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Signature:

Supervisor's Name: En Mohd Sa'ari Bin Mohamad Isa

Date: 5th. Mei 2006

NETWORK CABLE TESTER WITH LCD DISPLAY

BAZLINA BINTI BASARAHIM

This Report Is Submitted In Partial Fulfillment Of Requirements For The Bachelor Degree of Electronic Engineering (Industrial Electronic)

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Kolej Universiti Teknikal Kebangsaan Malaysia

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"I am acknowledging this report was written by my own except the draft and the passages which for each of them have been explained the references."

Signature: 

Author's Name: Bazlina Binti Basarahim

Date: 5 MAY 2006

Special for abah, mama, kak cik, adik , and friends of BENC

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ABSTRAK

Projek ini merupakan satu projek merekabentuk sebuah penguji kabel rangkaian dengan paparan LCD (*Liquid Crystal Display*). Penguji kabel ini berfungsi dalam mengesan kesinambungan dan sebarang masalah pada kabel yang diuji. Status dan masalah pada kabel UTP yang diuji akan dipaparkan pada skrin LCD. Status dan masalah yang dipaparkan akan membantu pengguna dalam menganalisa kabel yang telah diuji. Output yang dipaparkan pada skrin LCD adalah seperti '*good cable*', '*open*' dan '*short*' dan lain-lain. Ciri – ciri utama penguji kabel ini adalah seperti senang untuk digunakan (*hand-held operation*). Penguji kabel rangkaian ini membolehkan pengguna untuk menguji beberapa jenis kabel seperti Wayar Pasangan Berpintal Tanpa Bertebat (*Unshielded Twisted Pair (UTP)*) dan Wayar Pasangan Berpintal Bertebat (*Shielded Twisted Pair (STP)*). Projek ini melibatkan dua bahagian utama seperti proses merekabentuk litar asas elektronik iaitu litar penguji kabel dan juga litar LCD. Selain itu, projek ini juga memerlukan pengetahuan dan teknik mengenai proses rangkaian dalam mengenalpasti status dan masalah pada kabel RJ45.

ABSTRACT

The objective of this project is to design and construct a Network Cable Tester with liquid crystal display (LCD display). This tester can be used to detect the network cable continuity and polarity. It will be connected at one cable edge of the connection, where the status can be displayed by using LCD. The status can help the cable installer to judge on the installation and connection condition. Result is displayed on a backlit LCD screen indicating continuity, opens, shorts, and mismatches. The features of this LCD network cable tester are hand-held and easy operation, automatic power shutdown. This network cable tester will test for several types of cable such as shielded and non-shielded cables. The shielded and non-shielded cables include unshielded twisted pair (UTP), and shielded twisted pair. This project requires electronic circuit basic design about LCD circuit, timer and electronics simulations. Besides, this project also need network installation knowledge and technique especially on the status and problems of RJ 45 cables such as continuity, polarity, opens, shorts, and mismatched.

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LIST OF ABBREVIATIONS

LCD	-	Liquid Crystal Display
LED	-	Light Emitting Diode
PIC	-	Periperal Integrated Controller
UTP	-	Unshilded Twisted Pair

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The main objective of this chapter is to give the ideas about the whole project. This chapter contains of several subtopics that contains of project overview, the objective, scope, the methodology and the summary of the thesis. This chapter is also including of explanation of the implementation process of the project.

1.2 PROJECT OVERVIEW

This project is called the network cable tester with LCD display . Network cable tester is the perfect solution to testing installed cable and patch leads. This tester can be used to detect the network cable continuity and polarity. Result which is the problems of the cable such as open and short are displayed on the LCD screen. The features of this LCD network cable tester are hand-held and easy operation.

1.3 PROJECT OBJECTIVE

The main objective of this project is to design a network cable tester with Liquid Crystal Display (LCD). This cable tester is function to detect the network cable continuity and polarity and the status can be display by using LCD. In this project, This LCD network cable tester is hand-held and has an easy operation. Otherwise, the others advantage this network cable tester is because it completed with LCD display which is easy to interface, low power method of providing a display in this project. In this project, the user will find that it is easy to read the cable status, continuity and polarity. Besides that, the user will automatically find the problem of the cable either it is shorts, opens or mismatch. Therefore, the process to reconstruct the cable will be easier if the users know the problems earlier. As results, the user will save cost and time in doing their jobs.

1.4 SCOPE OF PROJECT

Generally, the main goal of the project is to design and construct the Network Cable Tester with Liquid Crystal Display (LCD). Therefore, to achieve this goal there are many scopes for this project, which contains many aspects. The scopes contains in this project is about the network installation and techniques, hardware and electronic circuit basic and the LCD programmable code.

The first scope is about network installation and technique. In this project, focus will be given to the RJ45 cable and other cable such as UTP and STP. This project also needs the characteristics, methods and problems of these cables. Moreover, this project is design for people who involve seriously in network field. It is also an advantage for

people who are just learned about the network installation because this network cable tester with LCD display will help them while testing the cable's continuity and polarity.

This project are also involves on hardware and electronic circuit basic and the technique. The electronic basic involves on design the related circuit such as receiver and transmitter circuit, LCD circuit, indicator and others. The processes are continuing with simulation, modification and construct the circuit to the board. This project are involved on PCB and casing design.

The third scope is about the LCD programmable code. In this project, the PIC16F877 are used in order to program the LCD display and to make sure that the circuit that had been design are function as needed. The software involved in this process is PicBasic Pro and ICProg. This software is used to program the PIC.

1.5 PROJECT METHODOLOGY

In this project, there are several method involved in the implementation process. The first methodology is by gain a lot of information. The information is from the related books such as the microcontroller (PIC), the books about the network cable tester and the books about LCD display. Otherwise, the information from the internet is another ways on gaining the related information. The manual book and the datasheet about the related IC that are used in this project are also another way of gaining the information. Through the manual book and the datasheet, we can find the information about the pin configuration of the PIC and the IC that are used in this project.

1.6 THESIS SUMMARY

Generally, this thesis is divided into five main chapters. The chapters are the introduction, literature review, the project methodology, the result and finally the conclusion and suggestion.

The first chapter is the introduction of the project. In this chapter, there are five subtopics involved which is the literature review of the project, the project objective, the scope of the project and the project methodology. This chapter is discussed about the whole project and the implementation process.

The second chapter is about the literature review. This chapter will explain about the information that had been used while implemented the project. The information is used as a reference and guideline to make sure that the project run smoothly and achieve the goal.

The next chapter is about the project methodology. This chapter will explain on the method that had been chosen in implemented this project. All the methods that had been chose must be implemented by sequence in order to make sure that this project is organized and achieve the goals.

The next chapter is about the results. This chapter will show the results either in pictures, graph and others. All the achievement in this project are then recoded and displayed through this chapter.

The last chapter is about the conclusion and the suggestion. The conclusion are made in order to identify either the objective of this project had been achieved on not. On the other side, the suggestion is made to improve the project in future.

CHAPTER II

LITERATURE REVIEW

2.1 INTRODUCTION

The main objective of the chapter is to cover about the concepts and theory that are used in this project. Furthermore, it is also to details all the information contains in this project. All the information are used to solve and find the solutions if there are any problems appears. Others, this chapter is also to guide from the theoretical and conceptual aspects that will be implement in this project.

2.2 NETWORK CABLE TESTER.

A cable tester is the most effective tool in certifying whether the network wiring is capable of transmitting data successfully. Cable testers also known as Time Domain Reflectometers which are generally compact, battery powered and handheld devices. They attach to one end of the cable, send out sonar-like pulses, and analyze the resulting reflections in order to diagnose typical problems such as bad connections, breaks, shorts, opens, electrical crosstalk, incorrect wire mapping, excess collisions, and so forth. In other words the network cable tester is physical-layer testing tools.

The UTP Cable Tester can be used for many purposes. It is mainly to test a UTP network cables of course. However it can also be used to find the right cable in a large bundle of identical looking cables. In fact the circuit can be used or adapted to test any type of cable of any number of wires, provided that the tester is equipped with the appropriate connectors.

The UTP Cable Tester consists of 2 tiny boxes which is a transmitter and a receiver that have to be connected to each end of the cable under test. One of the boxes contains a signal generator, powered by a standard 9V battery. The other box contains 8 LEDs that indicate the cable's condition.

Receiver consists of 8 LEDs with protective resistors, and 8 regular diodes. Their purpose is to provide ground level using the remaining wires (since they are held low). Transmitter contains 8 control LEDs and protective resistors. Theoretically, both the receiver and the transmitter should survive short-time connection into a working telephone socket. Due to this protection, as well as power consumption considerations, low-power LEDs need to be used .

The principle of operation is very simple. A good cable will show a single walking light. However, when the lights are lit out of order, it shows that some the cables have been switched in one or both of the connectors. If one or more lights don't light , its shows that one or more wires are cut. If two or more lights light up simultaneously you'll know that two or more wires are shorted together.

Cable testing takes place within the Physical Layer of the Open System Interconnection (OSI) Reference Model. The Physical Layer defines the transmission of bit through a medium, and standards at this layer specify electrical characteristics of the signal, cable and connector pin-outs.

However, this cable tester has several disadvantages. It was unable to measure dynamically because it could test only one wire after another and it was not good for testing in the field since both plugs which is the transmitter and the receiver that were located on the same unit. For example, it was impossible to test a test to a socket on the other side of a building.

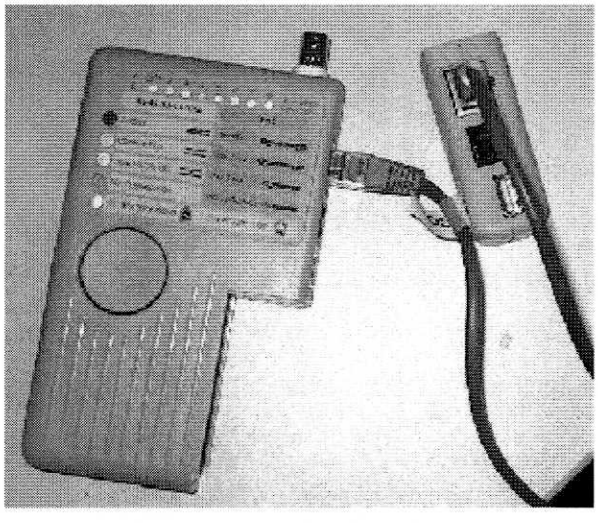

Figure 2.1: Network cable tester

2.3 UNSHIELDED TWISTED PAIR (UTP)

UTP stands for "Unshielded Twisted Pairs". UTP is probably the most common type of wire used today. This cable consists of 4 pairs of wires, where each pair is constantly twisted along the total length of the cable. This twisting is very important, for it ensures interference immunity and low radiation emission. The overall quality of the cable is very important, especially to run the network at 100Mbit/sec and beyond.

UTP can support telephone, 4 & 16 Mbps Token Ring, Ethernet, 100 Mbps Ethernet, Copper FDDI (CDDI), 155 Mbps ATM and others. UTP cable is rated by the EIA/TIA standards into categories.

- Category 3 is rated to 10 MHz, suitable for Ethernet (10 Mb/s)
- Category 4 is rated to 20 MHz, suitable for Token Ring (16 Mb/s).
- Category 5 is rated to 100 MHz, suitable for Fast Ethernet (100 Mb/s) and ATM (155 Mb/s).

UTP cable is generally wired in a star topology, with the troubleshooting advantages associated with stars. Although most of the topologies listed above require only 2 pair (4 wires), the specific 2 pair used varies by network type. Telephone requires only 1 pair for a single line phone. If you install 4 pair cabling, it will support any possible combination without requiring you to reterminate (put new connectors) on each connection if you change network types.