DOOR SECURITY CONTROL SYSTEM

Submitted by: Group 14

Group Members
Ashwin Kumar K (2017B5A81034G)
Sharvari Hedaoo (2017B5A70593G)
Shreyas Nisal (2017B5A70310G)
Vaibhav Chaudhari (2017B5A70834G)
Vanshika Kapoor (2017B5A70624G)

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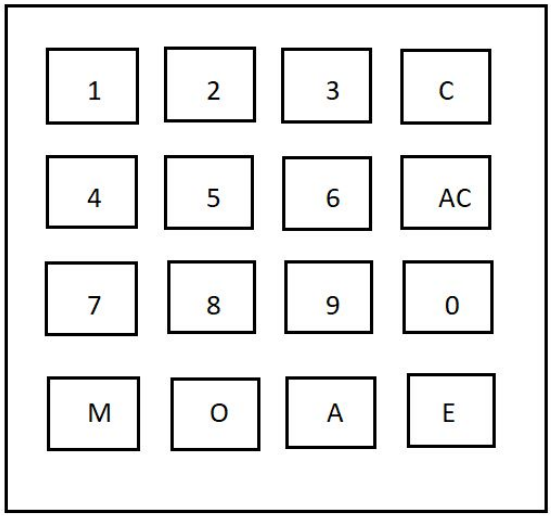
User Requirements & Technical Specifications.

Design a system that controls the opening and closing of a door based on password entry. The password is entered through a custom hex-keypad.



If the password is correct the person can enter. Each person is given two chances to enter the correct password.On failure an alarm is sounded. Inside the room a button is available when the button is pressed the door opens for 1 Min, so that the person can leave the room.

Technical Specifications:

There are three set of passwords: (1) User (2) Master (3) Alarm off

• The Master password is used by the security Personnel for updating Password of the day. Pressing the M button activates this mode. The system glows Enter Password LED asking the personnel to enter the password. The master password is a 16-digit value. The master is given only a single chance to enter the password.

If authenticated, the retry/Update LED glows.

If there is a failure in authentication the alarm is sounded.

When the retry/ Update LED glows the user has to enter the password of the day. This is a 12-digit value. Once this value has been accepted by the system the Passwd Updated LED glows.

• User has to press the O key when he wants to enter the room. The Enter Password LED prompts the user to enter the password. The user is given the C/AC option as well.

If the first attempt fails, the RETRY LED glows. The user is allowed to re-enter password, on authentication, the door opens for a period of 1 Min. On Failure an ALARM is sounded.

• To Turn-off the Alarm the A button has to be pressed. Enter Password LED glows prompting the user to enter the 14-digit password for turning of alarm, no retries are allowed.

If authentication is successful then the alarm is turned off.

• To leave the room a button is available inside the room, when the button is pressed the door opens for 1 Minute so that the person can leave the room.

Assumptions & Justifications

1. 16 digit Default Master Password: 1234567890123456

   Taken for ease of testing

2. 12 digit Default Alarm Password: 123456789012

   Taken for ease of testing

3. After 24 hours (and after a power reset), the system only responds to the ‘M’ key and the password of the day has to be updated.

   Made to meet design specifications

4. Alarm can only be turned off from outside the door.

   Made to meet design specifications

5. Once a particular mode has been entered, User/Master must complete the procedure, i.e. M or O or A pressed within execution of a particular mode will have no effect.

   Made to meet design specifications

6. If a mistake is made in entering a password for switching the alarm off, then the system will enter a lock-down state till power is reset.

   Made to meet design specifications

7. The first time the 8086 is switched on, the 24 hour clock starts running from that instant, and there onwards computes 24 hours count. Therefore the first action to be performed is to set the Password of the Day by Master in Master Mode (M).

   Made to meet design specifications

Components used

Sl. No.	Hardware Device	Description	Quantity
	8086	Microprocessor	1
	8284	Clock Generator	1
	8255	Peripheral Interface for LCD display, Hex KeyPad, Buzzer	2
	LM016L	CD Display	1
	4 X 4 Hex KeyPad	4 X 4 Hex KeyPad	1
	Buzzer		1
	OZ-SH-105D	Relay for Buzzer	1
	ULN2003A	Relay Driver IC	1
	8253	Programmable Interval Timer	2
	2716	ROM chip of 2K size	4
	6116	RAM chip of 2 K size (for stack and temporary storage of data.)	2
	LS 74138	3 line decoders	2
	LS 373	Octal Latch	3
	PSM 57-81 2P	Unipolar Stepper Motor	1

	LS 245	Octal Transceiver	2
	NOT gates		6
	OR gates		4
	MIH-SH-105D	Relay	1
	74LS241	Tri-state Buffer	1

Memory Interfacing

Size of ROM (2716) - 2k

Size of RAM (6116) - 2k

the Microprocessor used is 8086, hence we need an Even Bank and an Odd Bank for both ROM and RAM

ROM1(E)	00000_H - $00FFE_H$
ROM1(O)	00001_H - $00FFF_H$ (ROM is required at 00000_H - where there is the IVT)
RAM1(E)	01000_H - $01FFE_H$
RAM1(O)	01001_H - $01FFF_H$
ROM2(E)	$FF000_H$ - $FFFFE_H$ (ROM is required at reset address $FFFF0_H$)
ROM2(O)	$FF001_H$ - $FFFFF_H$

I/O Mapping

Address of 8255-1

Port-A: 00h	Port-B: 02h	Port-C: 04h	Control register: 06h	Control word: 88h

Address of 8255-

Port-A: 08h	Port-B: 0Ah	Port-C: 0Ch	Control register: 0Eh	Control word: 89h

Addressing of 8253A-1

Counter 0: 10h | Counter 1: 12h | counter 2: 14h | control register: 16h
Control word of counter 0: 36h | Control word of counter 1: 56h | Control word of counter 2: 94h

Addressing of 8253A-2

Counter 0: 18h | Counter 1: 1Ah | counter 2: 1Ch | control register: 1Eh
Control word of counter 0: 34h | Control word of counter 1: 5Ah | Control word of counter 2: 94h

Design

Door Specifications:

Door Material : Laminated Safety Glass

Height = 114 inches(2.9m)

Width = 32 inches(0.8128m)

Thickness = 0.5 inches(0.0127m)

Mass = 200 lbs (90 Kgs)

We will be using aluminium framed sliding doors. A sliding door track attached to the top of the door, allows controlling the movement of the door electromechanically.

The motor will rotate and the door can slide in two directions through the belt connecting the motor side gears and the sliding wheels. The mechanism can be understood via the following picture.

Counter Calculations :

8253-1 counter 0 gets a 2.5Mhz frequency signal from 8284 p-clock. This is reduced further to 50Hz.

Out clock freq = In clock freq/count thus implying Count = 50,000.

This 50Hz clock signal is given to 8253-1 counter 1 which is also configured in Mode 3

(Rate Generator). 50Hz is further reduced to 0.5Hz by loading a count value of 50/0.5=100

24 hour Timer

24hr timer is implemented by 8253-2 counter 0. (Mode 2,Rate generator or Divide by N counter)

The clock to this counter is fed from the output of 8253-1 counter 1 which is configured in Mode 3 (Square Wave Generator). The clock frequency applied to 8253-2 counter zero is 0.5Hz.

0.5*60*60*24 = 43200

Thus by loading a count of 43200 in this counter a 24 hour timer is made.

The out pin of this counter is inverted and fed to NMI pin of 8086. At the end of 24

hours a LOW-to-HIGH pulse is generated at NMI which then causes the state to change to update day password mode. The code does not branch back until a new password for the user mode is set. On

setting the new User password the system branches back to normal routine and the

the user is greeted with an LCD flashing “WELCOME”.

1 minute Timer

This timer operation is implemented using 8253-1 counter 2.

This counter is fed with a clock frequency of 50Hz from 8253-1 counter 1 out

pin.8253-1 counter 2 is configured in Mode 1(h/w re-Triggerable one shot timer).

50*60 = 3000

Hence loading a count of 3000 in 8253-1 counter 2 a 1 min timer is made.

As soon as the open_door subroutine is called the timer is triggered by giving a

LOW-HIGH-LOW pulse on its gate pin.On receiving this signal the out pin goes

low(Logic 0).At the end of one minute,(count == 0) out pin goes high(Logic 1) and

this out pin is polled at PC1 pin of 8255-2.At the end of 1 minute close_door

The subroutine is called and the door closes.

Interrupts

In the code we have used two interrupts(NMI and INT 80h). NMI is used for

implementation of the 24 hour timer which is utilised to set the password of the day.

INT 80h is fired when the push-button is pressed. It is pressed to open the door from

inside. INTR signal of 8086 happens to be level triggered, so for one time firing of this

interrupt the push button is connected to the clock pin of 8253-2 counter 2. 8253-2

counter 2 is configured as Mode 2.The out pin is connected to INTR pin of 8086.The

an interrupt vector is generated via an Octal Tri-state buffer. Octal Tri-state buffers puts 80h

on the data lines (D0,D7) as soon as INTA pin of the 8086 goes low which enables the

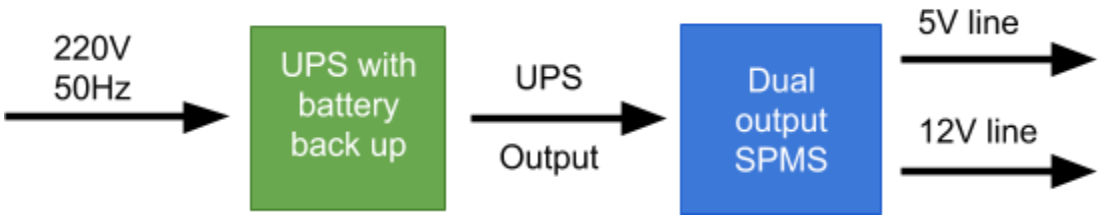
Octal Tri-state buffer(74LS241).

Power supply design

For the efficient operation of the system, we need 2 DC supplies one 5V line and one 12V line.

These two are generated by a dual voltage SMPS which is connected to a UPS which derives its power from the mains. Since we have not implemented any secondary memory, the memory will be lost in case of full battery drain. However,

when there is a secondary memory interface, a backup can be created before power drain and the system will restore full operation when power is restored. The following schematic explains the power supply design.



Stepper Motor

The command to open the door is issued from 8255-1 port when the routine open_door

is called in the main routine. Appropriate pins of ULN2003A Darlington pair are pulled

high which in turn drives the motor.

Variations in Proteus Implementation with Justification

1. ROM is only at 00000 – as proteus allows to change reset address.
2. 2732 is used as 2716 – not available in Proteus.
3. Motor rotates only 90 degrees for proof of concept. In real life implementation motors would rotate till the doors open/close.

Firmware:

Implemented using emu8086 attached.

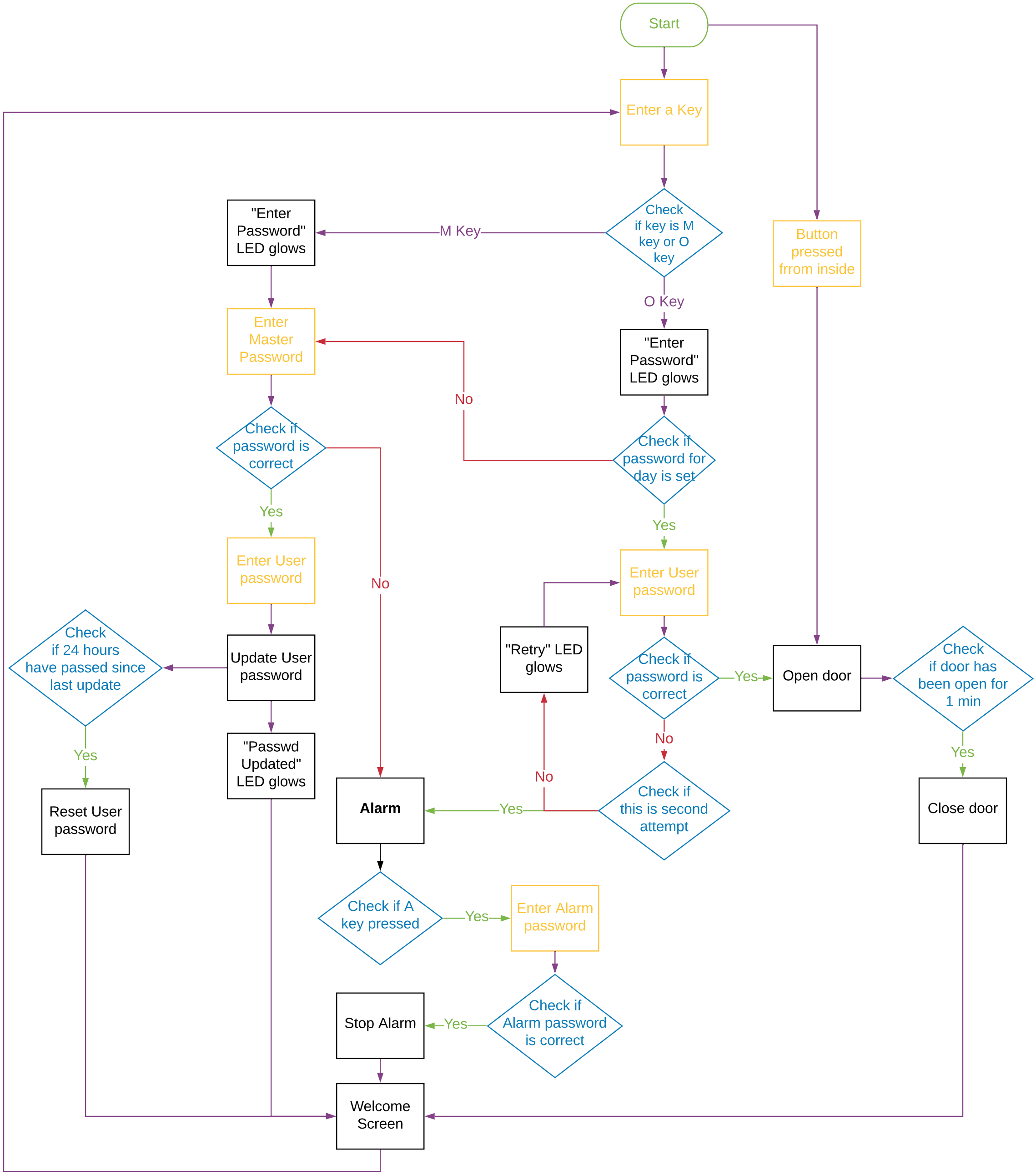
Design:

A ppt file with the complete design has been attached.

List of Attachments

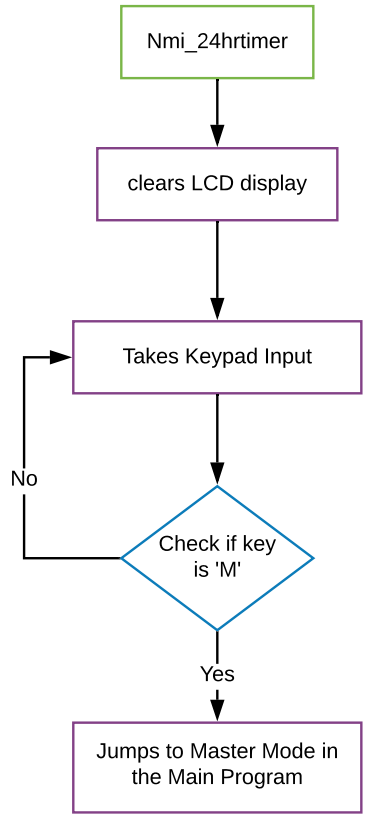
1. Complete Hardware Real World Design – Proj14.ppt
2. Manuals
    a. GF 36S Aluminum Framed Sliding Door Specs
    b. Nema 23 Size - 2 Phase Hybrid Step Motor
    c. LM016L_HitachiSemiconductorLCD
    d. ENG_DS_OZ_OZT_series_relay_data_sheet_E_0411
3. Proteus File – Proj14.pdsprj (proteus 8.6 file)
4. EMU8086 ASM File – code.asm
5. Binary File after assembly – proj14.bin

Flow Chart for Door Security Control System



Flowchart for Interrupts

Non Maskable Interrupt raised automatically after every 24 hrs



Interrupt Raised on pressing the exit Button: