REAL TIME CLOCK USING PIC MICRO

MOHD FAIZAL BIN RAZALI

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SYAFEEZA BT AHMAD RADZI
Pensyarah
Fakulti Kej Elektronik dan Kej Komputer (FKEKK),
Universiti Teknikal Malaysia Melaka (UTeM),
Karung Berkunci 1200,
Ayer Keroh, 75450 Melaka

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DEDICATION

I would like to dedicate this thesis to my family and somebody special, whose encouragement and support with a great help in completing it.

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ABSTRACT

This PIC project uses a 12C Real Time Clock IC (DS1307) and a four digit seven segment display to create a standard desk clock. The DS1307 serial real time clock (RTC) is a low-power, full binary-coded decimal (BCD) clock/calendar plus 56 bytes of Nonvolatile (NV) SRAM. Its transfer by bidirectional bus means address and data are transferred serially through an Integrated Circuit. This clock or calendar provides seconds, minutes, hours, date, month, and year information. The 16F877 is to retarget able to other PICs that have Analogue input ANO. For the accuracy, a watch crystal spec typically 2Oppm is used. Switching between input and output to read analogue or drive display by using 12C routines. Special care must be taken in placing the DS1307 and the crystal. For battery backup lost seconds as power applied-solved by not writing to chip at all if already initialized. Real-Time Clock (RTC) Counts Seconds, minutes, Hours, Date of the Month, Month, Day of the week, and Year with Leap-Year Compensation Valid Up to 2099.

ABSTRAK

Projek PIC ini menggunakan 12C Jam Masa Sebenar (DS1307) dan pameran empat digit 7 segmen untuk menghasilkan jam meja yang standard. DS1307 Jam Masa Sebanar bersiri adalah berkuasa rendah, kod perduaan dan persepuluh yang penuh, jam atau kalendar ditambah dengan 56 bit SRAM yang tidak cepat berubah. Ia dihantar melalui dua arah bermakna alamat dan data dihantar secara bersiri melalui IC. Jam atau kalendar mengandungi maklumat mengenai saat, minit, jam, tarikh, bulan dan tahun. Spesifikasi bagi RTC ini adalah RTC ini menggunakan penyusun Mikroelektronik C V5.0.0.3. 16F877 digunakan sebagai sasaran semula kepada PIC yang lain yang mempunyai Input Analog ANO. Sebagai ketepatan, ia menggunakan spesifikasi jam kristal jenis 220 ppm. Suis antara masukan dan keluaran untuk membaca analog atau panduan arahan dengan menggunakan jalan laluan 12C. Perhatian yang lebih perlu diberikan semasa meletakkan DS 1307 dan kristal. Untuk bateri sebagai sokongan kepada bateri lemah dengan tidak menulis semula ke atas cip keseluruhan jika sudah ditanda. RTC mengira saat, minit, jam, tarikh dalam sebulan, bulan, hari dalam seminggu, dan tahun serta tahun lompat. Pengiraan ini boleh berlaku sehingga hampir seratus tahun iaitu sehingga tahun 2099.

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ADC	ANALOG TO DIGITAL CONVERTER
ALU	ARITHMATHIC LOGIC UNIT
BCD	BINARY CODED DECIMAL
CCW	COUNTER CLOCKWISE
CH	CLOCK HERTZ
CMOS	COMPLEMENTARY METAL OXIDE SEMICONDUCTOR
CP	CODE PROTECTION
CPLD	COMPLEX PROGRAMMABLE LOGIC DEVICE
CW	CLOCKWISE
FOSCI	OSCILLATOR SELECTION
FSR	FILE SELECT REGISTER
GND	GROUND
IC	INTEGRATED CIRCUIT
ICSP	IN CIRCUIT SERIAL PROGRAMMING
INDF	INDIRECT FILE
LED	LIGHT EMITTING DIOD
LVP	LOW VOLTAGE POWER
PC	PROGRAM COUNTER
PGC	PHARMACOGENOMIC CLOCK
PGD	PHARMACOGENOMIC DATA
PIC	PROGRAMMABLE INTEGRATED CIRCUIT
RTC	REAL TIME CLOCK
PWRT	POWER UP TIMER

UL	**UNDERWRITERS LABORATORY**
USART	**UNIVERSAL SYNCHRONOUS ASYNCHRONOUS RECEIVER TRANSMITTER**
WDT	**WATCH DOG TIMER**

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CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

The standard clock is the clock for defining the standard second. The current standard second is defined to be the duration of 9,192,631,770 periods (cycles, oscillations, vibrations) of a certain kind of microwave radiation in the standard clock. The standard clock is used to fix the units of all lengths. The unit of length depends on the unit of time. A real-time clock (RTC) is a computer clock or a digital clock (most often in the form of an integrated circuit chip) that keeps track of the current time even when the digital clock is turned off. It is used in many kinds of digital clock and present in all digital clocks. RTC are also present in many embedded systems. Some models of integrated Real-time clock circuits are the DS1307 from Maxim and the 16F88 from Philips.

Real time clock run on a special battery that is not connected to the normal power supply. In contrast, clocks that are not real-time do not function when the digital clock is off. RTC should not be confused with real-time computing. It also shouldn't be confused with CPU clock because the CPU clock regulates the execution of instructions.

Primary lithium coin cells are commonly used for RTC and memory backup. Lithium cells have a high energy density, thus taking up a small amount of room on a PC board. Self-discharge near room temperature and below is typically less than 1% per year. At temperatures above about +60°C, self-discharge quickly increases. Lithium primary cells are usually sized to power the RTC for the expected life of the product.

The DSI307 is a low-power clock/calendar with 56 bytes of battery-backed SRAM. The clock/calendar provides seconds, minutes, hours, day, date, month, and year information. The date at the end of the month is automatically adjusted for months with fewer than 31 days, including corrections for leap year. The DS1307 operates as a slave device on the 12C bus. Access is obtained by implementing a START condition and providing a device identification code followed by a register address. Subsequent registers can be accessed sequentially until a STOP condition is executed. When VCC falls below 1.25 x VBAT, the device terminates an access in progress and resets the device address counter. Inputs to the device will not be recognized at this time to prevent erroneous data from being written to the device from an out-of tolerance system. When VCC falls below VBAT, the device switches into a low-current battery-backup mode. Upon power-up, the device switches from battery to VCC when VCC is greater than VBAT +0.2V and recognizes inputs when VCC is greater than 1.25 x VBAT.

1.2 OBJECTIVE

The main purpose for this project is to make an easier lifestyle at home, office and anywhere you want. Anyone can get the advantage from this project. This standard desk clock has a function such as you can see a time, date, month and year on the same time. So, user does not require other source such as calendar to see the date, month and year. This can make you save your cost from buying a calendar. This project also gives extra knowledge to student because the project uses a device that can be program by its software and it is called as Programmable Integrated Circuit (PIC). This PIC device has two software that can program the PIC device. The first one is Protues and the other one is Sourceboost. Firstly, the programming for the PIC codes must be program by following the instruction of the software. After finished programming the PIC with the command from the software, we can simulate the circuit. If there is no error detect with the command programming, it can be burn into the PIC. The circuit actually has four main devices. PIC chip (16F877) as the brain for the clock, Multiplexed Seven Segment Display to display the output, Analogue Key to control the display and DS1307 as a clock and calendar memory. These four main devices are connected in one circuit to get a standard desk clock.

1.3 PROBLEM STATEMENT

Nowadays people derive something that can make their life simpler. So many people develop a new device that can make the human life as simple as they want it. Today, there are no standard desk clocks that have more function accept to see the time. So, user only can see the time from the standard desk clock or watch. If users want to see date, month and year they must see from other source such as calendar. This can waste their time. Here, a device that shows a time and date have been build because it can make our life simpler. This standard desk clock has many functions from before because you can see a time and date at the same time. There are so many problem that must be solve while build this project. First, it is difficult to determine the type of microcontroller that will be employed in the product. Unfamiliar with the PlC programming language can give trouble because PIC is the important part in this device. It is difficult to choose the most suitable programming language to be used. Thus, the specifications of the PlC programming must be learn before in can be installed in the circuit.

1.4 SCOPE AND ORGANIZATION

The main purpose of this project is to build a standard desk clock. It has 8 addresses and each address have their register function such as SECOND 0-59, MINUTES 0-59, HOURS 0-24 OR 1-12, DATE 1-31, MONTH 1-12, YEAR 1-99 and CONTROL. The RTC has mode button to cycles the display showing the different data after each button press. The following sequence is minutes, seconds, hours-minutes, date-month and '20' years. For the specification, this RTC used Microelectronica C compiler as a compiler. The 16F877 is to retarget able to other PlC that have analogue input ANO. For the accuracy, watch crystal specification typically 20 ppm will be used. Switching between input and output to read analogue or drive display by using 12C routines.

1.5 OVERVIEW OF PROJECT

This clock is build to show the time and date by using a PIC as a main device. The clock is controlled by four input keys which are all connected to a single analogue input pin. This pin also drives one of the seven segment display LED, so it has to be switched between input to read the analogue voltage and output to drive the LED. This clock is a Real Time Clock. Without supply through to the clock it still follows the real time because it has a memory and the Lithium Battery to run the clock. The DS1307 is a brain for the digital clock and has been set until 2099. The clock use PIC 16F877 because this type have more function than others. By using a PIC burner, the source code for the clock programming can be burn into the PIC 16F877.

1.6 THESIS OUTLINE

Chapter 1 explains about the project background, objective of the project, scope of the project and problem that must be solve while doing this project.

In chapter 2, the explanation is focusing about the components that have been use in the circuit to create a standard desk clock. This chapter also explains the function of each component in detail.

Chapter 3 explains about methodology of the project. It explains about the operation of the digital clock, clock processing and flow chart of digital clock before creating a PIC program.

Chapter 4 explains about the simulation and the result from the simulation. Before simulating the circuit, the source code programming for PIC 16F877 must be burn into the PIC using the PIC burner.

Finally, the last chapter explains about the future recommendation and the conclusion for the project.

CHAPTER 2

LITERATURE REVIEW

2.1 P1C16F877

PlC 16F877 features 256 bytes of EEPROM data memory, self programming, 8 channels of 1 0-bit Analog-to-Digital (AID) converter, 2 additional timers, 2 capture/ compare/ PWM functions, the synchronous serial port can be configured as either 3 wire Serial Peripheral Interface (SPITM) or the 2 wire Inter-Integrated Circuit (I2CTM) bus and a Universal Asynchronous Receiver Transmitter (USART). All of these features make it ideal for more advanced level A/D pp1ications in automotive, industrial, appliances and consumer applications. This powerful (200 nanosecond instruction execution) yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller packs Microchip's powerful PlC® architecture into a 40- or 44-pin package.