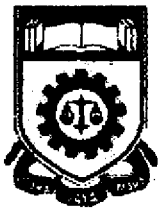


**AUTOMATIC MEASUREMENT OF IMPEDANCE IN  
SUPERIONIC MATERIALS USING HIGH SPEED  
(DAS) CARD**

This thesis is presented in partial fulfillment for the award of the  
Bachelor in Electrical Engineering (Hons) of  
**INSTITUT TEKNOLOGI MARA**



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NOVEMBER 1998

## **ACKNOWLEDGEMENT**

Praise be to Allah s.w.t for giving me the time and ability to complete this thesis, I owe my entire life.

I would like to express my special thanks and gratitude to my supervisors Puan Wahidah Mansur and Puan Fatimah Ibrahim for their guidance, advise, suggestions and materials given at various stage of this project.

I would also like to record my sincere thanks to the following: Prof. Madya Abdul Kariem from University Malaya and Encik Ahmad Maliki and also Mr.S. Anandan for providing me with relevant data and information on the study area. Staffs from Engineering Department and to all others who have helped me in one way or another, directly or indirectly during the course of preparing this project.

Finally and most importantly, I would like to thanks my husband, Nasaruddin Abu Bakar and my family for giving me a great deal of physical, moral support and assistance to make this project success. I am very much indebted to them.

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**Shah Alam**

**Selangor Darul Ehsan**

## **ABSTRACT**

This thesis describes the automatic measurement of impedance in Superionic Materials using high speed data acquisition (DAS) card PCL 1800. The plug in DAS card is installed in the IBM Personal Computer. A series electrolyte battery-cell resistor circuit is chosen as a sample for the impedance and phase shift measurement. The impedance and phase shift measurement have been conducted using two techniques; Lissajous method for the automatic measurement and RC –circuit method for the manual measurement. A control software has been designed to automate the measurement process which was written in Visual Basic 5. The software reads the data obtained from the series electrolyte battery cell- resistor circuits, calculates the real and imaginary part of the impedance and displays the impedance response graph.

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## **1.0 INTRODUCTION**

In the Information Technology (IT) era, most people prefer high technology using PC based instrumentation for their measurement. Equipment developments have led to the invention of a microprocessor controlled apparatus and data storage systems. This means that, a computer can be used to measure voltage, current, impedance and phase shift of electrical circuit, which leads to the transformations of manual measurement to the automatic measurement. The later provides several advantages such as: faster result, high efficiency, less error in handling and reducing the time taken for experimenting.

This project is concerned with the automatic measurement of electrical conductivity in superionic materials. The project is comprises of two modules i.e. the hardware and software. The hardware module consists of parallel battery cell-resistor circuit, terminal card, high speed (DAS) card and a PC. The PC processes the data obtained from the data acquisition card and displays the impedance response. In other words, the PC acts as a multimeter and an oscilloscope.

In the software module, a control software has been designed to automate the measurement process. The control routines configures the data acquisition