UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Development of an Electronic Board that Identify and Check the Functionality of the Commonly Used Arduino's Component (Assorted Component Checker)

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronic Engineering Technology (Industrial Electronics) with Honours.

by

MOHD ARSHAD BIN AZMAN
B071410536
951017-01-5211

FACULTY OF ENGINEERING TECHNOLOGY
2017

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **Development of an Electronic Board that Identify and Check the Functionality of the Commonly Used Arduino's Component**

SESI PENGAJIAN: **2017/18 Semester 1**

Saya **MOHD ARSHAD BIN AZMAN**

mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (✓)

☐	SULIT	(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972)
☐	TERHAD	
☐	TIDAK TERHAD	(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

Disahkan oleh:

_____ _____

Alamat Tetap:

No 138 Fasa 2 Taman Sri Temenggung

Jln Temg. Ahmad

84000, Muar Johor

Cop Rasmi:

Tarikh: _____ Tarikh: _____

** Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini perlu dikelaskan sebagai SULIT atau TERHAD.

DECLARATION

I hereby, declared this report entitled "Development of an Electronic Board that Identify and Check the Functionality of the Commonly Used Arduino's Component" is the results of my own research except as cited in references.

Signature	:	…….
Author's Name	:	Mohd Arshad Bin Azman
Date	:	……

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Technology (Industrial Electronic) (Hons.). The member of the supervisory is as follow:

……

(Amar Faiz Bin Zainal Abidin)

ABSTRAK

Pemeriksa Komponen Pelbagai merupakan sebuah papan elektronik yang membantu seseorang dengan memberi petunjuk bagaimana untuk memeriksa fungsi beberapa bahagian elektronik. Kebanyakan komponen elektronik yang dijual di kedai-kedai elektronik dalam keadaan bagus kerana kita hanya boleh menguji komponen tersebut selepas kita membelinya. Objektif untuk projek ini ialah untuk menambah baik projek sebelum ini yang bertajuk E-Penguji dimana boleh menguji 11 komponen sahaja. Projek ini menggunakan Arduino Mega sebagai pengawal, LCD sebagai paparan arahan sistem, pad kekunci sebagai pemasukkan data untuk memilih komponen yang ingin dipilih dan meguji 14 jenis komponen sebagai penguji. Borang kaji selidik mempunyai 10 jenis soalan yang telah diedarkan kepada pensyarah dan pelajar dalam FTK UTeM. Berdasarkan keputusan yang telah diambil, komponen penguji ini mendapat sambutan yang positif daripada pensyarah dan pelajar.

ABSTRACT

Assorted Component Checker is an electronic board that giving guidance to someone to check the functionality of electronic parts. Most of an electronic component that sell in the retail shop are in unknown condition because we only can test the component after we purchased them. The objective of this project is to improvise the previous project called E-Tester which can test component up to 11 components. The project uses Arduino Mega as controller, LCD to display instruction of system, keypad as input to choose the selected component and 14 various components as tester. A survey consists of 10 questions was done among the lecturer and students in FTK UTeM. The result indicates that the component tester got positive feedback from either lecturer and students.

DEDICATION

Special dedicated to my beloved parents, my father Azman Bin Mohammad and my mother Sairah Binti Sidik, family members and friends.

ACKNOWLEDGEMENT

Bismillahirrahmanirrahim,

Alhamdulillah. Thanks to Allah SWT, who with His willing give me the opportunity to complete Bachelor Degree Project with title "Development of an Electronic Board that Identify and Check the Functionality of the Commonly Used Arduino's Component". This bachelor degree project was prepared for Universiti Teknikal Malaysia Melaka (UTeM), basically for student in final year to complete the undergraduate program that leads to the degree of Bachelor of Engineering Technology (Industrial Electronic) (Hons.). This report is based on the methods given by the university.

Firstly, a million thanks to Amar Faiz Bin Zainal Abidin, a lecturer at Faculty of Engineering Technology and also assign, as my supervisor who had guided me a lot of task during this semester. I also would like to express my deepest thanks and appreciation to my parents, family, special mate of mine and others for their cooperation, encouragement, constructive suggestion and full of support for the report completion, from the beginning until the end of this Bachelor Degree Project. Also deepest thanks to all of my friends and everyone, that has been contributed by supporting my work and helps myself during the Bachelor Degree Project until its fully completed.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

ACC	-	Assorted Component Checker
RGB LED	-	Red, Green, Blue LED
LDR	-	Light Dependent Resistor
RG LED	-	Red, Green LED
LED	-	Light Emitting Diode
LCD	-	Liquid Crystal Display
TFT	-	Thin-Film Transistor
EPB	-	Electromagnetic Passive Buzzer
PIR	-	Passive Infrared sensor
UART	-	Universal Asynchronous Receiver-Transmitter
USB	-	Universal Serial Bus
ICSP	-	In-Circuit Serial Programming
PWM	-	Pulse Width Modulation
MHz	-	Mega Hertz
GND	-	Ground
BJT	-	Bipolar Junction Transistor
FET	-	Field Effect Transistor
IC	-	Integrated Circuit
ISP	-	In-System Programmable
MOSFET	-	Metal Oxide Semiconductor Field Effect Transistor
NPN	-	Negative-Positive-Negative
PNP	-	Positive-Negative-Positive

CHAPTER 1
INTRODUCTION

1.0 Introduction

The aim of this chapter is to create the framework of this project. All the requirements needed to be achieve at the end of the associated project. The background of this project will be described briefly. Thus, entire structure of the project is accurately being described. In this chapter, the topics that will be clearly stated about this project such as problem statement, objectives, scope of work and project contribution.

1.1 Background Study

According to TheFreeDictionary.com (2003), electronic component is a component which can amplify or control voltages or currents without mechanical or other nonelectrical command, or to switch currents or voltages without mechanical switches; examples include electron tubes, transistors, and other solid-state devices. Based on Analysts, (2017) the global market of electronic component is projected to reach US$191.8 billion by 2022 that cause by highly needed electronic in modern life. Due to that, people nowadays tends to create new device by using the electronic component.

According to Russin and Anuar, (2016), E-TESTER is an electronic board that giving guidance to someone to check the functionality of electronic parts. It does not just check the condition of component; it also can display the resistance value of the tested component. For instance, it can read the estimation of resistor, capacitor and inductance values. The part can be check or test by connect it with the E-TESTER.

This project aims to create an electronic component tester board named Assorted Component Checker (ACC) that have the ability to check the functionality of 14 commonly used electronic component for Arduino project.

1.2 Problem Statement

Most of the commercial electrical appliances sell in the retail shop can be tested their functionality at the retail shop after purchasing their appliances. But when it comes to purchasing the electronic components, there is no option to test the components at the shop. From this, it can be said that there is no guarantee that all the appliances are in good condition.

Besides that, for a simple component might be easy to test. For examples, an LED can easily be tested by using a simple electrical circuit. If the LED is turns ON when tested on the circuit, it means that LED is in good condition and if not, that LED is in bad condition. Meanwhile for TFT, it required a complex circuit connection and source code to test it functionality.

Another situation is student always face a problem such as when their component is faulty when they are using it. The students might spend time thinking of the problem at the source code instead of the condition of their component.

1.3 Objectives

The objectives for this project are:

1. To design a proof of concept a trainer kit that can test 14 type of components. The design of trainer kit consists of two parts. First part is external hardware design. This part is about designing the casing of the trainer kit. The second part is internal hardware design which consists of electronic circuit and software design which consist of source code.

2. To build the proof of concept of the compatible that is 8cm x 12 cm and low cost that is less than RM300 educational kit that using Arduino Mega as the controller. The external casing will be the plastic. It is because it easy to cut. It also cheap compare to the other material. So the cost of the project can be reduced. The microcontroller is Arduino Mega 2560. It is because Arduino Mega 2560 more cheaply compare to other microcontroller such as Raspberry Pi.

3. To verify the functionality of the trainer kit by demonstrating it in experiment to expert which are lecturers. This will be done by testing one by one of the component on the kit and see the output results that is follow the expected output or not.

4. To validate the effectiveness of the trainer kit with guiding them by demonstrating to the target audience (students and lecturer that taught the students Faculty Technology Engineering Universiti Teknikal Malaysia Melaka). A questionnaire will be used to measure the effectiveness.

1.4 Scope of Work

This project utilizes LCD 20x4 just as the output. The component that can be test is 14 just that is LED, resistor, RGB LED, LDR sensor, joystick, seven segment, ultrasonic sensor, push button, Electromagnetic Passive Buzzer (EPB), RG LED, LM35 sensor, humidity sensor, water sensor and servo motor. All component part that needs to be test is the input of this project. Another main part is the keypad that will help the user effortlessly handle this project.

There is limitation in designing the external hardware. The material that used to make this external hardware is Polyvinyl chloride (PVC). It is because PVC is easy to cut. It also cheap compares other material. So, the cost of the project can be reduced. PVC is a lightweight material. The user will easy to carry this educational kit. The dimension size of this project is 8cm x 10cm. I choose this dimension size because it enough to represent the entire component for my Final Years Project.

This project just covers five kind of sensor that is ultrasonic sensor, LDR sensor, humidity sensor, water sensor and LM35 sensor. In addition, the project also includes a common cathode of seven segment and RGB LED.

Moreover, the project is in addition needed help from humans to examine the components. For example, an ultrasonic sensor. After the component is connected, the user must move the object for five centimetres and ten centimetres by taking the directions on the LCD. This will help users understand the use of an ultrasonic sensor and component conditions. Nevertheless, it is different of the PIR sensor and sensor LDR because these two parts only differentiate distinguished values and reference components on the board.

1.5 Project Contribution

Based on the first problem statement, it states that the user need to test their electrical appliances at the retail shop to check the functionality. So, this ACC project can overcome this problem because this project is easily to be used which means the user can bring their electrical appliances back to home and test it by using ACC.

For the second problem statement, it states that a simple component such as LED can be check easily while the complex component such as TFT is hardly to check by using simple circuit. By using ACC, the user didn't have to worry about that because this ACC project can check the functionality of the complex component.

The third problem statement is student always thought that the faulty of their project is wrong in source code instead of the electronic component functionality. The student can avoid this problem from happen in their project by using this ACC project. They can use this ACC to check the functionality of their component before they construct their circuit.

CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

Literature review is an important part before commencing any project. It provided all information needed based on your project and the correct way to develop your project so that the project can perform depends on what you needed. For this chapter, we will have explained the component or equipment that we use in the project and the related past project.

2.1 Component Used

2.1.1 Arduino Mega 2560

Based on Arduino.cc, (2017), "Arduino Mega 2560 is microcontroller board that consists 54 digital input/output pins which 15 pins can be use as PWM outputs,16 analogue inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button".

For this project, we used Arduino Mega2560 because we used many pin on it for connection input and output. This microcontroller has a way to save algorithm and instruction when controlling input and output. Besides that, the coding for Arduino is easily to be made and upload because it builds as an open source microcontroller board. Figure 2.1 shows the picture of Arduino Mega2560.

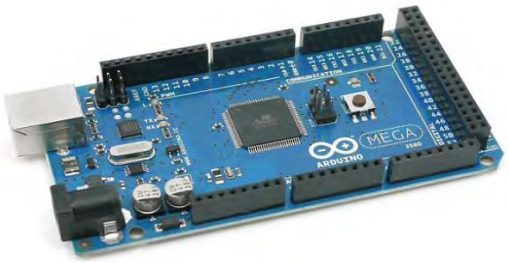

Figure 2.1: Arduino Mega2560 (Arduino.cc, 2017).

2.1.2 Light Emitting Diode (LED)

According to Merriam-webster.com, (2017) ,“LED is a semiconductor that emits light when voltage is supply to it and this led is usually used in electronic devices”.

In this project, LED is used as one of the component that will be tested and the LED colour we used to be blue, red and green. Figure 2.2 shows the led that used.

Figure 2.2: Red, Green and Blue LED (Merriam-webster.com, 2017).

2.1.3 Buzzer

According to Futureelectronics.com, (2017) ,“A buzzer is a mechanical, electromechanical, magnetic, electromagnetic, electro-acoustic or piezoelectric audio signalling device. A piezo electric buzzer can be driven by an oscillating electronic circuit or other audio signal source. A click, beep or ring can indicate that a button has been pressed.”.

In this project, buzzer also one of the component that we will tested. We choose this buzzer because the sound produced by this buzzer can notify the user that the buzzer is working properly. Figure 2.3 shows the buzzer that we used.

Figure 2.3: Buzzer (Futureelectronics.com, 2017).

2.1.4 Resistor

According to Allaboutcircuits.com, (2005), “Resistor is an electrical component that reduce the electric current. They are typically constructed of metal wire or carbon, and engineered to maintain a stable resistance value over a wide range of environmental conditions”.

For this project, resistor acts as the input where the value of resistor is being read and as to complete the connection of LDR sensor. Figure 2.4 shows the resistor used in this project.

Figure 2.4: Resistors (Allaboutcircuits.com, 2005).