

**A GENERIC ARRAY LOGIC (GAL) BASED CONTROLLER
SYSTEM FOR SHAFT-ENCODED DIGITAL
TACHOMETER**

**This project is presented in partial fulfillment for the award of the
Bachelor of Electrical Engineering (Hons)
UNIVERSITI TEKNOLOGI MARA (UiTM)**



Nazri Bin Daud
Faculty of Electrical Engineering
UNIVERSITI TEKNOLOGI MARA
40450 Shah Alam,
Selangor Darul Ehsan

ACKNOWLEDGEMENT

In the name of ALLAH, the most beneficent and merciful. With the deepest sense of gratitude to Al-mighty ALLAH who gives me a strength and ability, at last I've finished up doing this project

I will take this opportunity to express my sincere and outmost appreciation to my project supervisor Dr. Chan Sei for his dedication in guiding and helping me in many aspects throughout this project. Without him, I might be not be move far till now.

A special dedicated to my beloved mother that have been pass away and also to my father and my family. All of you are meant everything to me, thanks for your love and kindness. May ALLAH bless you all.

Finally, I would like to thank to all my best friends and also Mr. Maurice Dellostrinos, an engineer from Lattice Semiconductor for being very co-operative, understanding, helping, encouraging, give a morale support and everything. I won't forget all of your kindness to me, good luck for your future.

Nazri Daud

ABSTRACT

This project is focuses on the development of a Generic Array Logic (GAL) based controller system for shaft-encoded digital tachometer. This device will used GAL 16V8, a product of Lattice Semiconductor Inc. This work will involved designing the logic circuit using the schematic editor through the isp Synario software. Finally the design will be performed into the GAL IC by using the Intelligent Universal programmer of Advantech Corp. Then, the performed GAL IC will be inserted into the ISP Development Board for testing and verification. The testing indicates the GAL implementation could satisfy the system requirements of the shaft-encoded digital tachometer that expected and improved in reability. The ISP Development System software will used for the ISP product for the future work.

TABLE OF CONTENTS

CHAPTER	PAGE	
I	INTRODUCTION	
1.1	Introduction	1
1.2	Why ISP and GAL products	2
1.3	Basic principles of shaft-encoded digital tachometer	
II	PROJECT DEVELOPMENT AND SYSTEM DESCRIPTION	
2.1	Introduction	5
2.2	Personal computer	7
2.3	Advantech Intelligent Universal Programmer	7
2.4	GAL 16V8 IC	8
2.5	ISP Development Board	11
III	SOFTWARE DEVELOPMENT SYSTEM	
3.1	Introduction	12
3.2	ISP Synario System development	15
3.2.1	ISP Synario project navigator	17
3.2.1.1	The sources window	18
3.2.1.2	The notebook icon	18
3.2.1.3	Project sources	18
3.2.1.4	Design tips for GAL devices	19

CHAPTER I

INTRODUCTION

1.1 Introduction

Nowadays, we are surrounded by a myriad of digital devices. Digital watches, electronic calculators, digital meters, microprocessors and digital computers are all examples of such systems. A digital system typically consists of several subsystems. Each subsystem is a hardware component consisting of several logic circuits. A logic circuit is an interconnection of several logic devices designed to perform a desired function. The logic devices used in building a circuit are called gates. There are two types of logic circuit, combinational and sequential.

Throughout this project we have to examine the various building blocks of digital systems. As each block was described, an actual integrated circuit was cited that could be used to implement the logic function in a circuit. Many systems in use today are combinations of circuits of integrated circuits that meet the needs of the system. Once the actual parts have been specified and the final schematics have been drawn, it will probably be built on a breadboard.

This process is by nature, prone to errors by wiring. Use of many different integrated circuits tends to create massive numbers of interconnecting wires. Even with very orderly breadboarding technique, it is often difficult to trace the path of a wire in a circuit visually. By using troubleshooting, we can isolate the wire, but correcting a wiring error may still be difficult on the breadboard.