REAL-TIME DIGITAL CLOCK WITH VOICE

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This report is submitted in partial fulfillment of the requirement for the award of
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I would like to dedicate this thesis to my family, my fiancée and everyone, whose encouragement and support with great help in completing it.

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ABSTRACT

This project use DS1307 Serial Real-Time Clock and ISD2590 single-chip record and playback voice. LCD are uses to display seconds, minutes, hours, days, date, months and year information. DS1307 Serial Real-Time Clock is a low-power; full binary-coded decimal (BCD) clock/calendar plus 56 bytes of NV SRAM. Address and data are transferred serially via 2-wire, bi-directional bus. The clock/calendar provides second, minutes, hours, day, date, months and year information. The end of the month date is automatically adjusted for months with fewer than 31 days, including corrections for leap years. The clock operates in either 24-hour or 12-hour format with AM/PM indicator. The DS1307 has a build-in power senses circuit that's detects power failures and automatically switches to the battery supply. The ISD2590 have benefit of Winbond's ChipCorder technology is the use of on-chip nonvolatile memory, providing zero-power message storage. The massage is retained for up to 100 years typically without power. In addition, the device can be re-recorded typically over 100,000 times. It's designed to be used in microprocessor or microcontroller-based system. RTC with voice will display time, calendar, and voice to inform the time in each hour and any time when a switch button is pressed.

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ABSTRAK

Project ini menggunakan 12C Jam Masa Sebenar (DS1307) dan juga menggunkan IC Merekod dan Memainkan semula Rakaman Suara (ISD2590). LCD digunakan dalam projek ini adalah untuk memaparka hari, jam, minit, saat, tarikh beserta dengan tahun. DS1307 Jam Sebenar bersiri adalah kerkuasa rendah, kod penduaan dan persepuluhan yang penuh, jam atau kelandar ditambah dengan 56 bit SRAM yang tidak cepat berubah. Ia dihantar melalui dua arah bermakna alamat dan dihantar secara bersiri melalui IC. Jam atau kelandar mengandungi maklumat mengenai saat, minit, jam, tarikh, bulan dan tahun. Spesifikasi bagi RTC ini adalah RTC ini menggunakan penyusunan Mikroelektronik C V5.0.0.3.0. ISD 2590 menghasilkan kualiti yang tinggi, berkuasa rendah dan merupakan rakaman dan memainkan suara dalam masa 2 hingga 3 minit. Ia dilengkapi dengan CMOS yang mengandungi pengayun, penapis, pengayun audio dan juga mengurangkan bunyi bising pada suara semasa merakam dan juga memainkan semula. PIC16f877 digunakan sebagai sasaran semula kepada PIC yang lain yang mempunyai input analog ANO. Spesifikasi jam kristal jenis 220ppm digunakan sebagai ketetapan. RTC dengan suara ini akan memaparkan keluaran digit pada LCD dan akan mengeluarkan suara pada setiap jam dan mempunyai satu butang yang mana apabila ditekan akan mengeluarkan suara berpandukan keluaran digit pada LCD.

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LIST OF ABREVATIATION

ADC	ANALOG TO DIGITAL CONVERTER
ALU	ARITHMATHIC LOGIC UNIT
BCD	BINERY CODED DECIMAL
CCW	COUNTER CLOCKWISE
CH	CLOCK HERTZ
CMOS	COMPLEMENTARY METAL OXCIDE SEMICONDUCTOR
CP	CODE PROTECTION
CPLD	COMPLEX PROGRAMMABLE LOGIC DEVIVE
CW	CLOCKWISE
GND	GROUND
IC	INTERGRATED CIRCUIT
ICSP	IN CIRCUIT SERIAL PROGRAMMING
INDF	INDIRECT FILE
LED	LIGHT EMMITING DIODE
PC	PROGRAM COUNTER
PGC	PHARMACOGENIMIC CLOCK
PGD	PHARMACOGENIMIC DATA
PIC	PROGRAMMABLE INTERFACE CONTROLLER
PWRT	POWER UP TIMER
RTC	REAL TIME CLOCK
SQW	SQUARE WAVE
UL	UNDERWRITERS LABORATORY
USART	UNIVERSAL SYNCHRONOUS ASYNCHRONOUS RECEIVER

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WDT	WATCH DOG TIMER

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CHAPTER I

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, oscillation, 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 is 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 turn off. RTC are also present in many embedded systems.

Real time clock run on the 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 clocks is off. RTC should not be confused with the real-time computing. It also shouldn't be confused with CPU clock because the CPU clock regulates the execution of instructions.

Primary lithium coin cell 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

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PC board. Self-discharge near room temperature and below is typically less than 1% per year. At temperature above about +60°C, self-discharges 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 byte of battery-backed SRAM. The clock/calendar provide seconds, minutes, hours, day, date, month, and year information. The date at the end of the month is automatically adjusted for month with fewer than 31 days, including corrections for leap year. The DSI370 operates as a slave device on the 12C bus. Access is obtained by implementing a START condition and providing a device identification correction followed by a register address. Subsequent registers can be accessed sequentially until a STOP condition is executed. When VCC falls below 1.25 x VBA, the devices terminates and access in progress and resets the devices address counter. Inputs to the devices will not be recognized at this time to prevent erroneous data from being written to the devices from an out-of tolerance system. When VCC falls below VBAT, the devices 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.

In addition to a visual indication of time and alarm events, the ETL Clock reminder can announce the time or alarms using a recorded voice message. The unit can record up to 90 seconds of audio utilizing an ISD2590 Series. This audio reproduction method is preferable since the recorded audio can be in any language and can be from a recognized source

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1.2 OBJECTIVE

This *Real-time digital clock with voice* project is to make easier lifestyle at home, office and everywhere. This standard desk clock has function such as time (hours, minute, second), date, month and years. User can see all this on the same time and can cut the budget to buy a calendar and to see the date and years. Besides that, this clock also has voice to pronounce the time, date, month and year in each hour. This voice function can give an advantage to blind people to know time, date and years at anytime. With this standard clock, it also can give a guide to children underage to learn about how to read time, date and years. This project gives extra knowledge to student because Programming Integrated Circuit (PIC) is used to link all the function. Before using this PIC, we need to know the programming language that can be supported because programming language is one of the important sources to program the PIC.

1.3 PROBLEM STATEMENT

Nowadays, many people develop a new device that can make human life simpler as they need. This real time clock is one of the devices that can make human life simpler because there is no standard desk clock that have more function accept to see the time. User need to buy a calendar and watch in separately and it might be more expensive and waste time. Beside that, today no specification clock for the blind people and they need to ask someone when they need to know what time it is.

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 RTCV has mode button to cycles the display showing the different data

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after each button press. The following sequence is minutes, seconds, hour-minutes, date-month and '20' years. For the specification, this RTCV used Microelectronic C compiler as a compiler. The 16f877 is to retarget able to other PIC 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 using 12C routines.

1.5 OVERVIEW OF PROJECT

REAL-TIME DIGITAL CLOCK WITH VOICE is build to show the time, date by voice using a PIC as a main device. The clocks will be controlled by five 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 Real Time Clock with Voice. Voice will be produced in each hour or anytime by linking the voice command with the command of the time and date. Without any supply through to the clock it still follows the real time because it has a memory and the Lithium Battery to run the clock.

1.6 THESIS OUT LINE

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

In Chapter II, 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.

In Chapter III, the explanation is about the methodology of the project. The explanation is more the operation of the digital clock, clock processing and flow chart o digital clock before creating a PIC program.

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Chapter IV 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.

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2.1.1 PIN DIAGRAM

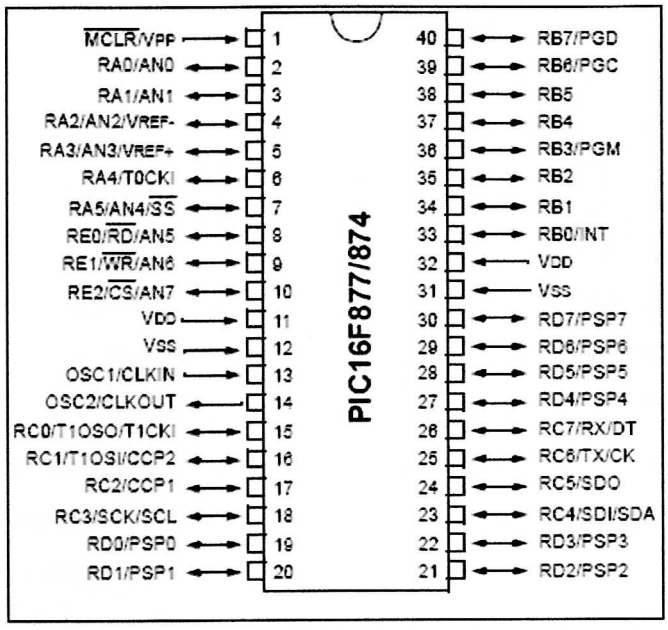

Figure 2.1 Pin Diagram

2.1.2 MICROCONTROLLER CORE FEATURES

- High performance RISC CPU
- Only 35 single word instruction to learn
- All single cycles instruction except for program branches which are two cycles
- Operating speed: DC-20Mhz clock input Dc- 200ns instruction cycle
- Direction, indirect and relative addressing modes
- Power-on reset (POR)
- Power-up Timer (PWRT) and oscillator Start-up Timer (OST)
- Watchdog Timer (WDT) with its own on-chip RC oscillator for reliable operation
- Programmable code protection
- Power saving SLEEP mode

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