CHAPTER 1

INTRODUCTION

1.1 Background

Development a personnel computer (PC) based energy management system associated with automatic meter reading and various load control functions for load management of home customers. Automatic meter reading configured by a programmable logic controller and power meter supports the function of recording 20 power parameters retrieved from an academic substation. Load control functions; which consist of demand control, timer control, cycling on/off control and direct control, are designed to effectively reduce peak load and to save electrical energy. Several types of software program coded by Visual Basic, programmable logic controller (PLC) ladder language, and partial Diamond package, are designed to integrate all hardware equipment in energy management system. The entire system has been installed and successfully operated since October 1997. Statistical data collected from 1997/10 to 1999/10 indicate that the proposed effect for peak load cutting and energy saving may be justified.

Development of PC based Home Energy Management System is a control system that embedded with intelligent to manage and monitor the usage of energy at home. Basically, this project is designed to be interface with home electrical
appliances based on development of Graphical User Interface (GUI) in Matlab 7.1 and microcontroller MC68HC11. The system is expected to become an intelligent management system that lead to energy saving in mean of low in cost and also to keep the life span of the appliances. For general view of this system, by plugging a plug of load at the provided socket at the system, it allows the users to see consumption rate for different appliances in their house. For example, when a heater is connected to the socket of this system, the LCD display will display the power dissipation.

The knowledge of power draw of each appliance becomes vital when it come to the usage of appliances in demand time. As example, in several countries such as US, the utility’s company will charge different rate if power consumption for a home in peak time is exceed certain limit. By adding a meter which is displaying power dissipation for summation of several appliances at same time will lead the users to disable certain appliance when total power consumption is exceeded the limit. Thus, user definitely can avoid the unnecessary charge due to exceeding the rate. Besides that, user could find the suitable range of time to use the appliances which is consuming major power and also be able to turn on or off appliances either through GUI and using external switch in purpose of limiting power consumption.

The system required the designing on hardware and software where it could be separate into three main parts. Its involve software development, control unit (microcontroller) and appliances interfacing circuit. For advance features of this system, the control unit will able to stand-alone running without connected to the PC. This is important because the usage of PC for 24 hours in a day is not efficient, as we know PC also draw a lot of power and furthermore the continuous running of PC would give bad effect to itself.
1.2 Objective

The objective of this project is:

(i) To create a device that constantly monitors the power consumption by each appliance and communicates the data to the user in easy manner by developing a GUI system.

(ii) To allow the user to control the appliances through a PC and also the system able to work independently base on the program that been set in control unit to be automatically react to the data such in order to manipulate the energy consumption patterns.

1.3 SCOPE OF PROJECT

(i) Develop a GUI using Matlab 7.1 for hardware and software interfacing.

(ii) Designing on microcontroller MC68HC11 in expanded mode as control unit and optimize the usage of features that exist in that microcontroller such as serial communication (SCI) and analog to digital converter (ADC).

(iii) Designing a signal conditioning circuit which is consisting of voltage sensor and current sensor.

(iv) Designing appliance interfacing circuit which is interface with appliances that apply the switching concept based on relay that controlled by microcontroller.

(v) Designing LCD display as a meter to view that measurement of voltage (rms), current (rms) and power consumption.