

Components and supplies

- Fingerprint sensor
- Solenoid lock
- LCD display
- Red and green LEDs
- Buzzer
- Relay module
- Arduino UNO
- Jumper wires

1. Fingerprint Sensor (usually like R305)



Wires (Usually 4-pin):

- **Red** – VCC (Power)
- **Black** – GND (Ground)
- **Green** – TX (Transmit data)
- **White** – RX (Receive data)

Connections:

Sensor Pin Connects To Why

VCC (Red) 5V on Arduino To power the fingerprint sensor

Sensor Pin	Connects To	Why
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GND (Black) GND on Arduino Completes the circuit (ground)

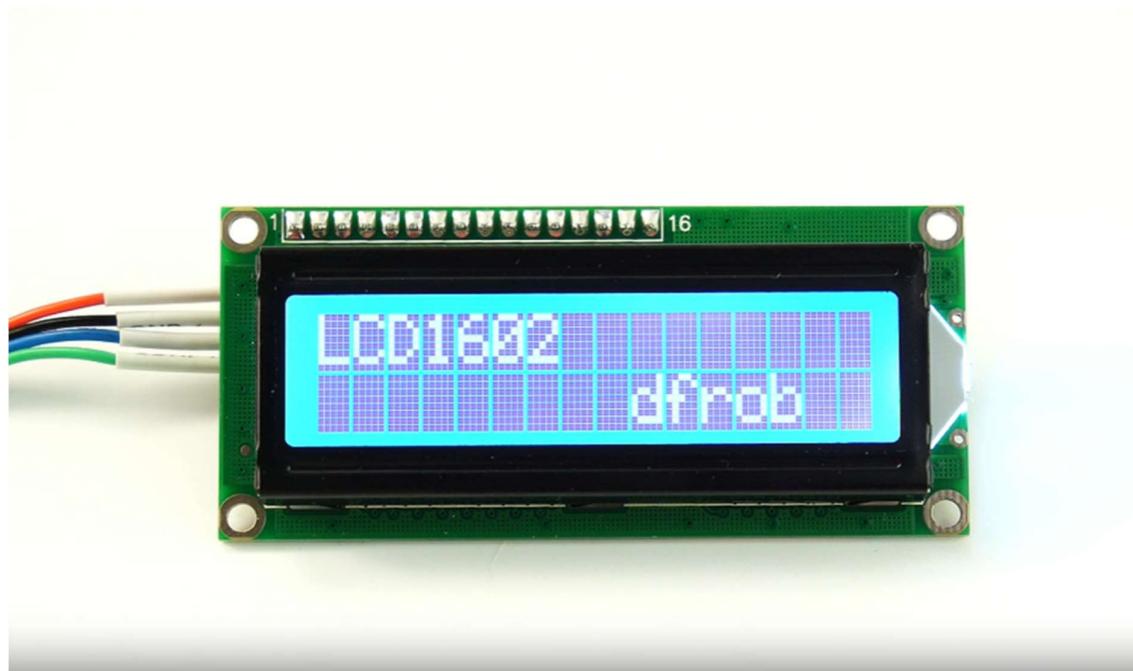
TX (Green) Pin 2 on Arduino TX from sensor → RX to Arduino (for data IN)

RX (White) Pin 3 on Arduino RX from sensor ← TX from Arduino (for data OUT)

Note:

We use **SoftwareSerial library** to handle this communication on Pins 2 & 3.

 **2. LCD Display (I2C 1602 LCD Module)**



This is a 4-pin module (easy I2C type):

Connections:

LCD Pin	Connects To	Why
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VCC 5V on Arduino To power the display

GND GND on Arduino To complete the power circuit

SDA A4 on Arduino For I2C data

SCL A5 on Arduino For I2C clock

Note:

- We use the **LiquidCrystal_I2C** library.
- Only two wires (SDA/SCL) are used for communication = cleaner wiring!

 **3. Red LED (Access Denied)**



Connections:

LED Pin	Connects To	Why
Long leg (Anode +)	Pin 6 on Arduino	Arduino controls ON/OFF (access denied signal)
Short leg (Cathode -)	330Ω resistor → GND	Resistor protects the LED and completes the ground path

 **4. Green LED (Access Granted)**



Connections:

LED Pin	Connects To	Why
Long leg (Anode +)	Pin 5 on Arduino	Arduino turns this ON when access is granted
Short leg (Cathode)	330Ω resistor → GND	Protects LED and completes ground path

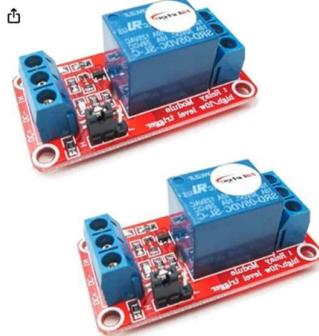
5. Buzzer (for sound feedback)



Connections:

Buzzer Pin	Connects To	Why
+ (Positive)	Pin 7 on Arduino	Arduino sends sound signal when triggered
- (Negative)	GND	Completes the buzzer's circuit

6. Relay Module (to control Solenoid Lock)



The relay acts like an **electrical switch**. The **Arduino triggers it**, and it **switches the solenoid power ON or OFF** safely.

Relay has 3 control pins:

Relay Pin Connects To	Why
VCC	5V on Arduino
GND	GND on Arduino Common ground
IN	Pin 8 on Arduino Signal pin to turn relay ON/OFF

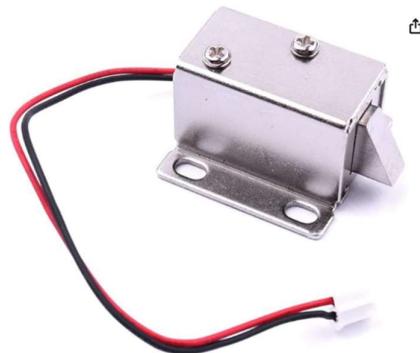
On the relay output side:

- **COM (Common)** → Connect one wire of **solenoid lock**
- **NO (Normally Open)** → Connect to **+** of external **12V power**
- **GND of power supply** → Connect to **GND of solenoid lock**

Why use relay?

Because the **solenoid lock uses more voltage/current** than Arduino can handle directly. The relay safely switches the external power ON/OFF to the lock.

7. Solenoid Lock



The lock needs more power (like 12V), so we don't connect it directly to Arduino.
Instead:

Connections (through Relay):

Lock Wire	Connects To
+ Wire	COM of Relay
- Wire	GND of external power
External Power (+) NO of Relay	
External Power (-) Lock GND & Arduino GND (shared ground)	

 When relay is triggered by Arduino, it connects NO to COM, and the lock opens.

8. Power Supply

- The **Arduino** gets power via USB or external 9V/12V adapter.
- The **Solenoid lock** gets power from a **separate power supply** (like 12V 2A adapter) — connected via the relay.

Summary Table

Component	Arduino Pin	Power	Note
Fingerprint Sensor	Pin 2 (RX), Pin 3 (TX)	5V & GND	Use SoftwareSerial
LCD I2C	A4 (SDA), A5 (SCL)	5V & GND	Use I2C LCD library

Component	Arduino Pin	Power	Note
Red LED	Pin 6	GND via 330Ω	Signals Access Denied
Green LED	Pin 5	GND via 330Ω	Signals Access Granted
Buzzer	Pin 7	GND	Optional feedback
Relay (for Lock)	Pin 8	5V & GND	Controls solenoid
Solenoid Lock	Relay COM & NO	12V Power	NOT direct to Arduino