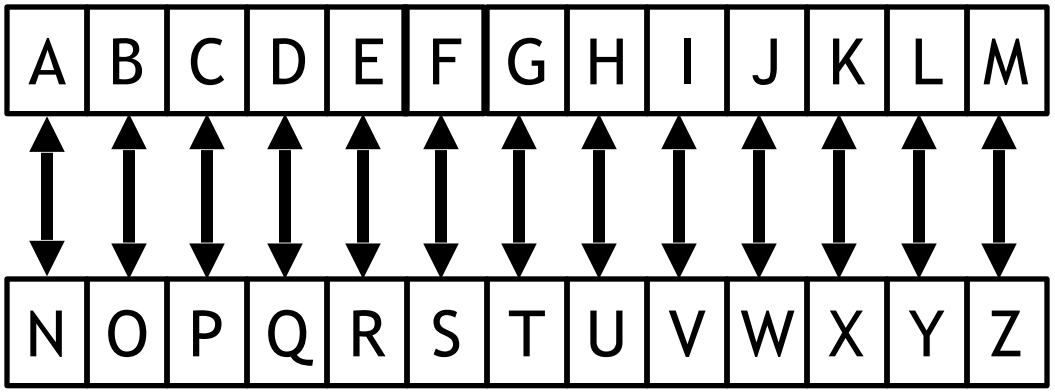
Project 2 Overview

ECE 5484

ROT13



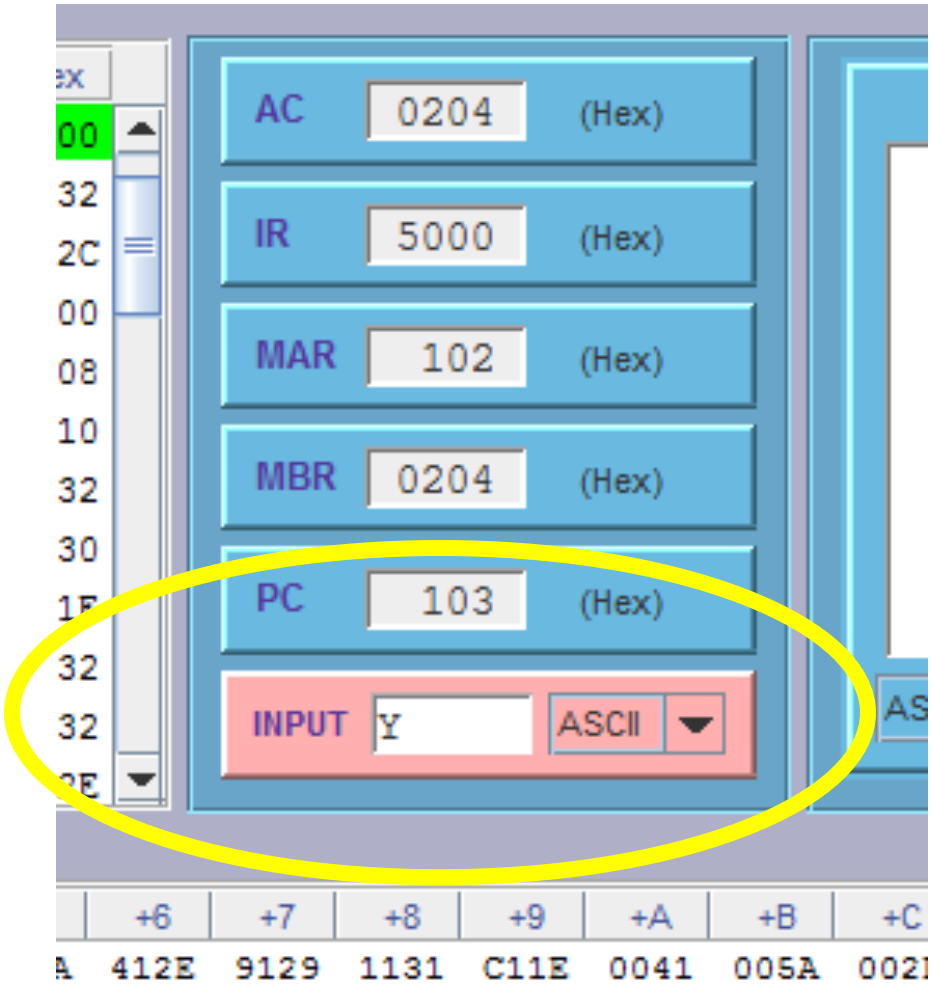
FUZZY → SHMML

SHMML → FUZZY

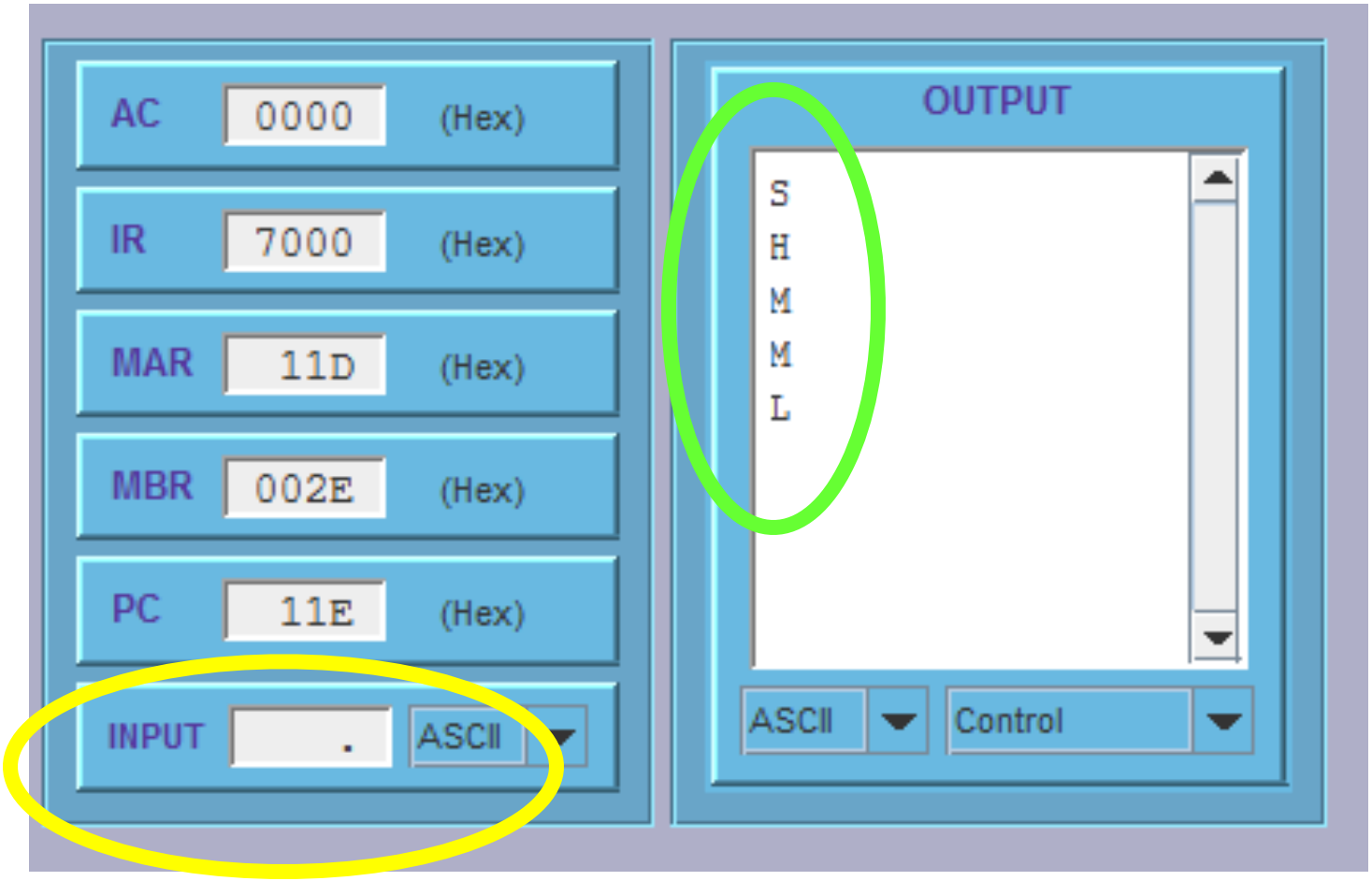
Program Operation

- <u>Input phase</u>
  - Input a character (‘A’-‘Z’ or ‘.’ only)
  - Apply the Rotate-13 (ROT13) transformation to the character if ‘A’-‘Z’
  - Store the transformed character in memory
  - Repeat until the input is a period (‘.’)
- <u>Output phase</u>
  - Output the stored characters (but not the ‘.’)
  - The program halts (instruction “Halt”)

Character Input



Character Output

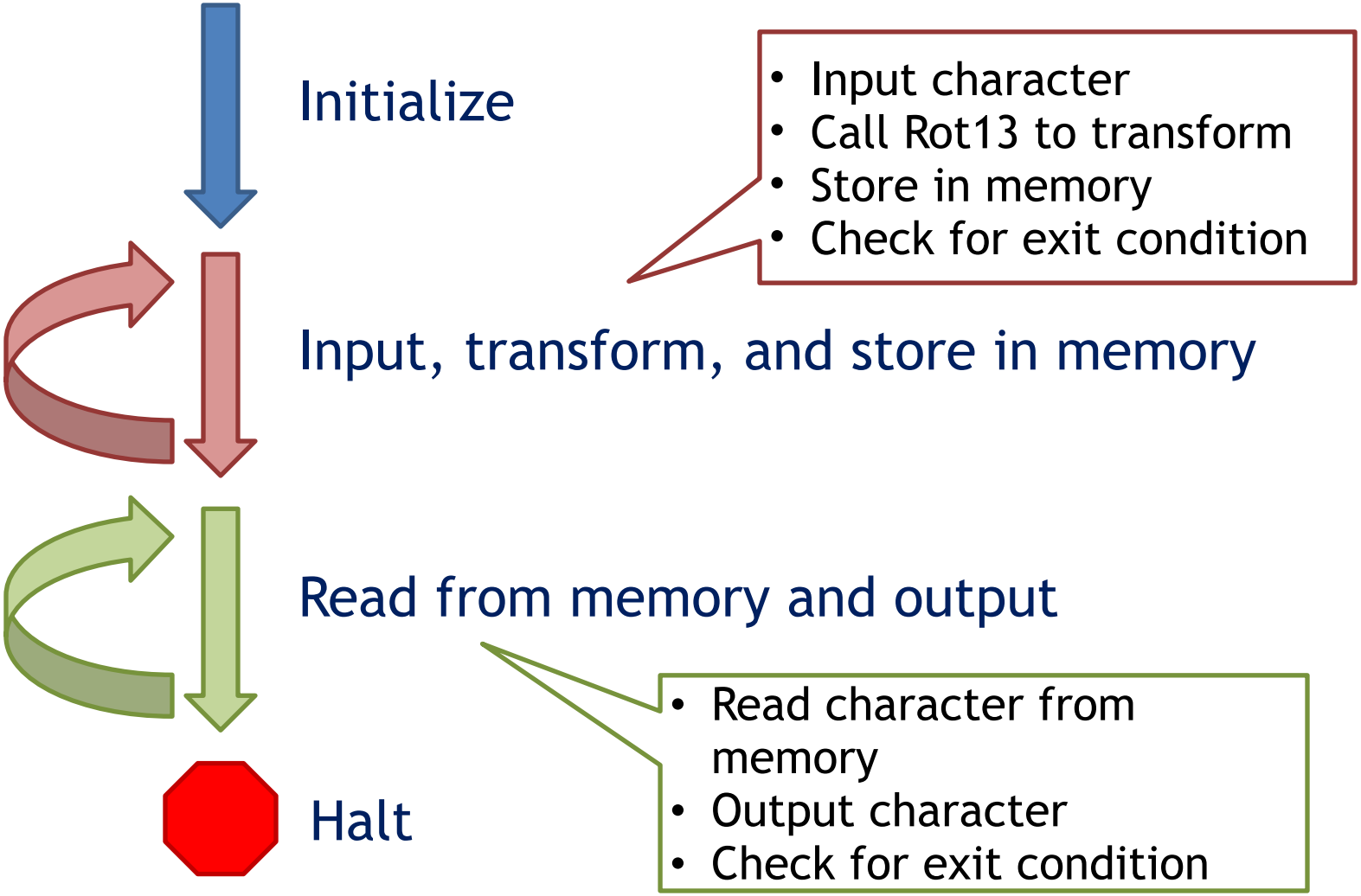


Characters in Memory

	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+A	+B	+C	+D	+E	+F
1B0	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
1C0	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
1D0	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
1E0	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
1F0	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
200	0053	0048	004D	004D	004C	002E	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
210	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
220	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
230	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000

Machine halted normally.

Program Design



Additional Requirements (1)

a) The first instruction of the program must be placed at location (address) 0x100 (100 hexadecimal) in MARIE's memory.

b) Constant data values should not be changed by the program.

c) Transformed input characters must be stored in successive memory locations beginning at location 0x200 (200 hexadecimal). The program should store all transformed input characters before any characters are output.

Additional Requirements (2)

d) The program should always initialize the values for Ptr in the working data memory and not rely on the values for these locations that are defined in the assembly source file.

e) The program should work for any inputs ‘A’ through ‘Z’ and ‘.’ (a period terminates input). The program does not need to validate inputs.

f) When transformed characters are stored and when transformed characters are output, the program must use a loop and indirect addressing to access the values in the array of words.

You *may* define a Count variable to count the number of characters, but there are also correct designs that do not require a Count variable.

Two Test Cases

- <u>Test 1</u>: Input the eight-character sequence "VIRGINIA" followed by a '.' to terminate the input. The ROT13 value of each character ("IVETVAVN") should be displayed after the '.' character is input.
- <u>Test 2</u>: Reload the program in MarieSim, without reassembling, input the four-character sequence "GRPU" followed by a '.' to terminate the input.

Starting Code: Initialization

```
        ORG                 100

/Initialize Ptr (pointer).
        Load                Start
        Store               Ptr

/ ** Add code to accomplish the input and output phases.

/ Here's an example of how subroutine ROT13 is called.
/ We'll just transform 'A' in this example then halt.
        Load                ChA
        Store               InVal
        Jns                 ROT13

/ Halt
        Halt
```

Starting Code: ROT13 Subroutine

```
ROT13, HEX        0
       Load       InVal
       Add        Val13
       Store      Hold
       Subt       ChZ
       Skipcond   800
       Jump       NoAdj
       Add        ChA
       Jump       Done

NoAdj, Load       Hold

Done,  JumpI      ROT13
```

Almost Works

Starting Code: Constants, Data Area

```
/ -----
/ Constants (the program should not write to these
locations)
/ -----
ChA,   HEX              0041      / Constant value 'A'
ChZ,   HEX              005A      / Constant value 'Z'
ChPe,  HEX              2E        / Constant period char
Val13, DEC              13        / Constant rot value 13
One,   HEX              1         / Constant value 1
Start, HEX              200       / Constant address

/ -----
/ Data area (these locations are for reading and writing)
/ -----
InVal, HEX              0         / Subroutine input value
Hold,  HEX              0         / Temporary variable
Ptr,   HEX              0         / Character pointer
```

Project 2: Report Contents

- Name, email, title at the top of page 1
- Body of the Report
  - Section 1 – Objectives
  - Section 2 – Design Description
  - Section 3 – Testing and Results
  - Section 4 – Conclusions
- Submit three files
  - Report (*.pdf)
  - Source (*.mas)
  - Listing (*.list)
  - Machine language (*.mex)

Hint: Learn to use MarieSim's Features

- Editing and assembling code
- Executing code
  - Run
  - Step
  - Breakpoints
- Inspecting registers and memories
  - Registers
  - Memory

Hint: Develop in Stages

- Input character until '.' then Halt
- Input character, do ROT13 until '.' then Halt
- Input character, do ROT13, store character until '.' then Halt
- Input characters, do ROT13, store character until '.' then output characters

This is just one approach. The key is to start simple, test, fix, and expand slowly until fully functional.

Hint: Look at Examples

- Starting code provided with Project 2
  - Some initialization
  - Most of the subroutine
  - Example of call to the subroutine
- Ex4_2.mas (downloaded with the MARIE software files)
  - Loop to read characters from memory and output
  - “Null” (00H) is the terminating character
- Ex4_4.mas (downloaded with the MARIE software files)
  - Subroutine call