Journal of Advances in Science and Technology

Vol. III, No. VI, August-2012, ISSN 2230-9659

IMPLEMENTATION OF DIP TEST IN MICROCONTROLLER-BASED OPERATIONS CONTROL SYSTEM

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Vol. III, No. VI, August-2012, ISSN 2230-9659

Implementation of Dip Test in Microcontroller-Based Operations Control System

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Abstract: ***- Microcontrollers usually contain from several to dozens of general purpose input/output pins (GPIO). GPIO pins are software configurable to either an input or an output state. When GPIO pins are configured to an input state, they are often used to read sensors or external signals. Configured to the output state, GPIO pins can drive external devices such as LEDs or motors.***

Many embedded systems need to read sensors that produce analog signals. This is the purpose of the analog-to-digital converter (ADC). Since processors are built to interpret and process digital data, i.e. 1s and 0s, they are not able to do anything with the analog signals that may be sent to it by a device. So the analog to digital converter is used to convert the incoming data into a form that the processor can recognize. A less common feature on some microcontrollers is a digital-to-analog converter (DAC) that allows the processor to output analog signals or voltage levels.

In addition to the converters, many embedded microprocessors include a variety of timers as well. One of the most common types of timers is the Programmable Interval Timer (PIT). A PIT may either count down from some value to zero, or up to the capacity of the count register, overflowing to zero. Once it reaches zero, it sends an interrupt to the processor indicating that it has finished counting. This is useful for devices such as thermostats, which periodically test the temperature around them to see if they need to turn the air conditioner on, the heater on, etc.

Time Processing Unit (TPU) is a sophisticated timer. In addition to counting down, the TPU can detect input events, generate output events, and perform other useful operations.

A dedicated Pulse Width Modulation (PWM) block makes it possible for the CPU to control power converters, resistive loads, motors, etc., without using lots of CPU resources in tight timer loops.

Universal Asynchronous Receiver/Transmitter (UART) block makes it possible to receive and transmit data over a serial line with very little load on the CPU. Dedicated on-chip hardware also often includes capabilities to communicate with other devices (chips) in digital formats such as I2C and Serial Peripheral Interface (SPI).

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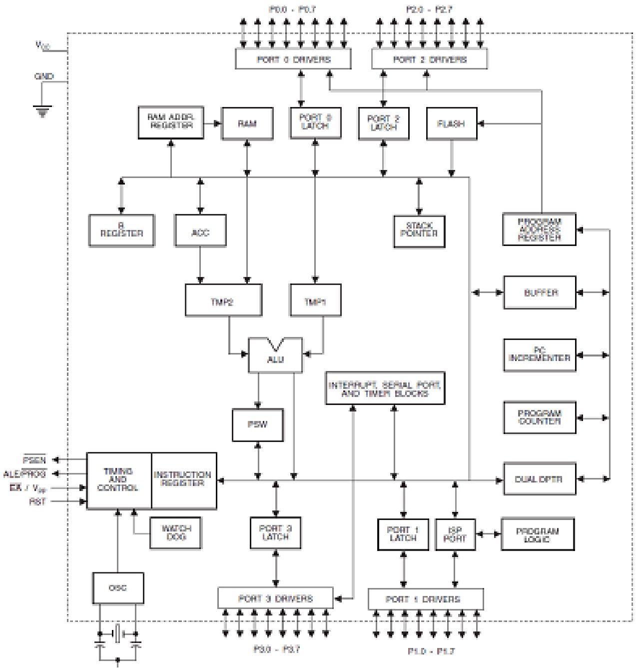
1. INTRODUCTION

A **microcontroller** is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Program memory in the form of NOR flash or OTP ROM is also often included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications.

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, and toys. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems.

Some microcontrollers may use Four-bit words and operate at clock rate frequencies as low as 4 kHz, for low power consumption (milliwatts or microwatts). They will generally have the ability to retain functionality while waiting for an event such as a button press or other interrupt; power consumption while sleeping (CPU clock and most peripherals off) may be just nanowatts, making many of them well suited for long lasting battery applications. Other microcontrollers may serve performance-critical roles, where they may need to act more like a digital signal processor (DSP).

2. BLOCK DIAGRAM FOR 8051



3. HARDWARE DESCRIPTION

It consists of two major parts and provides a function to convert the parallel data bus to RS232 serial port and vice versa. Also, it provides an in-system programming function. The functions of the three two parts are described as follows:

• Philips P89v51RD2/P89c51RD2 is an 8051 microcontroller. The microcontroller connection to the RS232 is through the serial data bus and control signals - address, write, read, reset, and chip select signals.

• Philips RS-232 drivers/receivers are the transceivers. The first one allows the microcontroller to be in-system programmed through a PC's serial port such as COM1. The RS-232 mainlyconsists of two sections: drivers (transmitters) and receivers. The drivers convert the CMOS-logic output levels to RS-232 signals, whereas the receivers convert theRS-232 signals to CMOS-logic output levels.

4. SOFTWARE DESCRIPTION

The programming of the demo test board can be done by writing firmware code requires the following software.

• Raisonance is one of the embedded system vendors that provide the development tools for the 8051 microcontroller. The software compiles the firmware code and generates an 'Intel Hex' file. Flash Magic is a free Windows application software that allows easy programming of Philips Flash Microcontrollers. The software loads the 'Intel Hex' file to the microcontroller by using its in-system programming mode communicating through serial port.

5. IMPLEMENTATION OF DIP TEST

CONNECTIONS:

- **Connect Port2 (P2) to LED Section.**
- **Connect Port0 (P0) to DIP switch Section.**

```
#include<reg51.h>

#include<intrins.h>

typedef unsigned char uchar;

typedef unsigned long ulong;

typedef unsigned int  uint;

#define         TIMER_RELOAD (-921)

#define         port_delay()     _nop_(),    _nop_(),
_nop_(), _nop_()

uint count;

ulong value;

uchar state,rdata;

void timer0(void)

interrupt 1 using 1

{

        count++;

        TH0 = (uchar)(TIMER_RELOAD>>8);

        TL0 = (uchar)TIMER_RELOAD;

}

/*

void delay(uint n)

{

        n = count + n;

  while (n != count);

}

*/

void io_open(void)

{
```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```
        TMOD = 0x21;
        IE = 0x92; //1001 0010
        SCON = 0x50; //0101 0000
        REN = 1;
        TL0 = (uchar)TIMER_RELOAD;
        TH0 = (uchar)TIMER_RELOAD >> 8;
        TH1 = TL1 = 0xFA;
        TR0 = 1;
        TR1 = 1;
}
void main(void)
{
        io_open();
        while(1)
        {
                P0 = P2;        }}
```

6. CONCLUSION

This integration drastically reduces the number of chips and the amount of wiring and circuit board space that would be needed to produce equivalent systems using separate chips. Furthermore, on low pin count devices in particular, each pin may interface to several internal peripherals, with the pin function selected by software. This allows a part to be used in a wider variety of applications than if pins had dedicated functions. Micro-controllers have proved to be highly popular in embedded systems since their introduction in the 1970s.

Some microcontrollers use a Harvard architecture: separate memory buses for instructions and data, allowing accesses to take place concurrently. Where a Harvard architecture is used, instruction words for the processor may be a different bit size than the length of internal memory and registers; for example: 12-bit instructions used with 8-bit data registers.

The decision of which peripheral to integrate is often difficult. The microcontroller vendors often trade operating frequencies and system design flexibility against time-to-market requirements from their customers and overall lower system cost. Manufacturers have to balance the need to minimize the chip size against additional functionality.

Microcontroller architectures vary widely. Some designs include general-purpose microprocessor cores, with one or more ROM, RAM, or I/O functions integrated onto the package. Other designs are purpose built for control applications. A micro-controller instruction set usually has many instructions intended for bit-wise operations to make control programs more compact. For example, a general purpose processor might require several instructions to test a bit in a register and branch if the bit is set, where a micro-controller could have a single instruction to provide that commonly-required function.

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