Team 5: Door Lock
Block Diagrams

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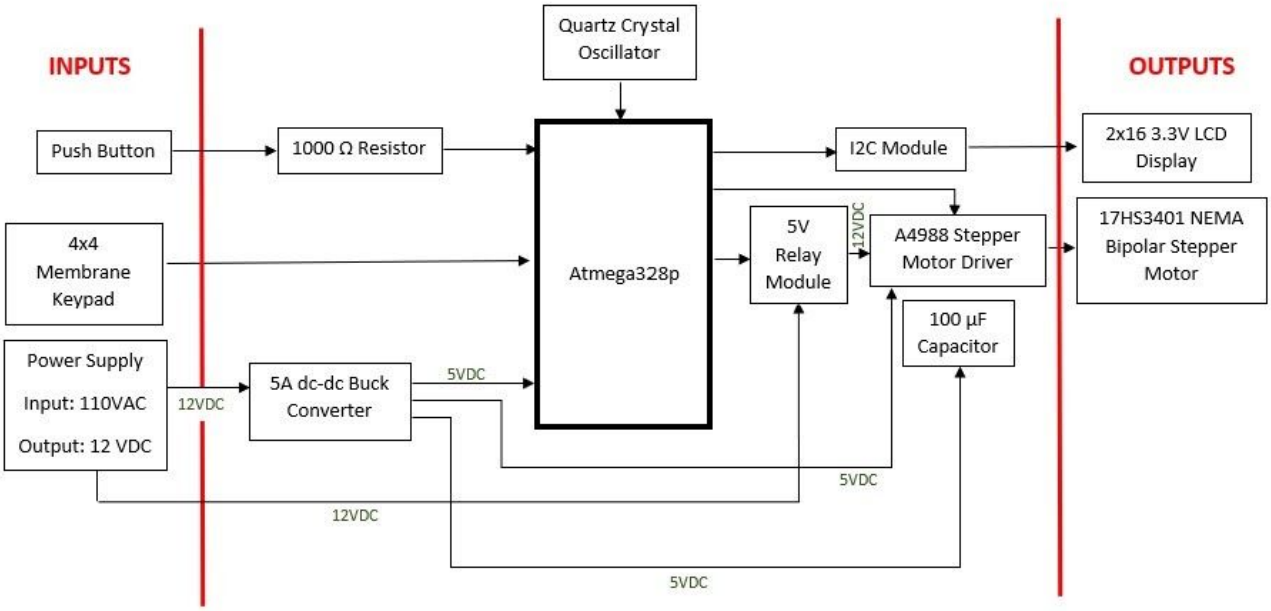
Revision 1

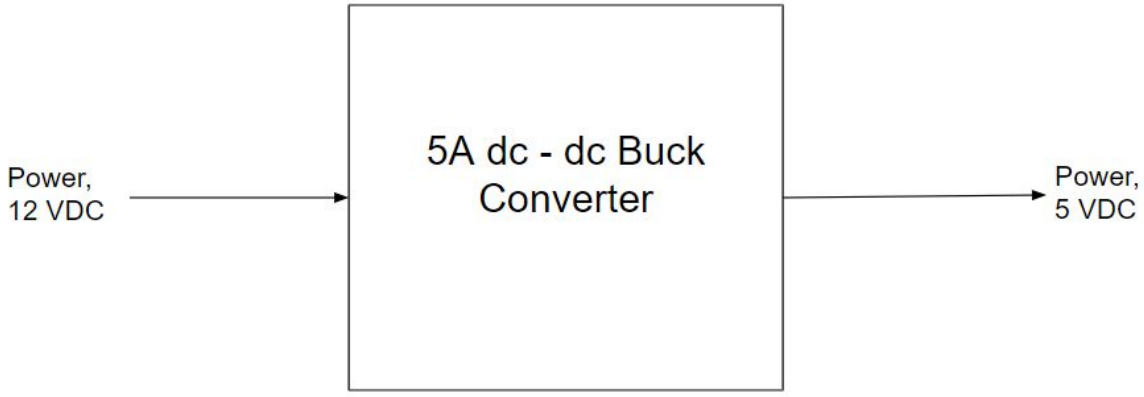
Level 0 Block Diagram

Module	Keypad Door Lock
Inputs	- 12v power supply: powers up the system. - Push Button: This push button will be used to unlock the door in case of emergency. - 4x4 Keypad: The keypad will be used to enter the password.
Outputs	- 2x6 LCD screen: used for User Interface. - Stepper motor: Locks/Unlocks the door's deadbolt.
Functionality	This design will have two modules: - The keypad module: This module will be located outside of the door. It will contain the 4x4 keypad and the LCD screen (and I2C). - The locking module: This module will be mounted on the bolt lock inside the room. It will contain the stepper motor as well as the PCB and all components needed for the design. The two modules will be connected between each other using wires which will be run on the door and will go through to the outside on the hinges side of the door.

Level 1 Block Diagram:

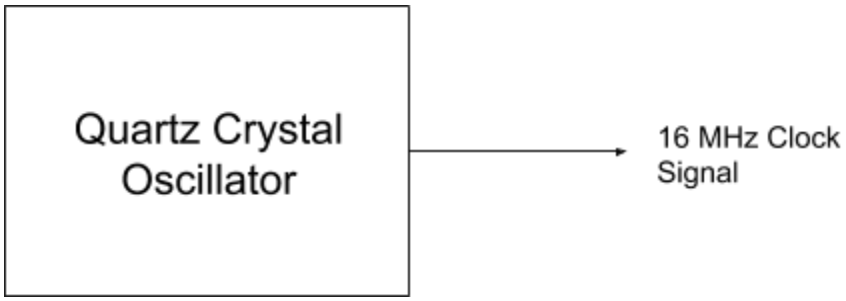


Buck Converter: Level 0



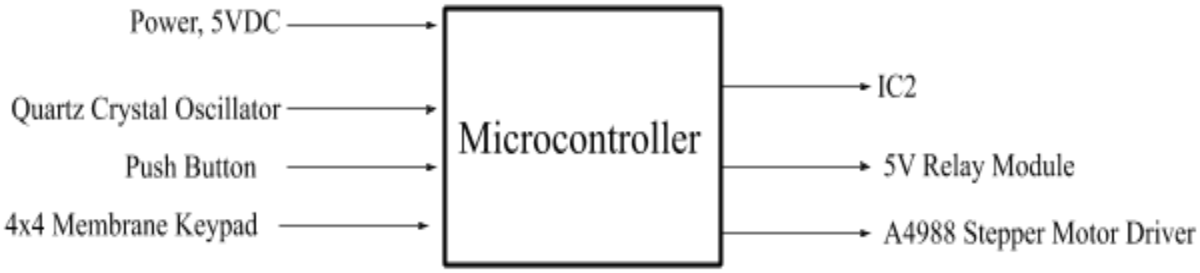
Module	Buck Converter 12V - 5V
Inputs	Regulated 12 VDC
Outputs	Regulated 5 VDC
Functionality	Convert 12 VDC needed for the stepper motor to 5 VDC needed for the atmega328p and stepper motor driver.

Quartz Crystal Oscillator: Level 0



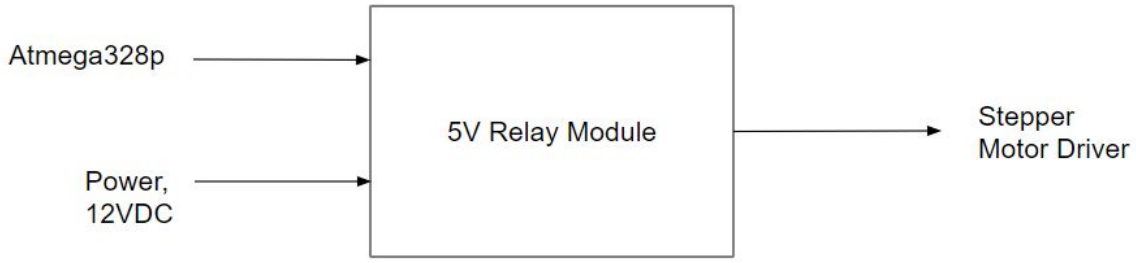
Module	16MHz Quartz Crystal Oscillator
Inputs	Regulated 3.3VDC?
Outputs	16 MHz Clock Signal
Functionality	The crystal oscillator generates a 16MHz clock signal that the ATMega328 needs to function.

Microcontroller: Level 0



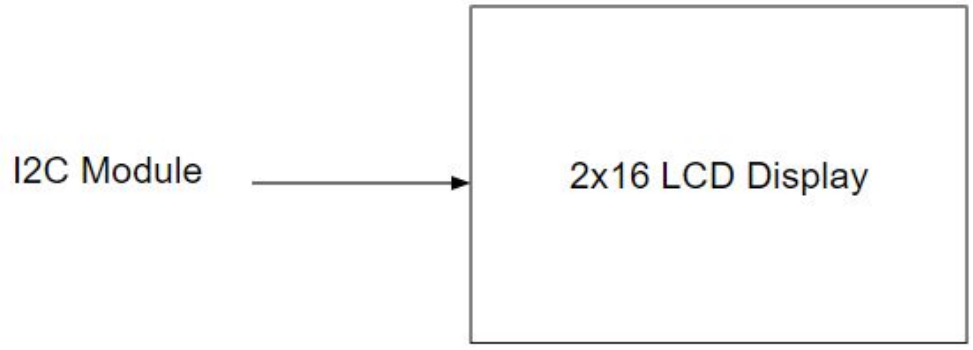
Module	Atmega328p
Inputs	-Power: Regulated 5VDC -Oscillator: 16 MHz Clock Signal -Push Button -4x4 Membrane Keypad
Outputs	-IC2 Control: Connects to the 2x16 LCD and displays a text to a user and inputs from the 4x4 membrane keypad. -5V Relay Module: Activates Module when input from 4x4 Membrane Keypad matches with set password. -A4988 Stepper Motor Driver: Activates Module when input from 4x4 Membrane Keypad matches with set password.
Functionality	The Atmega328p is powered by 5VDC and is programmed to take inputs from the 4x4 Membrane Keypad and push button to activate the A4988 Stepper Motor Driver, IC2, and 5V Relay Module when the input from the keypad matches the set password.

5V Relay Module: Level 0



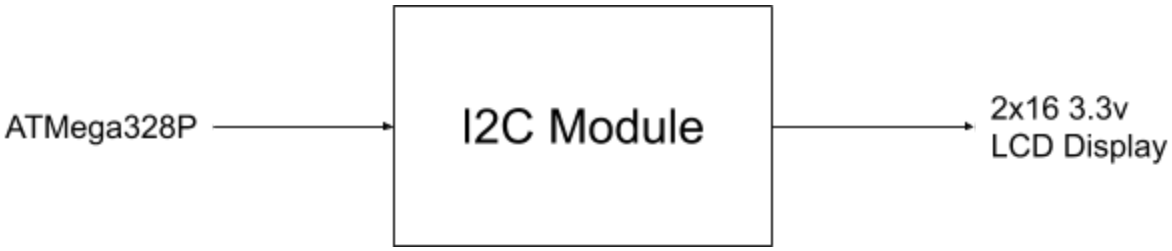
Module	5V Relay
Inputs	Atmega328P, 12VDC Power
Outputs	12VDC to the stepper motor driver
Functionality	The Relay powers on and off the stepper motor driver with a 12VDC output, which disables the force acting on the deadbolt. This enables someone to use the key on the dead bolt as designed.

LCD: Level 0



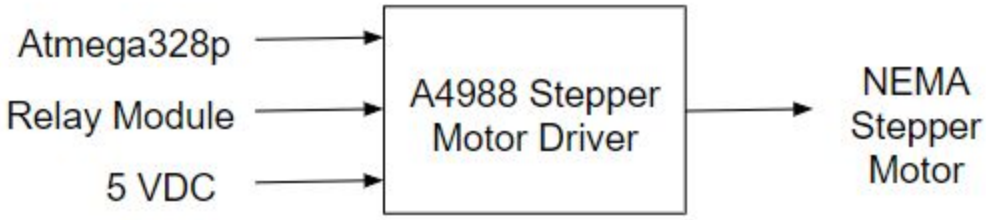
Module	2x16 LCD Display
Inputs	I2C
Outputs	N/A
Functionality	- Displays numbers entered into the keypad - Displays the status of the deadbolt (locked or unlocked)

I2C Module: Level 0



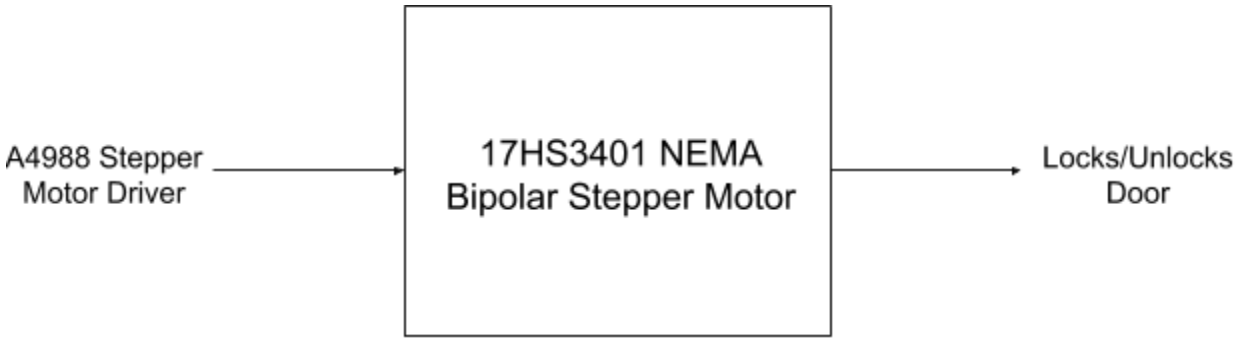
Module	I2C Module
Inputs	Atmega328P
Outputs	2x16 LCD Display
Functionality	Used to minimize the number of pins that are needed to control the LCD Display. The I2C module allows the ATMega328P to control the LCD Display with two pins (SDA and SCL)

A4988 Stepper Motor Driver: Level 0



Module	A4988 Stepper Motor Driver
Inputs	Atmega328P, 5 VDC, Relay Module (12 VDC when switched on).
Outputs	NEMA Stepper Motor
Functionality	This module will greatly facilitate the control of the bipolar stepper motor. It will be controlled by the Atmega328P and will power the stepper motor with the 12V coming from the relay when needed.

17HS3401 NEMA Bipolar Stepper Motor: Level 0



Module	17HS3401 NEMA Bipolar Stepper Motor
Inputs	A4988 Stepper Motor Driver
Outputs	Locks/Unlock the door
Functionality	The stepper motor receives a signal from the A4988 driver (ATMega328 sets signals on A4988) and acts accordingly. Locks and Unlocks the door depending on entered password and/or emergency push button.

4x4 Membrane Keypad: Level 0

Module	4x4 Membrane Keypad
Inputs	N/A
Outputs	Atmega328P
Functionality	This 4x4 keypad will let the user enter the code for the door to lock/unlock. It will send the information about the key entered to the Atmega3278P that will process the information and lock/unlock the door if the correct code is entered or prompt the user to try again if the code is incorrect.