HIGHER TECHNICAL INSTITUTE

ELECTRICAL ENGINEERING DEPARTMENT

DIPLOMA PROJECT

DEVELOPMENT OF DIGITAL CONTROLLER FOR RECTIFIERS

by

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Dedicated to my family

DESIGN CONSTRUCTION AND TESTING OF A DIGITAL CONTROLLER FOR RECTIFIERS

Project report submitted by

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ABSTRACT

TITLE : DIGITAL CONTROLLER FOR RECTIFIERS

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The purpose of this project is to design,construct and test a digital controller for single phase rectifiers .This project uses digital I.C's and incorporates a visual display for the firing angle.In addition to the output pulse produced at a certain angle **a**,a similar pulse of the same duration is produced at an angle **180+a** degrees.

Based on the block diagram of the digital controller and its princible of operation the appropriate circuit was designed,constructed and tested according to some terms and conditions:

1. A local oscillator should produce pulses of frequency equal to 1 degree.

2. The selection of the firing angle should be through an UP/DOWN decade counter.

3. A 3-digit display should exist for the selected firing angle.

INTRODUCTION

Control over rectifiers is often used in order to control the output dc voltage from them.Since the control element of rectifiers is the thyristor,the controller designed and constructed in this project is a phase controller providing a firing pulse at the tryristor gate at a certain given delay.In general,a phase controller is used in any thyristor application due to the capability of this semiconductor device to control the power flow in various circuits.Since power control is of great importance nowadays,these controllers are widely used especially in industry in electric motor drive systems,heat controls,light controls,power supplies,vehicle propolsion systems and high voltage direct current systems.

The need described above to control the power flow led modern technology to proceed into the manufacture of larger and larger thyristors (up to 4000A) and the development of the corresponding phase controllers.Thus,even ready made I.C's are manufactured that can control the firing pulse of thyristors and in addition provide the means for using them as a part of a special industrial application.Such facilities are the incorporation of a tachogenerator feedback circuit for motor speed control,a circuit providing overcurrent protection to the load,etc.

In this particular project a digital controller was designed and constructed.The purpose of this project should be considered strictly academic having in mind the developments made recently on phase controllers as described above.For the construction of this controller several digital I.C' were used and in addition a visual display for the input firing delay was incorporated as well as an up-down counter to enable the user to input this delay.