working Group (SISWG)

IEEE 1667	Standard Protocol for Authentication in Host Attachments of Transient Storage Devices
IEEE 1801	Unified Power Format
IEEE 1900	Dynamic Spectrum Access Networks (DySPAN)
IEEE 1901	*Broadband over Power Line Networks*
IEEE 1906.1	Recommended Practice for Nanoscale and Molecular Communication Framework
IEEE 2600	*Hardcopy Device and System Security (and related ISO/IEC 15408 Protection Profiles)*
IEEE 12207	Information Technology – Software life-cycle processes
IEEE Switchgear Committee	C37 series of standards for Low and High voltage equipment

Table 2.2.1.3 Notable IEEE Standards committees and formats

2.3 TECHNOLOGY

We still using the basic wiring technologies. We use it because it is easier to understand and it is commonly use at home. That's why we choose the single phase wiring as our project. In this project we use MCB/ELCB that used to protect a low voltage circuit in case of a fault. It contains a switch device that switches off whenever a fault occurs in the connected circuit.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

Basic Electrical Wiring Kit is designed mainly for education purpose. The design and the making of the kit is equivalent to a small room wiring circuit and can be used to teach student more about electrical wiring. When we first design it, we mainly think about the hardship of the student that went through the difficulties to understand the knowhow of electrical wiring. From the brainstorming that we did, this project were born and now we can promote it to be used for teaching purposes.

For the board, we didn't want to spend more money so we use a recyclable item for the board. The main issue here is tat the board is quite heavy thus making it difficult to move around. But with the implementation of 5S in PSP, we still decided to use a recyclable item so that the board have its own identities.

Each step of project is a process to complete the project. Every step must be followed one by one and must be done carefully. If some error occurs it can make a project probably could not operate or do not look neat and perfect.

Before the project finish, various process needs to be done according to proper procedures to ensure that projects do not have any problems. Among the measures the work done in preparing this project are.

- Process of designing wiring circuit.
- Board size measuring.
- Checking connection on the wiring kit.

3.1.1 Project Flow Chart

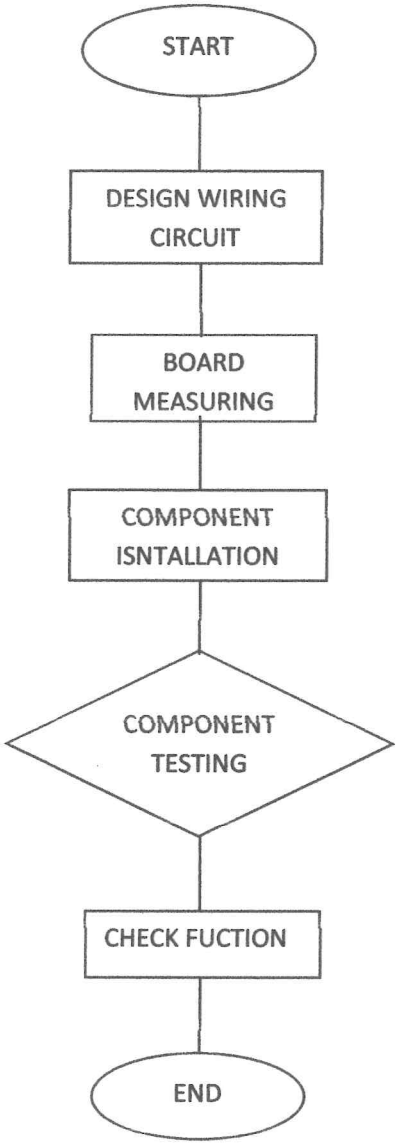

Figure 3.1.1 Project Flowchart

3.1.2 Circuit Operation Flow Chart

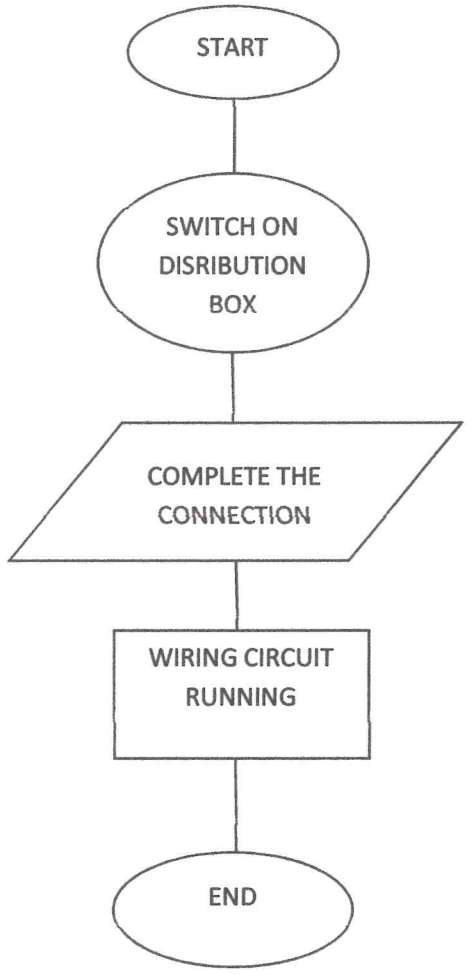

Figure 3.1.2 : Circuit Operation Flowchart

3.2 GANTT CHART

WEEK / ACTIVITY	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18
Students Registration																		
Project Briefing																		
Submission of Project Title																		
Submission of Proposal																		
Assistance and Discussion																		
Progress The Project and First Draft of The Report 50%																		
Progress The Project, Second Draft of The Report and presentation 75%																		
Preparation for presentation																		
Submission of Final Report																		
Presentation																		

3.3 SKETCHING SCHEMATIC.

In the early process of brainstorming, we experiment with a lot of design that can be used as teaching module for student. At the end, we end up with the design that we sketch in a piece of paper for the beginning. The sketch is done for the better insight for the process of designing the circuit that will be used for the kit project.

3.4 PROCESS OF THE WIRING CIRCUIT DESIGNING

3.4.1 Design the Circuit Diagram

After decide what kind of project that we want to build. We need to make a research about the circuit, electronic component that we need to used, hardware and so on. These things actually can help us to be better in designing circuit. For example, we need to know the size, foot of component, polarity of the component, the component method compilation and etc to make a circuit diagram.

In the first step in Circuit Designing process is make a circuit diagram that can be use in the next process. Among steps in the circuit diagram are:-

i. Before the circuit is produced, the things that we need to be emphasized are the position of symbols and components used in the Schematic circuit. Once we know the entire production circuit, the circuit can be drawn.

ii. Then, make sure that the connection of the component is correct.

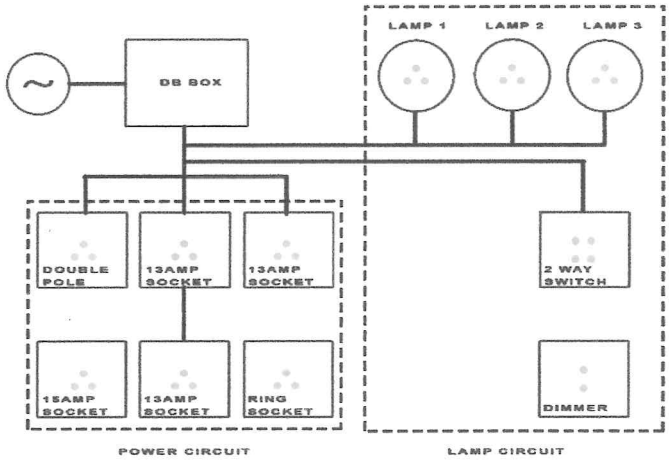

Figure 3.3 Circuit Diagram

3.5 COMPONENTS

3.5.1 Distribution Switch Set.

A distribution board (also known as panelboard, breaker panel, or electric panel) is a component of an electricity supply system that divides an electrical power feed into subsidiary circuits, while providing a protective fuse or circuit breaker for each circuit in a common enclosure. A consumer unit normally has a single horizontal row of fuses or MCBs, though some older units grouped four fuses in a square arrangement. For two-rate supplies (standard/off-peak), a second CU may be added (stacked). Multiple CUs are also found in larger premises.

Larger commercial, public, and industrial installations generally use three-phase supplies, with distribution boards which have twin vertical rows of breakers. Larger installations will often use subsidiary distribution boards.

Figure 3.5.1 A MCB & an ELCB

3.5.2 Socket 13 Amp & 15 Amp.

AC power plugs and sockets are devices that allow electrically operated equipment to be connected to the primary alternating current (AC) power supply in a building. Electrical plugs and sockets differ in voltage and current rating, shape, size and type of connectors. The types used in each country are set by national standards, some of which are listed in the IEC technical report TR 60083, Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC. The scope of IEC TR 60083 states: The report only contains systems for which standard sheets have been published in a National Standard, which may be a National Standard of the country itself or any other IEC member country.

Plugs and sockets for portable appliances started becoming available in the 1880s, to replace connections to light sockets with easier to use wall-mounted outlets. A proliferation of types developed to address the issues of convenience and protection from electric shock. Today there are approximately 20 types in common use around the world, and many obsolete socket types are still found in older buildings. Co-ordination of technical standards has allowed some types of plugs to be used over wide regions to facilitate trade in electrical appliances, and for the convenience of travellers and consumers of imported electrical goods. Some multi-standard sockets allow use of several different types of plugs, improvised or unapproved adapters between

incompatible sockets and plugs may not provide the full safety and performance of an approved socket and plug combination.

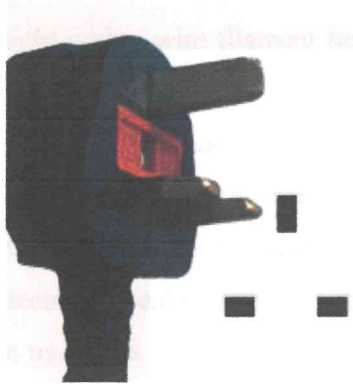

Figure 3.5.2 Socket

3.5.3 Switch.

In electrical engineering, a switch is an electrical component that can break an electrical circuit, interrupting the current or diverting it from one conductor to another. The mechanism of a switch may be operated directly by a human operator to control a circuit (for example, a light switch or a keyboard button), may be operated by a moving object such as a door-operated switch, or may be operated by some sensing element for pressure, temperature or flow. A relay is a switch that is operated by electricity. Switches are made to handle a wide range of voltages and currents; very large switches may be used to isolate high-voltage circuits in electrical substations.

Figure 3.5.3 Switch

3.5.4 Bulb.

Bulb is an electric light with a wire filament heated to a high temperature, by passing an electric current through it, until it glows with visible light (incandescence). The hot filament is protected from oxidation with a glass or quartz bulb that is filled with inert gas or evacuated. In a halogen lamp, filament evaporation is prevented by a chemical process that redeposits metal vapor onto the filament, extending its life. The light bulb is supplied with electric current by feed-through terminals or wires embedded in the glass. Most bulbs are used in a socket which provides mechanical support and electrical connections.

Incandescent bulbs are manufactured in a wide range of sizes, light output, and voltage ratings, from 1.5 volts to about 300 volts. They require no external regulating equipment, have low manufacturing costs, and work equally well on either alternating current or direct current. As a result, the incandescent lamp is widely used in household and commercial lighting, for portable lighting such as table lamps, car headlamps, and flashlights, and for decorative and advertising lighting..

Figure 3.5.4 Bulb