CASH REGISTER

MICROPROCESSORS INTERFACING

PROJECT REPORT

GROUP – 12

Name of Student	ID Number
Aadhar Sharma	***2018AAPS0384G***
Anshul Somvanshi	***2018A3PS0405G***
Ayush Agrawal	***2018A8PS0568G***
Pulkit Purwar	***2018A7PS0091G***
Shashank Mittal	***2018A7PS0127G***

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

K. K. BIRLA GOA CAMPUS

SEM II, 2019-20

CONTENTS

SYSTEM SPECIFICATION

The system to be designed is a Cash Register which gets inputs via a keyboard. Outputs are available on a LCD display. It gets power using the standard power outlet and has battery life of 36 hours when fully charged. The battery charges itself when the system is on and is used to provide back-up to the RAM.

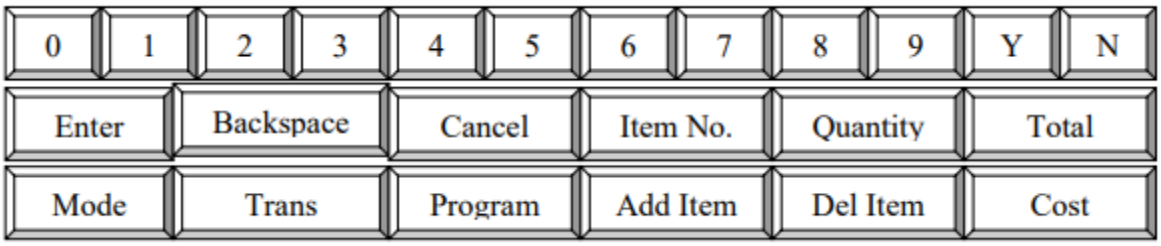


Figure 1

The format of the keyboard is shown in the above diagram (Figure 1). Display is a 16 x 1 Liquid Crystal Display connected to the micro-controller through a display driver (HD44780) which is available with the LCD.

SYSTEM OPERATIONS

- The system is interactive in nature
- It has a hardware lock which has a key. Only when the lock is open the system is functional else the system is disabled and if a user presses a key the system turns on a buzzer.
- Buzzer is turned on for 1 minute by a frequency of 4 KHz.
- After the lock is open, the LCD is turned on and it displays “System Ready”.
- The user has to then press the Mode button on the keyboard. The LCD then displays “Select Mode”.
- It can be operated in two modes. Transaction, which is the normal function, and Program Mode, in which user can add new items and their cost.
- Every item has an item code and a cost associated with it.
- If the user presses the Trans key the system enters into transaction mode. The LCD displays “Enter Transaction Mode Y/N ?”. User then has to press Y to confirm. If user presses N it goes back to Mode Select display.
- In the Transaction mode user is expected to enter the item code and the quantity. Item code has to be entered using the Item No. key followed by the item code. The item code can be entered with the help of the numeric keys 0-9. At the end of the item code the user has to press the Enter key. The item code will be then displayed on the LCD.
- User can press Backspace key to change the value of last key press or he can press Cancel to delete the whole entry.
- After the item code is displayed, user has to enter the quantity by pressing Quantity key followed by quantity of the item (using the numeric keys) a person wishes to buy and the Enter key.
- Automatically the total cost of the item will be displayed on the LCD.
- The user can continue entering all the items and finally press Total to display the total cost.
- In the Program mode user can add new items or delete an item. If the cost of an item is to be updated it has to first deleted and re-added to the item list in memory. When you add a

new item you have enter the item number by using the Item no. key and the cost using the Cost key. After the cost has been keyed in the user must press Enter.

- The inter-active display will confirm your entry before storing it in the memory.
- If an item is to be deleted it is done using the Del Item key. Then user is required to press the Item No key followed by the item code and then press Enter. The inter-active display will confirm your entry before deleting it from the memory.

ASSUMPTIONS & JUSTIFICATIONS

ASSUMPTIONS

- User should press mode when system is switched on.
- Price & quantity are single digit number.
- Item number is a double digit number. Eg – 2 is invalid. 02 is valid.
- Backspace key is pressed only after at least one digit is entered.
- For Delete option a valid item number is entered.
- Total cost is single or double digit.

JUSTIFICATIONS

- Using 8253 – as 8254 not available in Proteus.
- 2732 is used as 2716 – not available in Proteus.
- Using a gate-based circuit for memory – does the same as LS 138 here
- ROM in only 00000 – as proteus allows changing reset address.
- To accommodate all the buttons we have used all three ports of 8255 and thus have three interfacing tables, one for each port.

COMPONENTS USED

1. 8086: Microprocessor x1

2. 74LS245: Buffer x4

3. 74LS373: Latch x3

4. 74LS138: 3:8 Decoder x2

5. 74LS244: Octal Line Receiver x1

6. 2732: ROM x2 (Smallest ROM chip available is 4K and as we need to have even and odd bank)

7. 6116: RAM x2 (Smallest RAM chip available is 2 K and we need odd and even bank. We need RAM for stack and temporary storage of data)

8. 8253: Programmable Interval Timer x1 (to generate clock for buzzer)

9. 8255: Programmable Peripheral Interface x2

10. LM016L: LCD Display (16x2) x1

11. Switches

12. Buzzer

13. Logical Gates

14. Buttons

MEMORY & I/O ADDRESSING

MEMORY MAP

1. ROM 1: 00000H - 00FFFH

2. RAM 1: 01000H - 01FFFH

I/O MAP

1. 8255 (KEYBOARD): 00H, 02H, 04H, 06H

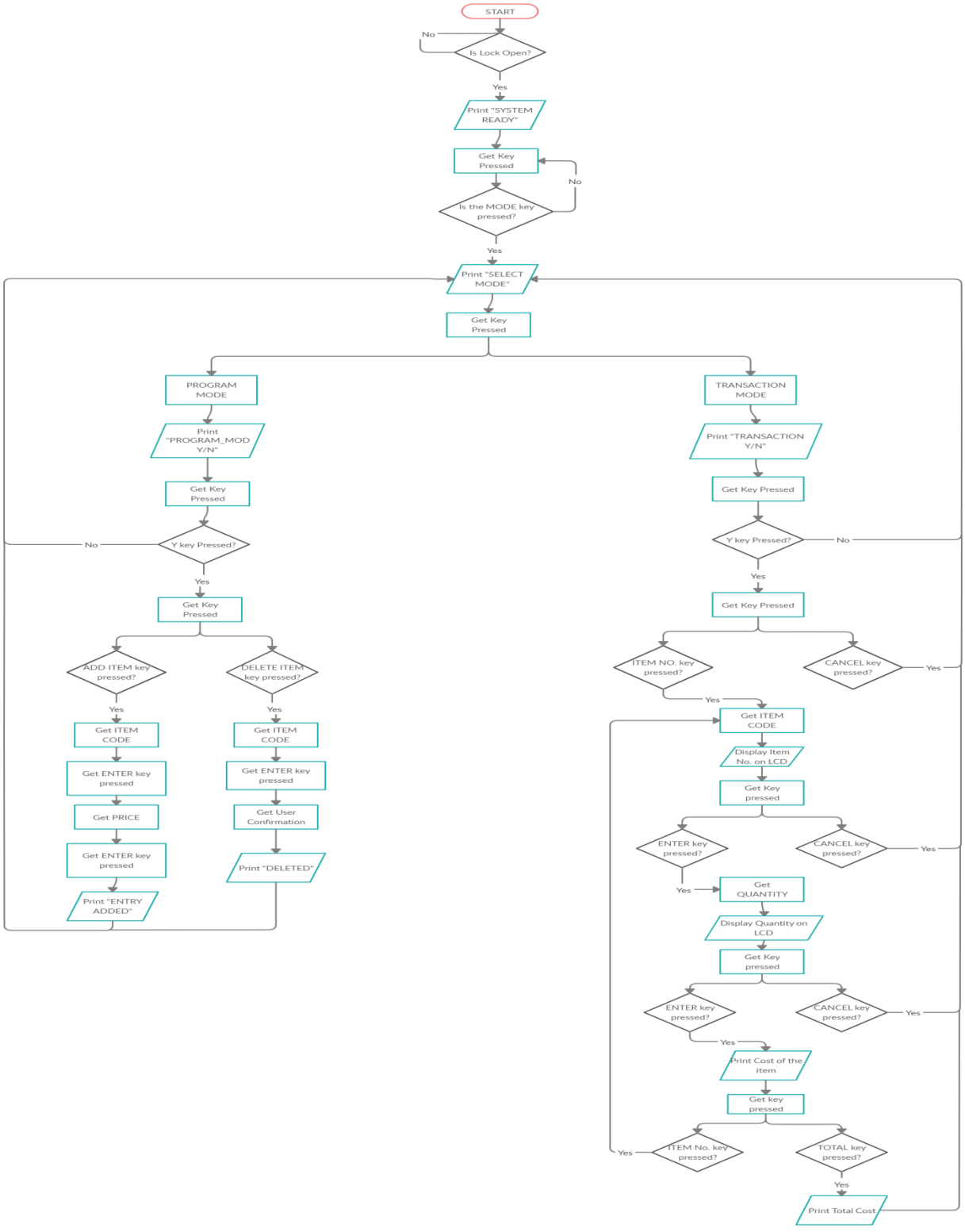
2. 8255 (LCD): 08H, 0AH, 0CH, 0EH

3. 8253: 10H, 12H, 14H, 16H

DESIGN

Complete design with proper labeling attached.

FLOWCHART


START
Is Lock Open?
No
Yes
Print "SYSTEM READY"
Get Key Pressed
Is the MODE key pressed?
No
Yes
Print "SELECT MODE"
Get Key Pressed
PROGRAM MODE
Print "PROGRAM_MOD Y/N"
Get Key Pressed
Y key Pressed?
No
Yes
Get Key Pressed
ADD ITEM key pressed?
DELETE ITEM key pressed?
Yes
Get ITEM CODE
Get ENTER key pressed
Get PRICE
Get ENTER key pressed
Print "ENTRY ADDED"
Yes
Get ITEM CODE
Get ENTER key pressed
Get User Confirmation
Print "DELETED"
TRANSACTION MODE
Print "TRANSACTION Y/N"
Get Key Pressed
Y key Pressed?
No
Yes
Get Key Pressed
ITEM NO. key pressed?
CANCEL key pressed?
Yes
Yes
Get ITEM CODE
Display Item No. on LCD
Get Key pressed
ENTER key pressed?
CANCEL key pressed?
Yes
Yes
Get QUANTITY
Display Quantity on LCD
Get Key pressed
ENTER key pressed?
CANCEL key pressed?
Yes
Yes
Print Cost of the Item
Get key pressed
ITEM No. key pressed?
TOTAL key pressed?
Yes
Yes
Print Total Cost

FIRMWARE

Implemented using emu8086 (attached).

LIST OF ATTACHMENTS

1. Complete Hardware Real World Design – cash_reg_design_g12.pdf
2. Manuals
    a. LM020L
3. Proteus File – cash_reg_g12.dsn
4. EMU8086 ASM File – cash_reg_g12.asm
5. Binary File after assembly – cash_reg_g12.bin