South China University of Technology

Experimental Report of Microcomputer Interface Technology Course

Name: Huang Zejun Student ID: 202130670058

Instructor: Xie Xiaomeng

Experimental Topic 1： Memory Experiment

Experiment Overview

【Experimental objectives and requirements】

Experimental purpose: Master Proteus operation; familiarize yourself with bus, register, bus switch characteristics; master memory operation timing

Experimental requirements: Install proteus software, draw schematics, and simulate memory operations

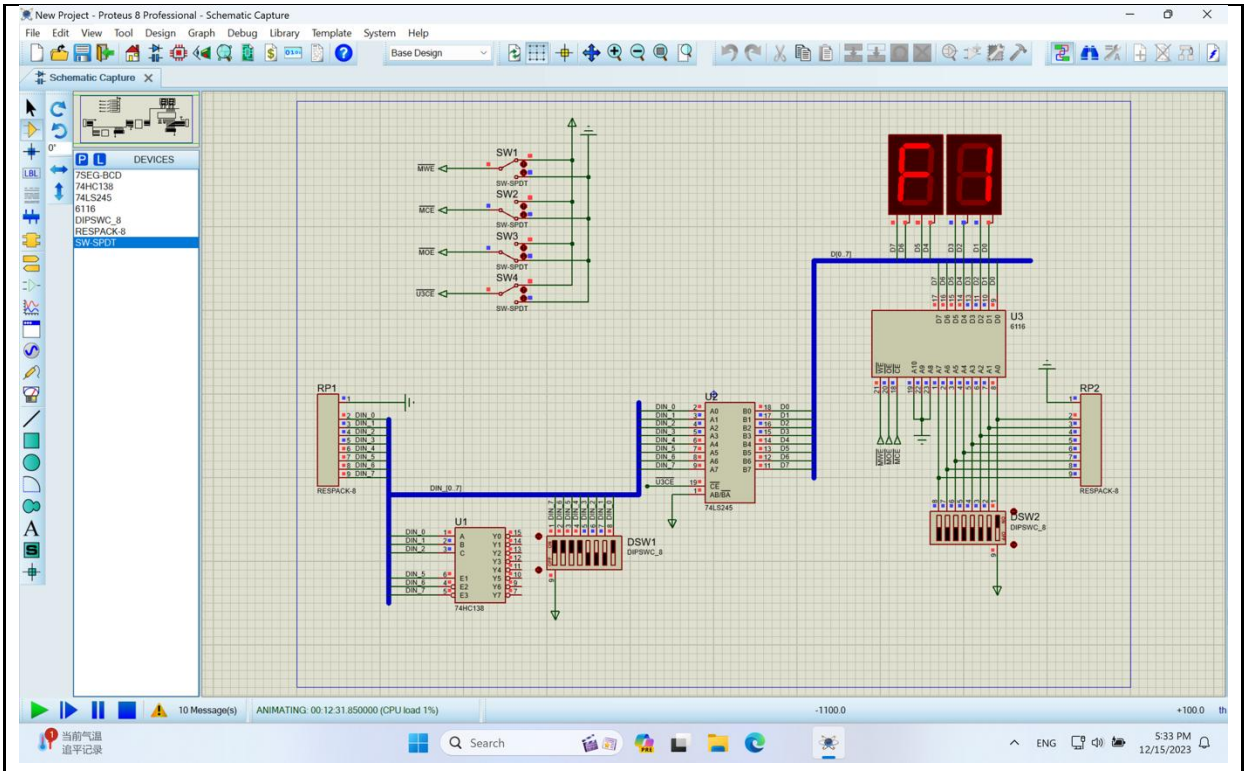
【Experimental environment】

Operating system: Windows 10

Experimental content

【Circuit diagram, design ideas, program source code and comments】

Circuit Diagram:

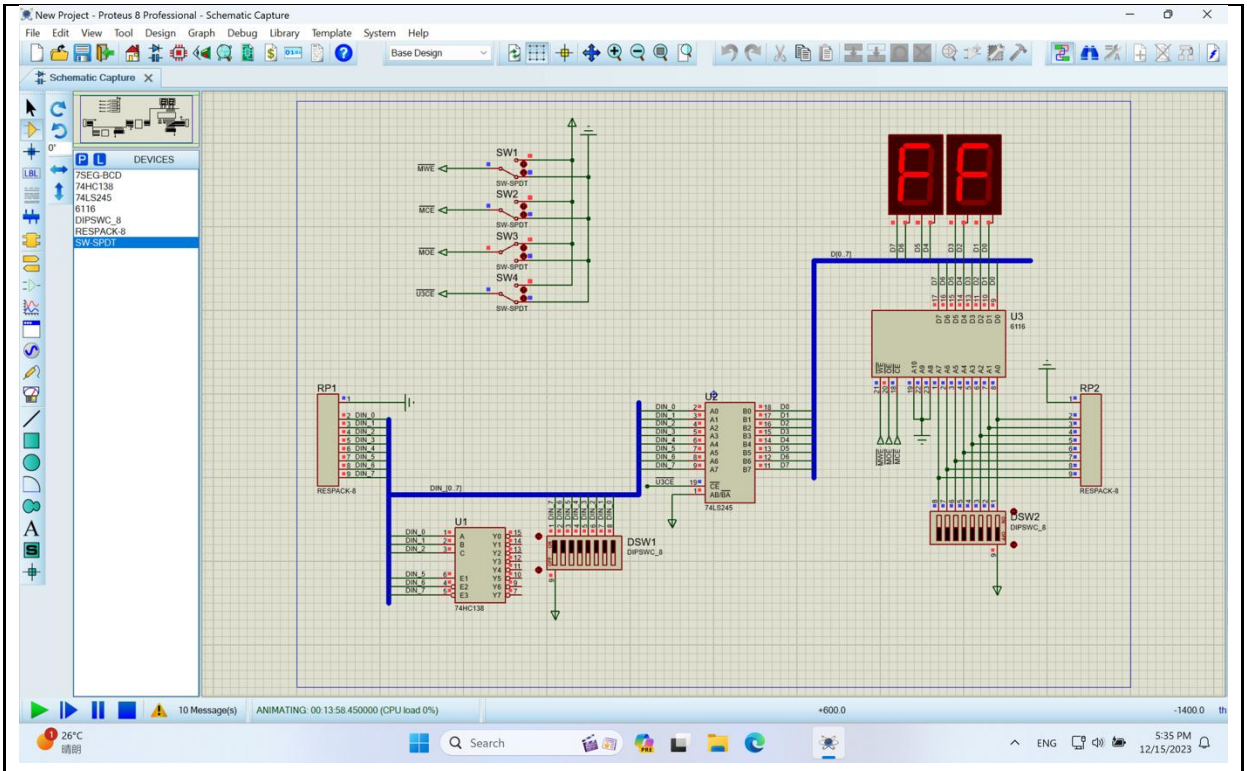


The operation mode of 6116 is determined by the combined effect of /WE, /0E, and /CE, all of which are active at low level.

Experimental steps:

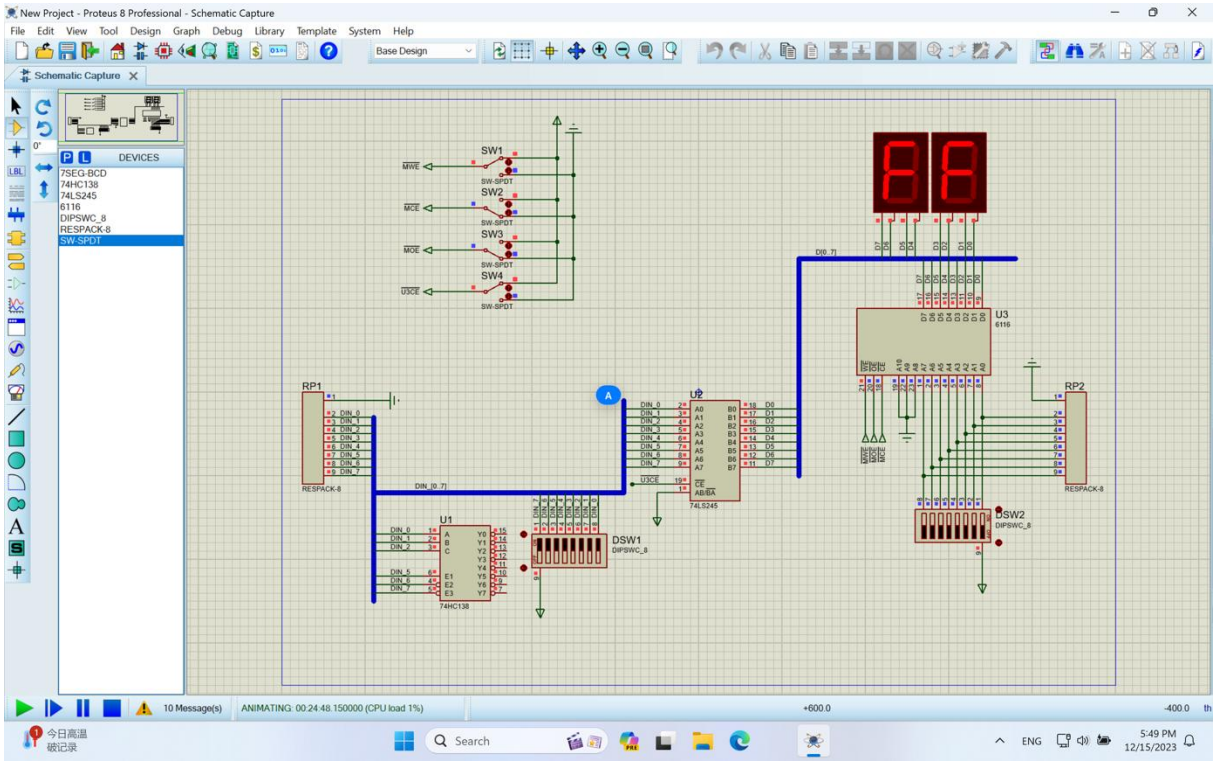
1、 We first set CE=1, set the address bit and data bit to 00H and FFH respectively, set WE=0 and OE=1, and now 6116 is set to write.

2、 Set CE=0 and U3CE=0. At this time, the chip select selects 6116 and 74LS245 is enabled, and the writing is completed.



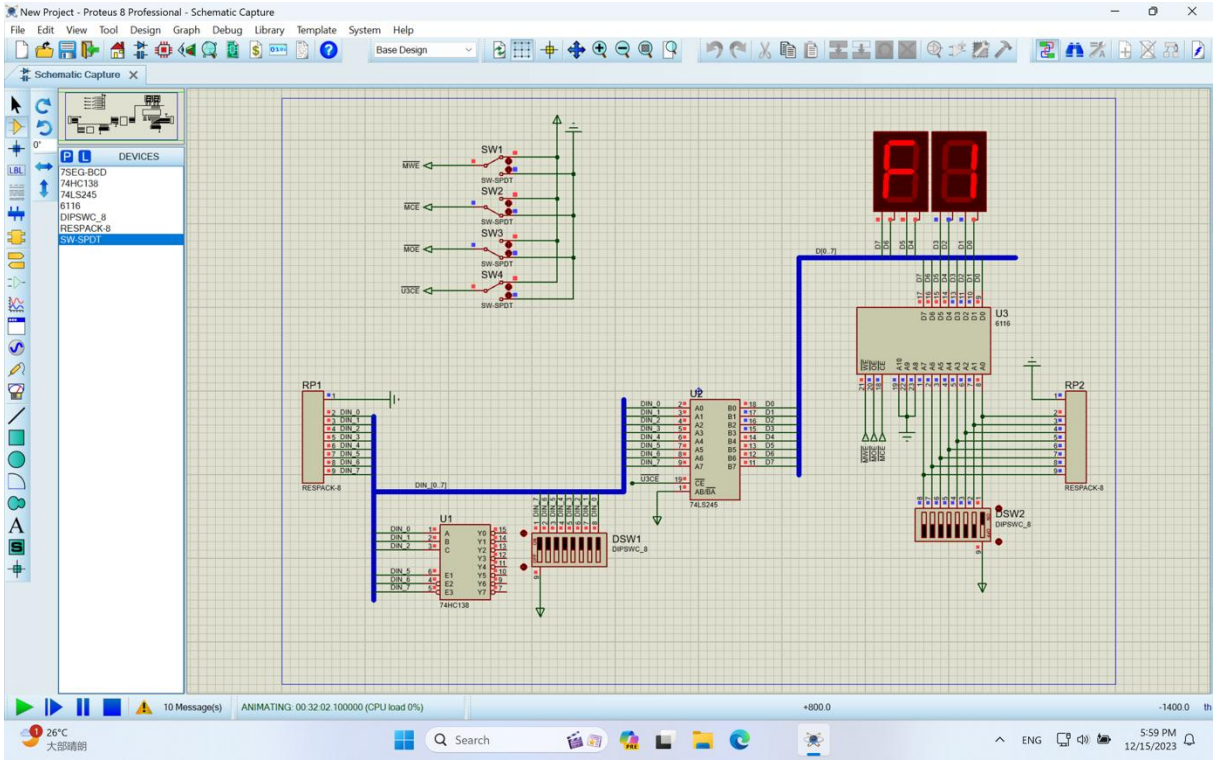
3、 Set CE=1 and U3CE=1, at this time the chip select does not select 6116 and 74LS245 is blocked, set WE=1 and OE=0, at this time 6116 is set to read out.

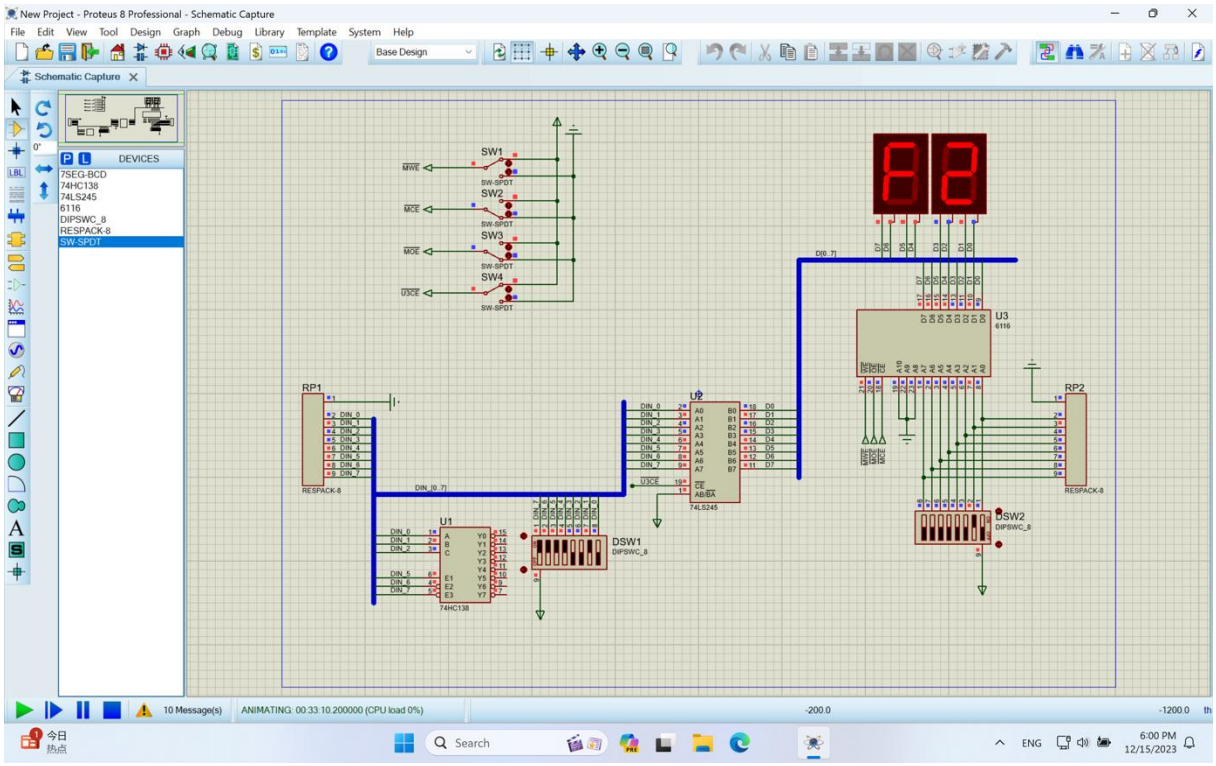
4. Set CE=0 and select 6116. At this time, 6116 reads the content of address 00H and displays FFH on the eight-segment digital tube.



Similarly, write F1H-8FH to 01H-08H respectively to complete the experiment.

Experimental results:





summary

Through this experiment, I learned about the operating characteristics and initialization programming methods of the 6116 static random access memory (SRAM). I also learned about the storage capacity and storage unit of the 6116 and how to store and read data.

In this experiment, I first connected the data and address pins of the 6116 and input the data to be stored into the 6116 through the data pins. Then, I set the address of the memory cell to be written and instructed the 6116 to write using control signals (such as the read/write signal). Through this experiment, I successfully stored data in the 6116 and read the stored data by setting the address and read/write signals. This experiment will be of great benefit to my future studies and practice. I have a deeper understanding of the working principles and operation of memory and learned how to use programmable memory to read and write data.

Experimental Question 2: 8255 experiments

Experiment Overview

【Experimental objectives and requirements】

Experimental purpose: To understand the working characteristics and initialization programming of 8255A

Experimental requirements: Draw the schematic diagram as required; program to initialize 8255A; simulate the operation of 8255A

【Experimental environment】

Operating system: Windows 10

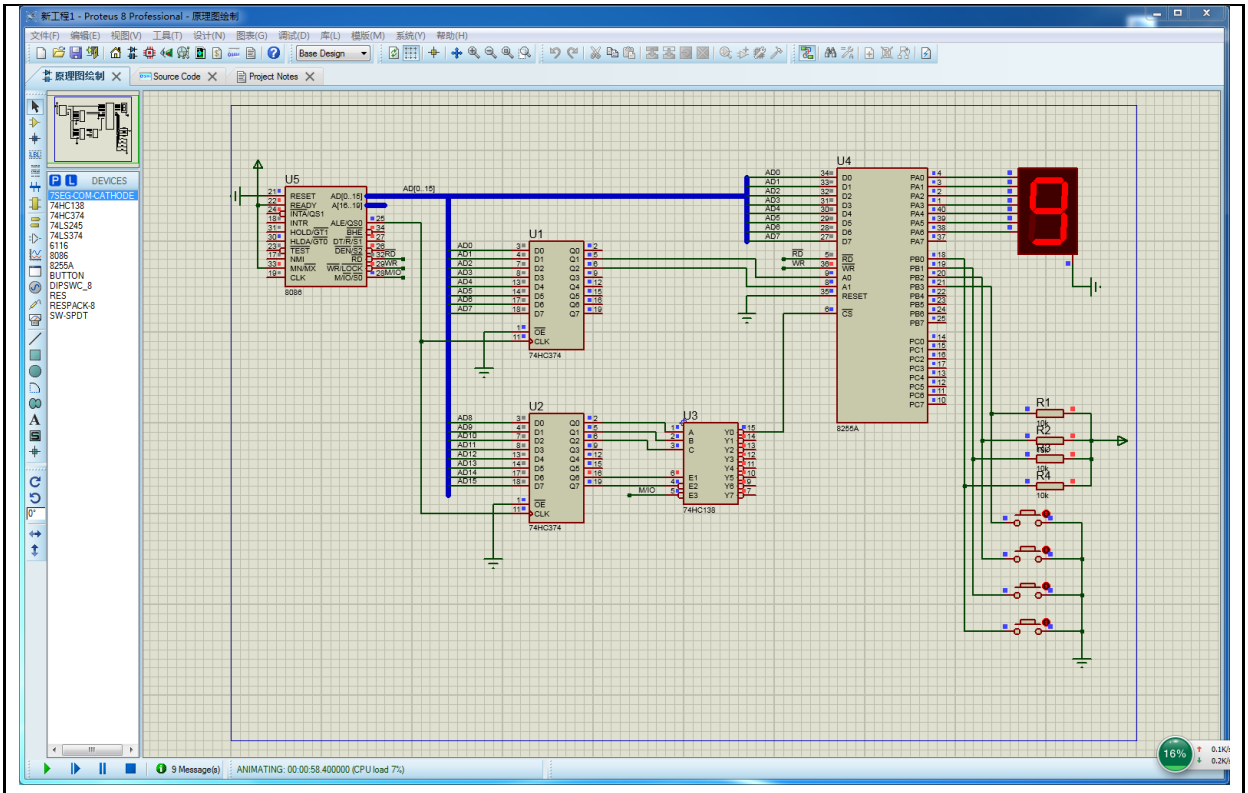
Experimental content

【Circuit diagram, design ideas, program source code and comments】

Experimental steps:

1. Draw a schematic diagram according to the experimental requirements and connect the 8255A chip and the digital tube.
2. Program to initialize 8255A, configure ports A and B to output mode, and port C to input mode.
3. Perform simulation operation of 8255A and control the output of port A and port B to make the digital tube display from 0 to FF.

Circuit Diagram:



Program source code:

```
.MODEL SMALL
.8086
.stack
.code
.startup

    MOV DX, 4006H ; Store the port number at address 4006H in the DX register
    MOV AL, 10000000B ; Store the binary number 10000000B in the AL register
    OUT DX, AL ; Write the value of the AL register to the port specified by the DX register (initialization)

    MOV DX, 4000H ; Store the port number at address 4000H in the DX register
L:
    MOV CX, 16 ; Store 16 in the CX register for loop counting
    LEA SI, LED ; Store the address of the LED array in the SI register
L1:
    MOV AL, [SI] ; Read the value of the memory location pointed to by the SI register into the AL register
    OUT DX, AL ; Write the value of the AL register to the port specified by the DX register
    INC SI; add 1 to the value of SI register and point to the next memory unit
    PUSH CX ; Push the value of the CX register into the stack to save the loop count
    MOV CX, 10000 ; Store 10000 in the CX register for internal loop counting
```

L2:

NOP

NOP; No operation, used for delay

LOOP L2; Loop until the value of the CX register is 0

POP CX ; Pop the loop count saved in the stack

LOOP L1; Loop until the value of the CX register is 0

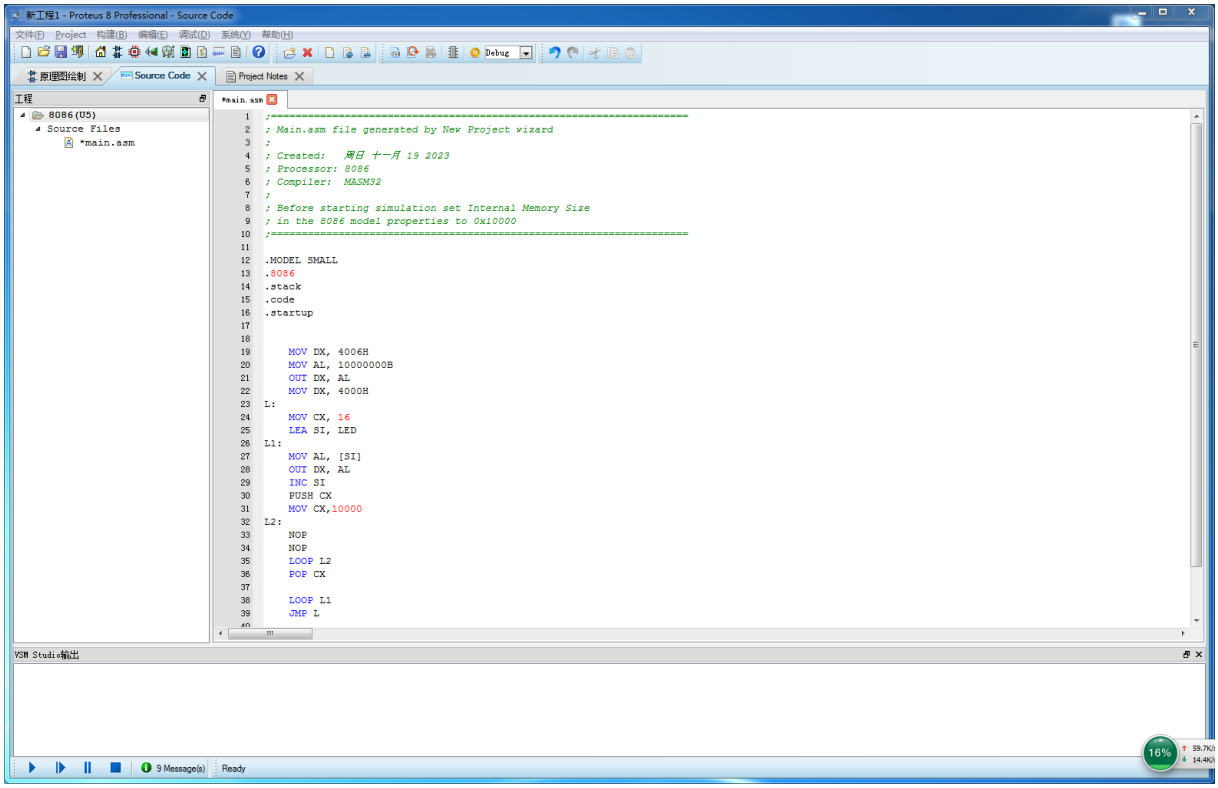
JMP L ; Unconditional jump to label L

.data

LED DB 3FH,06H,5BH,4FH,66H,6DH,7DH,07H,7FH,6FH,77H,7CH,39H,5EH,79H,71H

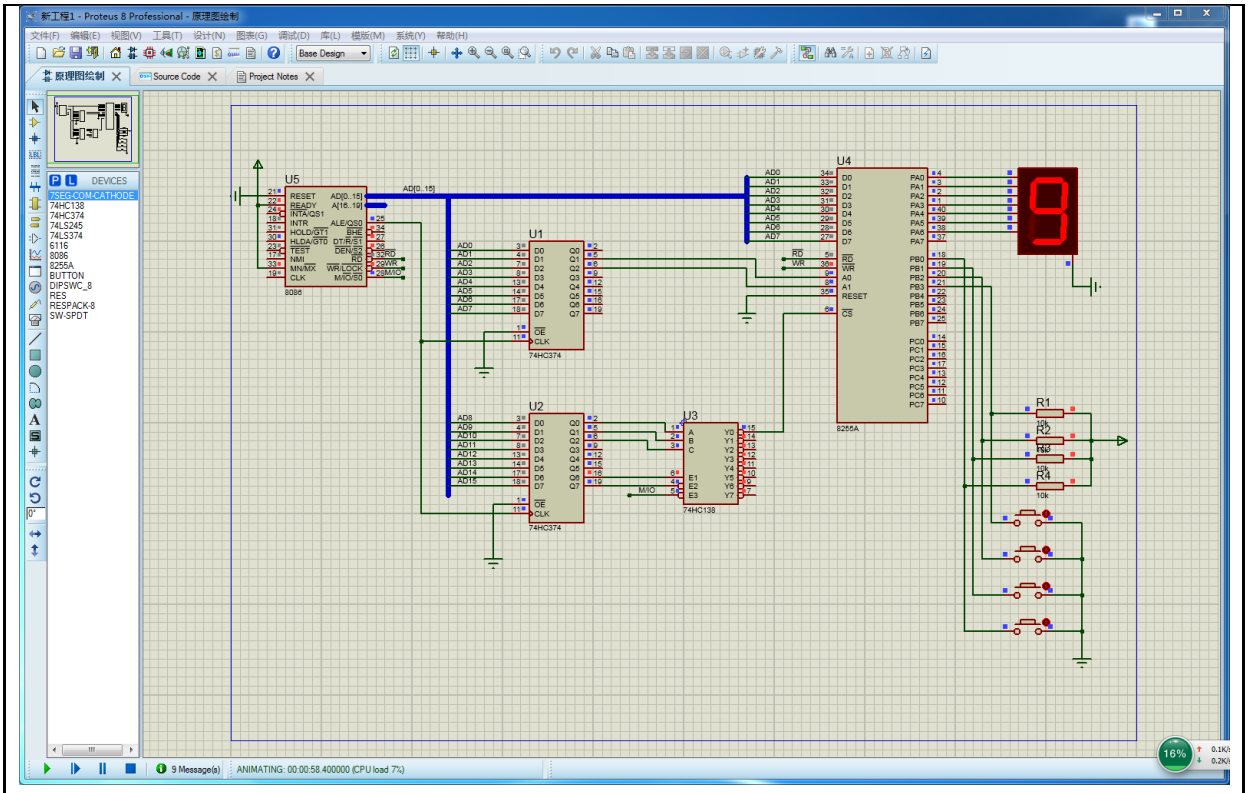
; Define LED array and store LED mode

END



Experimental results:

Through the programming and simulation operation of the above code, the control of the 8255A chip and the digital tube was successfully realized, and the digital tube displayed from 0 to FF.



summary

Through this experiment, I mastered the 8255A's operating characteristics and initialization programming methods. I also learned about the 8255A's three programmable I/O ports and how to configure them for input or output mode. I also learned how to program the 8255A chip to control input and output to external devices. This will be of great benefit to my future studies and practice.

Experimental Question 3: 8253 and DAC0832 experiments

Experiment Overview

【Experimental objectives and requirements】

Experimental purpose: To understand the working characteristics and initialization programming of 8253A, and to use DAC0832 to output various waveforms

Experimental requirements: Draw the schematic diagram as required; program to initialize 8253A; simulate the operation of 8253A; useDAC0832 outputs various waveforms

【Experimental environment】

Operating system: Windows 10

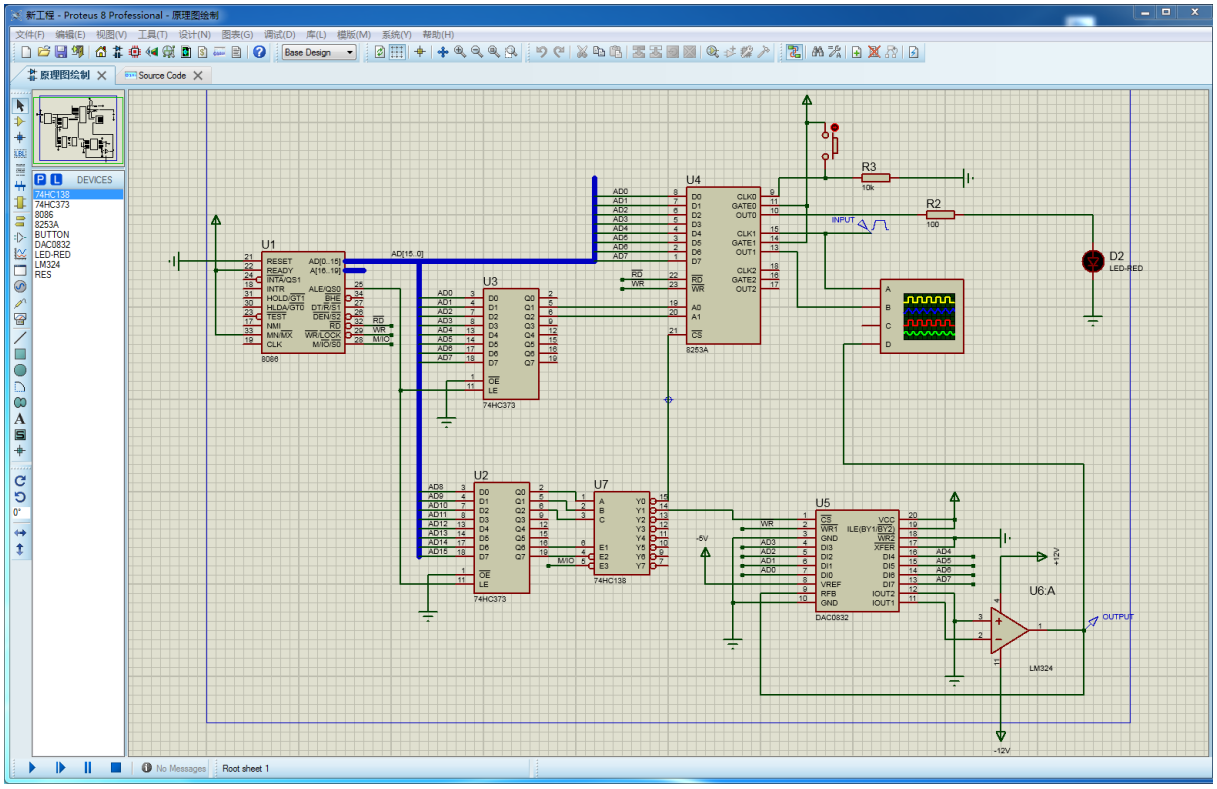
Experimental content

【Circuit diagram, design ideas, program source code and comments】

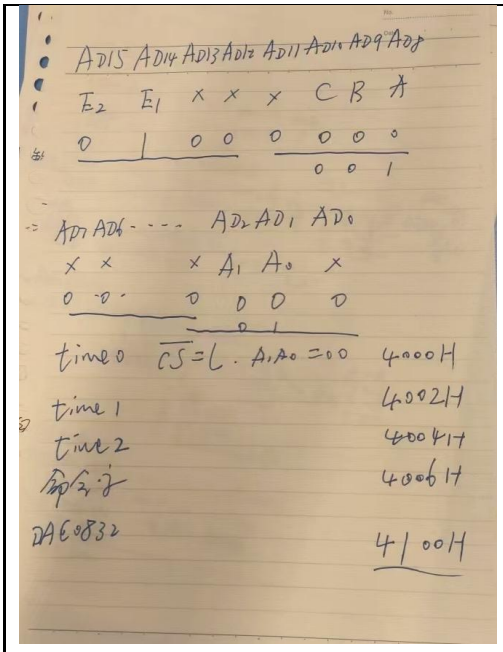
Experimental steps:

1. Draw a schematic diagram according to the experimental requirements and connect the 8253A chip and the DAC0832 chip.
2. Program to initialize 8253A and set the working mode of the counter channel.
3. Perform simulation operations of 8253A and generate different waveform signals by controlling the count value of the counter channel.
4. Use DAC0832 to output various waveform signals.

Circuit Diagram:



Port Address:



Program source code:

```
.MODEL SMALL
.8086
.stack
.code
.startup

   MOV DX,4006H ; Store the port number at address 4006H in the DX register
   MOV AL,15H ; Store the hexadecimal number 15H in the AL register
   OUT DX,AL ; Initialize, timer 0 is set to mode 2

   MOV AL,10 ; Store the decimal number 10 in the AL register
   MOV DX,4000H ; Store the port number at address 4000H in the DX register
   OUT DX,AL ; Set the initial value to 10

   MOV DX,4006H ; Store the port number at address 4006H in the DX register
   MOV AL,57H ; Store the hexadecimal number 57H in the AL register
   OUT DX,AL ; Initialize, timer 1 is set to mode 3,

   MOV AL,20 ; Store the decimal number 20 in the AL register
   MOV DX,4002H ; Store the port number at address 4002H in the DX register
   OUT DX,AL ; Set the initial value to 20

   MOV DX,4100H ; Store the port number at address 4200H in the DX register
   MOV AL,0 ; Store decimal number 0 in register AL
```

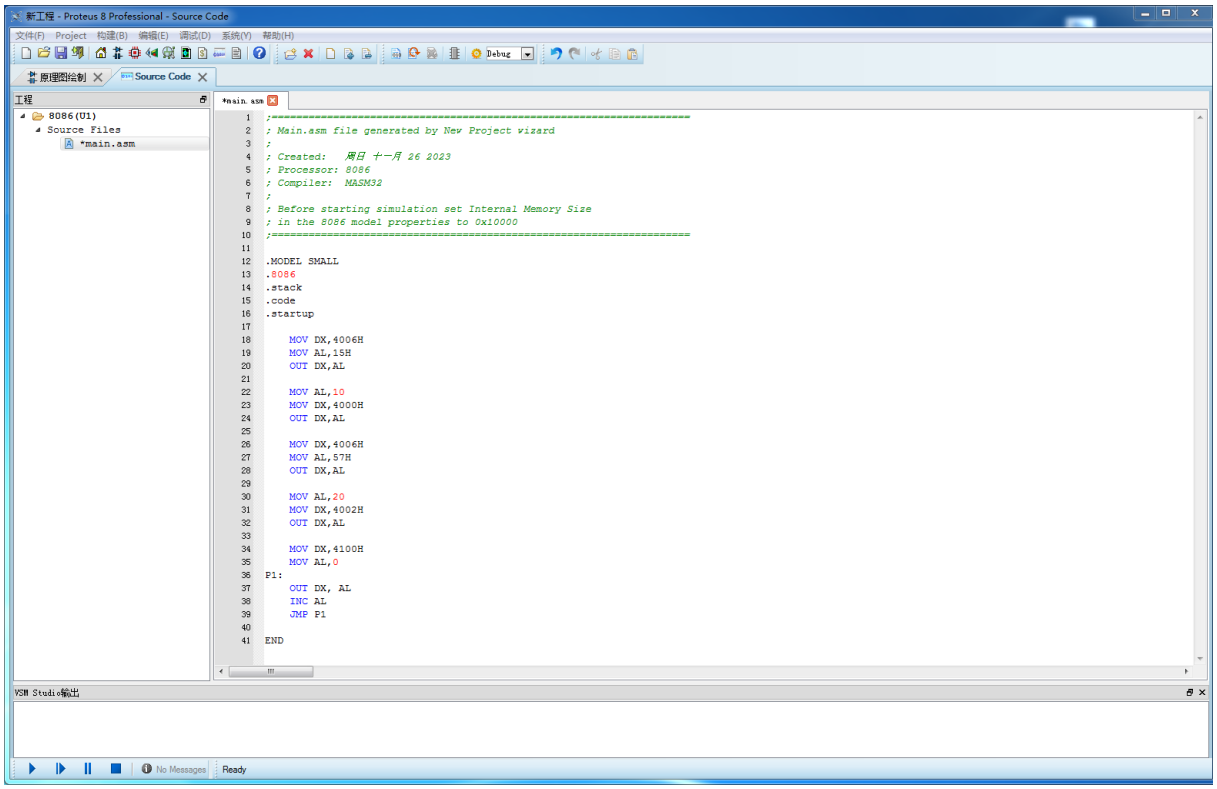
P1:

OUT DX, AL ; Write the value of the AL register to the port specified by the DX register

INC AL ; add 1 to the value of the AL register

JMP P1 ; Unconditional jump to label P1

END



Experimental results: Through the programming and simulation operations of the above code, the initialization and control of 8253A were successfully achieved, but the DAC0832 failed to output various waveform signals.

summary

Through this experiment, I mastered the 8253A's operating characteristics and initialization programming methods. I also learned about the 8253A's counter/timer channels and different operating modes. I also learned how to use the 8253A and DAC0832 chip to generate various waveform signals. This will be of great help to my future studies and practice.

Experiment 4: ADC0801 Experiment

Experiment Overview

【Experimental objectives and requirements】

Experimental purpose: To understand the operating characteristics and timing of ADC0801

Experimental requirements: Draw the schematic diagram as required; use ADC0801 to sample and display the external voltage

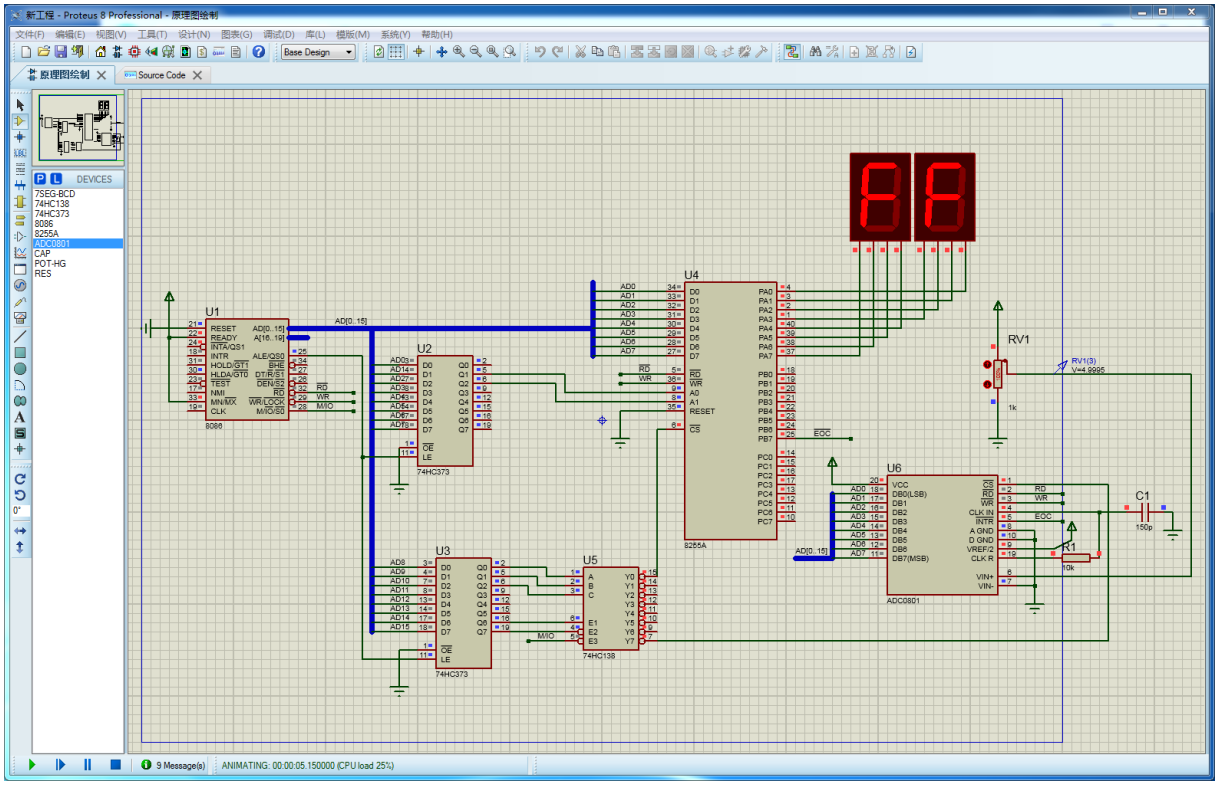
【Experimental environment】

Operating system: Windows 10

Experimental content

【Circuit diagram, design ideas, program source code and comments】

Circuit Diagram:



Program source code:

```
CODE SEGMENT PUBLIC 'CODE'
    ASSUME CS:CODE
START:

    ; Initialize 8255, PA mode 0 output, PB mode 0 input, PC mode 0 input (8BH) mode control word
```

```
    MOV AL, 8BH
    MOV DX, 4006H ; Set the control port address of 8255 to 4006H
    OUT DX, AL
    ; Loop continuously
L:
    ; Send a write command to ADC0801 and start A/D conversion (assuming the ADC0801 port address is 4700H)
    MOV DX, 4700H; The address of ADC0801 is 4700H in high 8 bits and 00H in low 8 bits
    OUT DX, AL ; Write command to ADC0801 and start A/D conversion
        MOV CX, 50 ; Set a reasonable timeout value
L1:
    ; Check if PB7 is low
    IN AL, DX
    TEST AL,80H
        JNZ L2 ; If PB7 is high, jump to L2
L2:
    ; PB7 is high, read the data of ADC0801 and save it to AL register
    IN AL, DX
        LOOP L1; Decrease CX and loop until CX is zero


    ; Send the read data to the PA port for display, that is, output to the 4000H port
    MOV DX, 4000H
    OUT DX, AL; Output the value of the AL register, that is, the conversion result
    JMP L ; Continue loop

CODE ENDS
    END START
```

summary

In the experiment, we drew the schematic diagram of ADC0801 and made circuit connections as required. Then, we used ADC0801 to sample the external voltage and displayed the converted digital signal.

Through this experiment, we successfully used the ADC0801 to sample and display an external voltage, learning its operating principles. We also mastered its operating characteristics and timing, gaining a deeper understanding of analog-to-digital conversion. This is of great significance for voltage acquisition and signal processing in practical applications.

(Some experiments were completed in the school computer room, and my own computer could not be

opened, so there were not enough screenshots)

Instructor's comments and grades

Comments:

score: Instructor's signature:

Review date: