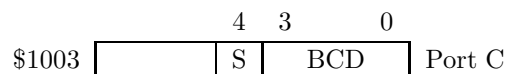


# ECE 265

## Computer Problem #2

In the next few computer problems, you will use the THRSim11 simulator to develop a programmable home thermostat (PHT). You will use the THRSim11 IO Box to provide input to and display output from the ports of the M68HC11.

One feature of the PHT that you will program in this computer problem is the ability to set the initial temperature when the thermostat is turned on. Port C of the M68HC11 is used to furnish a one-digit signed BCD number to the unit:



The data is given in sign-magnitude form. Bit 4 (S) is the sign bit and Bits 3-0 give the magnitude of the BCD digit. This value is used to adjust the default temperature setting (TEMP\_DEF), given in the program, to give the initial temperature setting (TEMP\_SET). For instance, if the value of the default temperature setting is 72, and the Port C data (least significant five bits) are %10100, then the initial temperature setting should be 68.

After TEMP\_SET has been computed, this value should be “printed” to the LCD display on the THRSim11 IO Box. ASCII characters “printed” to address \$1040 will appear on the display. See the Help topic on the THRSim11 IO Box (under External Boxes) for more information.

The following template may be used to develop your program (pht2.asm):

```
*
* Computer Problem #2, ECE 265
*
* Your Name
* Your Partner's Name
*
```

```

STACK EQU $00FF ; set up the stack and port
PORTC EQU $1003 ; addresses
LCDDATA EQU $1040
LCDCTRL EQU $1041

ORG 0
TEMP_DEF FCB $72 ; set the default temperature
TEMP_SET RMB 1 ; desired temperature setting
TMP1 RMB 1

ORG $E000
MAIN: LDS #STACK ; initialize the stack pointer
LOOP: LDAA PORTC ; read Port C
      JSR INIT_TEMP ; initialize TEMP_SET
      JSR PRINT ; print TEMP_SET to LCD
              ; display
      BRA LOOP

INIT_TEMP: RTS

PRINT: CLRA
      STAA LCDCTRL ; set the LCD cursor position
      LDAA #$06
      STAA LCDDATA ; to upper left
              ; .
              ; .
              ; .
      RTS

ORG $FFFE
RESET: FDB MAIN

```

The program continually reads Port C, in the main loop, computes the initial temperature setting (subroutine `INIT_TEMP`), and prints it to the LCD display (subroutine `PRINT`). Your task is to write the `INIT_TEMP` and `PRINT` subroutines.

After you have successfully written and tested the program to produce the desired

results, then upload the assembly language program (`pht2.asm`) to the *Computer Problem #2* dropbox on Carmen. Each student in the group should do this individually. When testing your program, be sure that it works for any initial default temperature in the range of 9-90. Also, print copies of the following two pages and turn them in during class on the due date:

1. `pht2.LST`
2. THRSim11 IO Box Window

The THRSim11 IO Box Window should show some typical results. Only one hardcopy of the programs needs to be turned in as a report for each group.