Solenoid Lock Build Instructions

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NOTICE: Use of this document is subject to the terms of use described in the document "Terms_of_Use_License_and_Disclaimer" that is included in this release package. This document can be found at:

https://github.com/TeamPracticalProjects/Wireless_IO_Board/blob/master/Terms_of_Use_License_and_Disclaimer.pdf

Contents

1. Introduction.

This document provides step-by-step instructions to build an RFID Lock that unlocks a door or cabinet using a solenoid. This particular installation activates an existing 24 volt DC solenoid inside of a locking pushbar industrial front door. However, these instructions apply to activation of any DC solenoid up to 24 volts DC and up to 2 amperes of current.

The RFID Lock is compatible with the MN_ACS RFID Access Control System, see the following for details:

https://github.com/TeamPracticalProjects/MN_ACL

The main activity involved in this project is building a Wireless_IO_Board with the necessary components installed to operate the solenoid. The resulting Wireless_IO_Board should be mounted in a suitable enclosure and wired to a source of solenoid power and to the solenoid itself. The Wireless_IO_Board must also be supplied with its own, 5 volt logic power.

In order to integrate this locking mechanism with the MN_ACL RFID Station project, the "SolenoidFirmware" must be flashed into the Photon on the Wireless_IO_Board and the resulting Solenoid_Lock must be configured to listen for "front door" checkin events.

Each of these activities is covered in its own section of this document. Before proceeding with any of these activities, we strongly suggest that you read through the Overview document in this repository:

https://github.com/TeamPracticalProjects/RFID_Lock/blob/master/RFID_Lock_Project_Overview.pdf

2. Building the Wireless_IO_Board.

Complete instructions for building a Wireless_IO_Board can be found at:

https://github.com/TeamPracticalProjects/Wireless_IO_Board/blob/master/Docs/Wireless_IO_Board_Build_Instructions.pdf

The minimum parts needed to operate a solenoid locking device are the *Core Components* (section 2.1 of the referenced document) and the *Relay/Solenoid Control Parts* (section 2.3 of the referenced document). You might wish to review all the Wireless_IO_Board repository; in particular the documents:

- https://github.com/TeamPracticalProjects/Wireless_IO_Board/blob/master/Docs/Wireless_IO_Board_User_Manual.pdf

- https://github.com/TeamPracticalProjects/Wireless_IO_Board/blob/master/Hardware/PCB/Wireless_IO_Board_Parts_List.pdf

You may, of course, wish to add additional parts to your Wireless_IO_Board if your project requires additional capabilities; e.g. an external LED, an on-board buzzer, or sensor input(s).

3. Connect and Test the Solenoid Lock.

Figure 3-1 shows the external connections to the Wireless_IO_Board that you constructed per section 2 of this document.

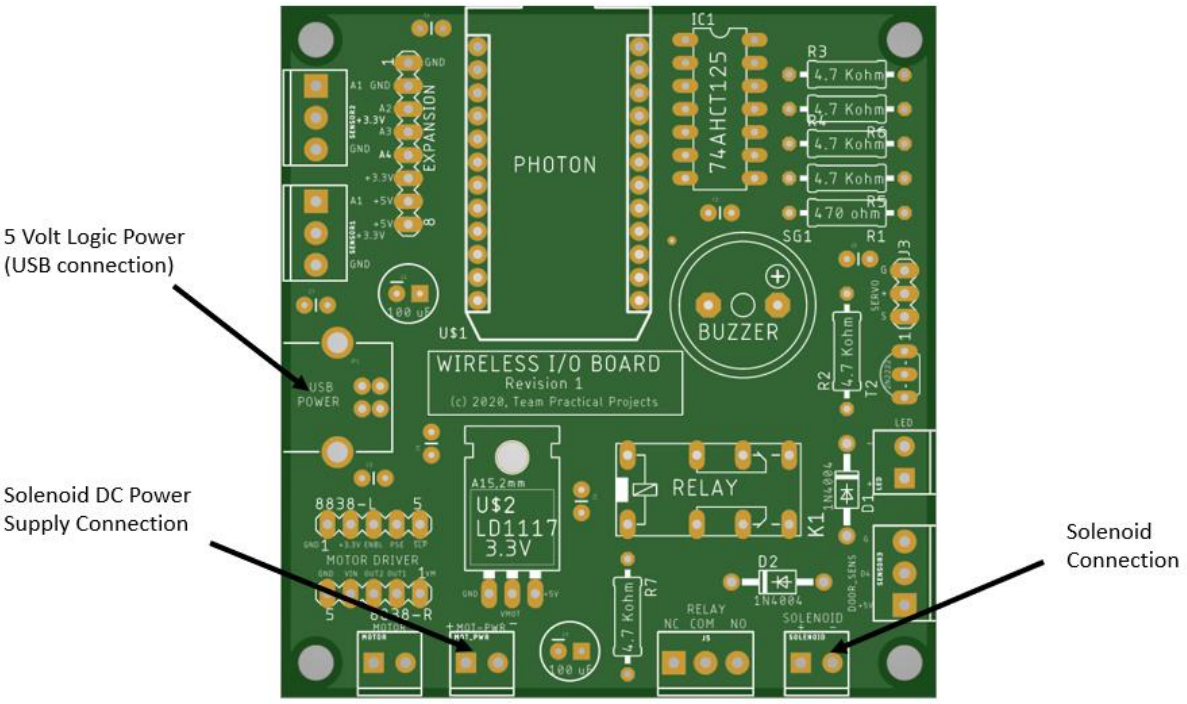

Figure 3-1. Connections to the Wireless IO Board to Solenoid Activation.

The Solenoid Lock PCB requires two power supply connections and provides one connection to the solenoid device:

- ***Logic Power***: 5 volt logic power is connected to the type B USB port on the Wireless_IO_Board. This connection supplies power for the circuitry on the board.

- ***Solenoid Power***: A separate power supply is needed for the solenoid. In our case, this is a 24 volt DC power supply. The power supply outputs (+ and -) are connected to the Wireless_IO_Board via the *Motor Power* terminal block. *NOTE*: the Wireless_IO_Board must not have an LD1117 voltage regulator mounted on the board, nor should it have the R7 resistor and associated 100 uF capacitor mounted in the board (unless these components are needed for use with the particular solenoid power supply chosen). *Carefully observe the polarity of the power supply connection – the polarity does matter!*

- ***Solenoid Connection***. Wires from the solenoid are connected to the Solenoid terminal block on the Wireless_IO_Board. This terminal block is labeled with the polarity of the solenoid output signal, in the event that this matters to the particular solenoid device used (it usually doesn't). *NOTE*: the Wireless_IO_Board has a flyback diode wired across the solenoid terminals so that an external flyback diode is not needed.

We suggest mounting the completed Wireless_IO_Board in a plastic box and using an external terminal block to make connections to the solenoid and solenoid power supply wiring; see figure 3-2. This setup provides for covering of the electronics and for additional strain relief of the cables from the solenoid and solenoid power supply.

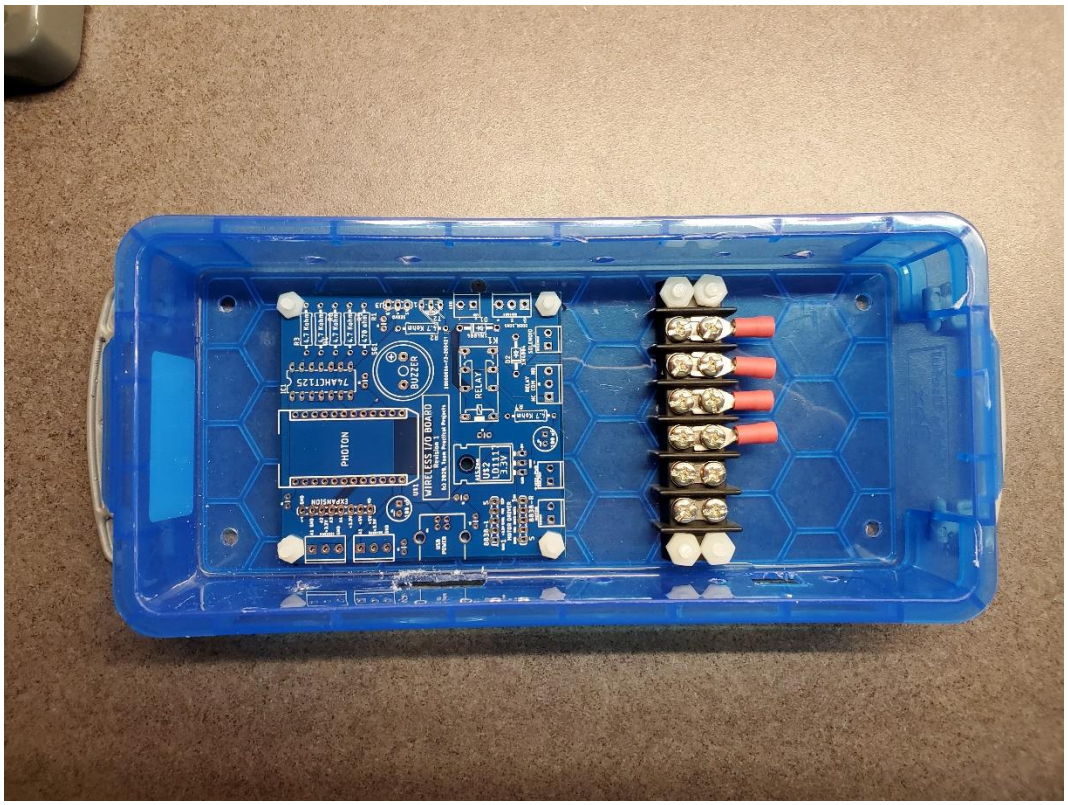

Figure 3-2. Solenoid Lock PCB and Terminal Block in Enclosure.

You can optionally test out the functionality of the solenoid lock by using the Wireless_IO_Board test firmware. This firmware is described in section 3 of the Wireless_IO_Board User Manual, which can be found at:

https://github.com/TeamPracticalProjects/Wireless_IO_Board/blob/master/Docs/Wireless_IO_Board_User_Manual.pdf

4. Install and Configure the Solenoid Lock Firmware.

The firmware flashed to the Photon on the Wireless_IO_Board per section 3 of this document is used for testing purposes. In order to have your Solenoid_Lock become part of the Maker Nexus Access Control System (MN_ACS) and respond to RFID card taps on RFID Stations, you must flash different firmware onto the Wireless_IO_Board Photon. The firmware that you need is located in this repository at:

https://github.com/TeamPracticalProjects/RFID_Lock/tree/master/Software/Particle_SW

Download the folder "SolenoidFirmware" to your computer. Next, open the Particle Workbench[1] on your computer and set the "workspace" to this folder. You can compile and flash the firmware to your Photon device using the Particle Workbench. Using the Particle Workbench is beyond the scope of this document. Refer to Particle's on-line documentation and tutorials for details.

Once the Solenoid_Lock firmware is flashed to your Wireless_IO_Board Photon, you should see the D7 LED flashing blue about once per second. You must now use the "MN_Station_Configurator" App (running on an Android device) to set the "deviceType" and the "Lock Listen code" into the Wireless_IO_Board Photon. Complete instructions for this can be found at:

https://github.com/TeamPracticalProjects/MN_ACL/blob/master/Documents/RFID_Administrator_User_Manual.pdf

[1] If you don't have the Particle Workbench (Visual Studio Code) on your computer, see Particle's documentation at: https://www.particle.io/workbench. Refer the Particle's documentation for installation and operating instructions.