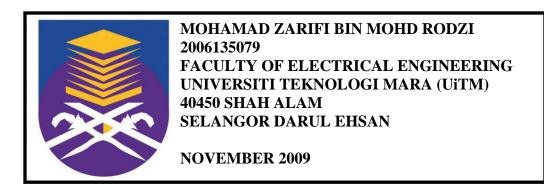
DETECTION OF FAULTY PILOT CABLE USING ALTERA CYCLONE II BOARD WITH TIME-DOMAIN REFLECTION (TDR) TECHNIQUE

Project report is represent in partial of fulfillment for the award of the Bachelor of Electrical Engineering (Hons)

UNIVERSITI TEKNOLOGI MARA MALAYSIA



ACKNOWLEDGEMENT

Firstly I would like to express my gratefulness to ALLAH S.W.T for I have finally finished my final year project report of Detection of Faulty Pilot Cable Using ALTERA Cyclone II Board with Time-Domain Reflection (TDR) Technique. I would like to express my sincere gratitude and appreciation to my project supervisor and co-supervisor, Dr Azilah Binti Saparon and Prof. Madya Dr Ngah Ramzi bin Hamzah for their continued support, generous guidance, help, patience and encouragement in during for the preparation of this final project until its complete. I also would like to take this opportunity to appreciate the important contributions of the following persons;

- 1. My family for continuously praying of my success
- 2. Mr. Sallehudin, High Voltage Lab's technician, for his cooperation during the experiments
- 3. Mr. Asyraff, Research assistance for Dr Azilah binti Saparon, for his help and idea
- 4. Mr. Mohd Syukri, Research assistance for Prof. Madya Dr Ngah Ramzi bin Hamzah, for his helps and ideas
- 5. Mr Mohd Hafizam, Research assistance for Dr Azilah binti Saparon, for his helps and ideas
- 6. Mr. Mohd Shahril Sharifuddin, Microelectronics Lab's technician, for his cooperation during the experiments
- 7. Mohd Zakaria bin Ramli and Che Su binti Che Mat, my uncle and auntie for their help
- 8. Nurul Hidayah binti Marzuki, Mohd Das, all my friends and everybody who have either been directly or indirectly involved in completing this final project report

Once again, thank you all for helping me finish this final project report and only ALLAH S.W.T can reciprocate their helps.

ABSTRACT

This project implements digital technique to control the inspection wires in pilot cable by using ALTERA Cyclone II board. It is the advancement of time-domain reflection (TDR) technique for faulty cable detection. The TDR module generates pulse signal and it will be injected into the inspection wire. The edge and reflection signal from the inspection pilot cable are recorded by the digital sampling oscilloscope (DSO). By analyzing the shape of reflected pulse signal (in step waveform) and other data using oscilloscope, the type and location of fault cable can be determined. This entire module is coded using Very High Speed Integrated Circuit Hardware Description Language (VHDL).

TABLE OF CONTENTS

Description	Page
DEDICATION	iii
DECLARATION	iv
ACKNOWLEDGEMENT	v
ABSTRACT	vi
TABLE OF CONTENTS	vii
LIST OF FIGURES	X
LIST OF TABLES	xii
ABBREVIATIONS	xiii
CHAPTER 1	
INTRODUCTION	
1.0 INTRODUCTION	1
1.1 PROBLEM STATEMENT	2
1.2 OBJECTIVES	2
1.3 SCOPE OF WORK	3
1.4 ORGANIZATION OF PROJECT REPORT	3
CHAPTER 2	
LITERATURE REVIEW	
2.0 INTRODUCTION	4
2.1 THEORETICAL BACKGROUND	4
2.2 TIME DOMAIN REFLECTION (TDR)	4
2.3 TRANSMISSION LINE	6
2.4 PILOT CABLE	6
2.5 TYPE OF CABLE FAULT	9
2.6 TESTING CRITERIA	9
2.5.1 Open Circuit Fault	9
2.5.2 Short Circuit Fault	9

CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

The pilot cable is normally used for control signaling, telecommunication, protection and data transmission purposed associated with power distributed and transmission system. Pilot cable is complying with the customer requirement of Tenaga National Berhad (Malaysia Utility Company). Pilot channel provide channel between electricity supply substation for communication and for protective relaying of high voltage overhead and undergoes lines [3]. These cables must function under condition where there are subjected to long trains of high voltage, induced by electromagnetic induction from zero sequence fault current in the overhead phase conductors.

In the pilot cable there are bundle of wire enclosed in wire amour or single core round hard drawn aluminum wire applied helically (spiral-shaped) over them and covered by dual insulation with an inner core of cellular polyethylene and outer skin of solid polyethylene. An over voltage in pilot cable cores may compromise alarm system, resulting the severe damage to the power system and prevent equipment. However, the problems will occurs when the pilot cable along with transmission line enters swampy areas as water might seep into in and cause damage to it. Also there are others problems such as broken conductor, water damage, crimps and variety of other fault condition [2].

There are several types of testing the pilot cable such as wavelet based noise cancellation technique, a capacitive-inductive coupler, TDR cable fault locators and many more. For this project the implementation of TDR technique been used to monitor the pilot cable. TDR have been around for many years and remain the fastest and the most accurate way to pinpoint cabling problems.