OpenDoor Assembly and Testing Instructions

***Caution:** This project requires the user to install an electric door strike on a door frame. Significant carpentry skills and appropriate tools are required to successfully install this product. Do not attempt this project unless you have access to the necessary tools and skill set. A sample video about installation of a similar door strike in a wooden door frame can be viewed at: https://www.youtube.com/watch?v=dImYdCY89CM.*

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1. Introduction.

This project allows you to open a door using an app on a smartphone. The app is based upon the "DO button" app from IFTTT (https://ifttt.com/wtf) and is available on both iOS and Android smartphones.

The door is opened electronically using an electric door strike. An electric door strike replaces the standard door strike with a device that has a solenoid controlling the back of the strike. When the solenoid is activated, the door may be pushed open even when the door bolt is extended and locked. The door strike should be a "fail secure" model; this means that the back of the electric door strike is always locked in place when there is no power to the solenoid. The back of the door strike can only be pushed open when the solenoid is activated. Use of an electric door strike means that no modifications need be made to the standard door knob and lock mechanism. These continue to work as usual and the door can always be unlocked and opened with the standard key.

Installation of an electric door strike involves significant modification to the door frame. Please do not attempt this project unless you have the necessary tools and skills to do this. A sample video about installation of a similar door strike in a wooden door frame can be viewed at: https://www.youtube.com/watch?v=dImYdCY89CM.

The "DO button" app on your smartphone allows you to open the door from anywhere in the world, as long as you have Internet access. You can let yourself into your house via this project and you can let family and friends into your locked house when you are away. Activation of the "DO button" on your smartphone unlocks the door strike for two seconds, allowing anyone standing at the door to enter by simply pushing on the door. An LED lights when the door strike is activated to cue the person at the door that the door strike is unlatched. You can easily change this two second activation time to any time period that you want via the IFTTT "DO" app recipe that you create in your private IFTTT account.

Figure 1.1, below, contains an overview of the system concept for this project. Internet capability is supplied by a "Photon" module from Particle.io[1]. The Photon requires a WiFi connection to the Internet. The software supplied with this project is loaded onto the Photon module (via WiFi), as detailed in section 3.3 of this document. This software activates a relay which, in turn, activates the electric door strike for a period of time that is specified in the IFTTT "DO" recipe that you create based upon the instructions in section 3.4 of this document.

[1] A Particle "Core" module may alternatively be used. The Photon is newer, better and cheaper than the Core, but you can use an old Core if you have one.

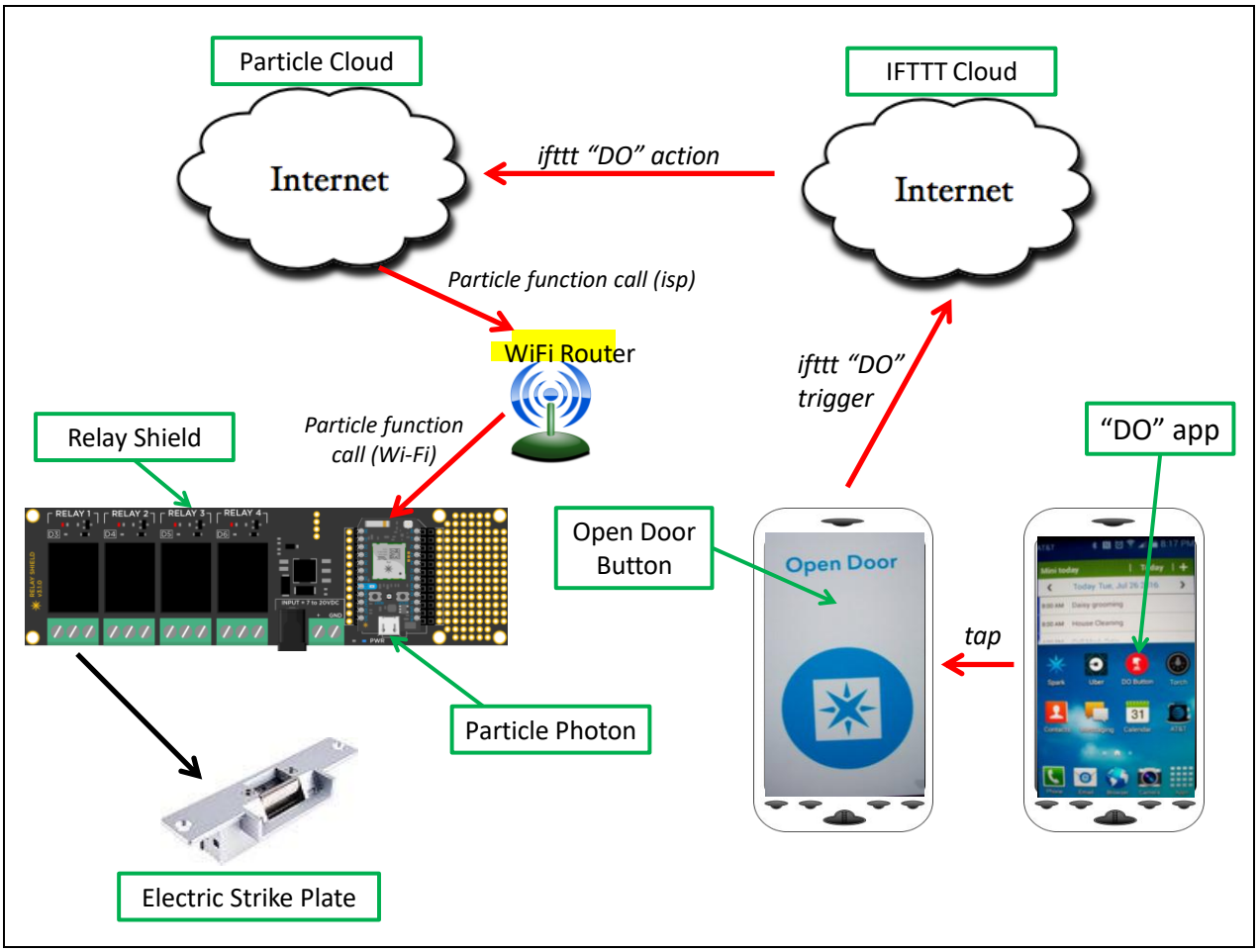

Figure 1.1. System Overview.

The Photon is plugged into a "Relay Shield", also from Particle.io. The Relay Shield accepts 12 volt DC power (which is also used by the door strike) and connects the Photon to 4 relays. Only one relay (#1) is used for this project. You can use the other three relays in any manner that you wish by writing functions similar to the one supplied with this project. Refer to the Particle.io on-line documentation for further information.

Note that it takes about 5 seconds from DO button activation on a smartphone until the door strike actually unlocks. This is a delay through the IFTTT cloud service. A custom app that communicates directly with the Particle Cloud service could avoid this delay, but is not part of this project. An LED is included in this project so that a person standing by the door knows when the door strike is unlatched.

This project requires you to have an account with Particle.io and with IFTTT.com. Both services are free and all Internet communication is secure.

2. Parts List.

2.1. Required Parts.

- 1 ea. Particle Photon Module, with headers: (https://store.particle.io/collections/photon)
- 1 ea. Particle Relay Shield: (https://store.particle.io/collections/shields-and-kits)
- 1 ea. 12 VDC Power Supply: (https://www.amazon.com/RockBirds-RB-1202-Switching-Supply-Adapter/dp/B00VM292AO?ie=UTF8&*Version*=1&*entries*=0)
- 1 ea. Electric Door Strike, fail secure, 12 VDC: (https://www.amazon.com/Generic-Electric-Strike-Secure-Control/dp/B00V45GWTI/ref=sr_1_1?s=hi&ie=UTF8&qid=1469666361&sr=1-1&keywords=generic+electric+strike)
- 1 ea. 6 x 2 Terminal Block: (http://www.jameco.com/webapp/wcs/stores/servlet/ProductDisplay?search_type=jameco all&catalogId=10001&freeText=231010&langId=-1&productId=231010&storeId=10001&ddk)
- 3 ea. Shorting Jumper for terminal block: (http://www.jameco.com/webapp/wcs/stores/servlet/ProductDisplay?search_type=jameco all&catalogId=10001&freeText=659382&langId=-1&productId=659382&storeId=10001&ddk)
- 1 ea. Diode, general purpose switching, If = 1 amp; NTE 587 or equivalent: (http://www.frys.com/product/1975293?site=sr:SEARCH:MAIN_RSLT_PG)
- 1 ea. Resistor, 680 ohms, ½ watt: (http://www.frys.com/product/999156?site=sr:SEARCH:MAIN_RSLT_PG)
- 1 ea. Panel mount green LED (no internal resistor): (http://www.frys.com/product/1334056?site=sr:SEARCH:MAIN_RSLT_PG)
- Misc. insulated hookup wire, #22 awg - #18 awg. Length and colors as required by the installation.
- Misc. wood screws and walls anchors, as required by the installation.

2.2. Optional Parts.

It is not required to mount the Relay Board in an enclosure, but I prefer to do so. Here are the additional parts needed if you choose to do this:

- 1 ea. Plastic Pencil Box: (http://www.officedepot.com/a/products/452396/Really-Useful-Boxes-Plastic-Storage-Box/)
- 4 ea. Nylon Standoff, female-female threaded, #4-40 x ½": (http://www.mouser.com/ProductDetail/Keystone-Electronics/1902C/?qs=sGAEpiMZZMtrde5aJd3qw3QaZpWtG6nidQne%2f0XWhd0%3d)
- 8 ea. Nylon Screw, #4-40 x ¼": (http://www.mouser.com/ProductDetail/Keystone-Electronics/9527/?qs=sGAEpiMZZMtFmYSM%2fWUJwjMM2jkmYE8T6M5YAr%2f3kG0%3d)

3. Installing the Photon and Software.

In this step, you install your Photon (or Core) module on the Relay Board and set up your Particle.io account so that you can communicate with it. The Relay Board receives 12 volts DC (12 VDC) power from the Rockbirds power supply through the barrel jack. The Relay Board converts this 12 volt power to 5 volts to power the Photon.

3.1. Assembling the Photon on the Relay Board and Supplying Power.

First, unbox the Photon and the Relay Board. Next, plug the Photon onto the Relay Board in the position shown in figure 3.1:

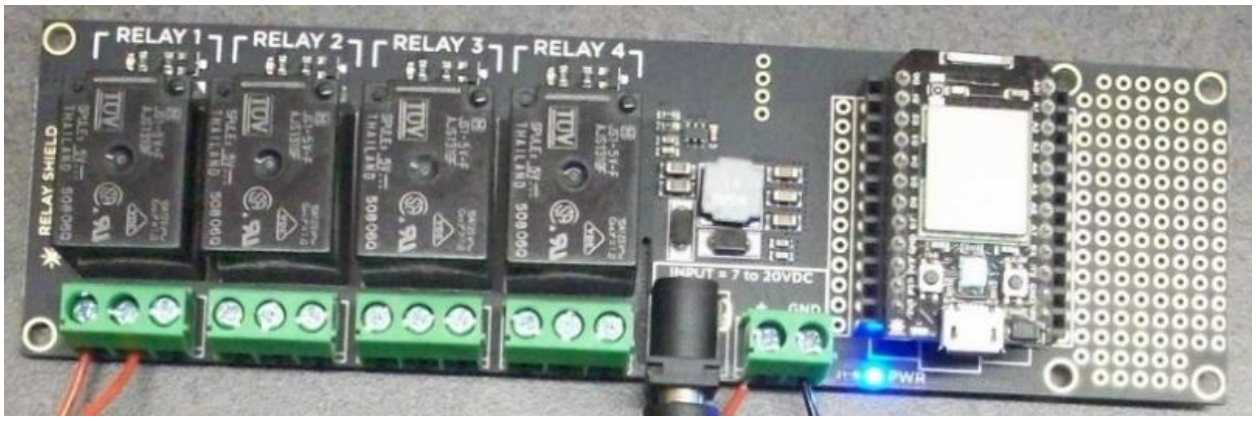

Figure 3.1. Photon (Core) Installed on Relay Board.

Figure 3.1 actually shows a Core mounted on the relay Board; the Photon looks very similar. It is important to note that the micro-USB connector on the Photon/Core must be facing the front of the Relay Board, i.e. the side of the Relay Board where the screw terminals and barrel jack are located.

Plug the Rockbirds power supply into an AC socket. Then plug the barrel plug from the power supply into the mating barrel jack on the Relay Board. The "PWR" light on the Relay Board (near the front of the Photon) should light up, indicating that the Relay Board has power. The multicolor LED on the Photon should be flashing blue, but in any event, it should be flashing, breathing, or just displaying some color.

3.2. Setting up your free Particle account and "capturing" your Photon.

Using any Internet connected computer, go to:

https://docs.particle.io/guide/getting-started/start/photon/

Follow the instructions on this web site to establish your free Particle.io account, capture (register) your Photon device to your account, test out connection to your Photon using the Tinker app on your smartphone, and/or use the web IDE to upload some software to your Photon (such as the Blink program).

3.3. Loading the DoOpen software onto your Photon.

Using any Internet connected computer, go to:

https://github.com/BobGlicksman/Particle-Door-Open/blob/master/Software/DoOpen.txt

Copy the entire contents of this text file (source code) to the clipboard of your computer. Then go to:

https://build.particle.io/login

and log in to your Particle.io account (the one that you created in the previous step).

Select your Photon device (if you have more than one device registered) and then click on "CREATE NEW APP". The IDE window should show two empty methods:

```
void setup() {

}

void loop() {

}
```

Select all of this and then paste the contents of your clipboard into this window. The code in the IDE window should match the code from https://github.com/BobGlicksman/Particle-Door-Open/blob/master/Software/DoOpen.txt **exactly**. Make sure that you have copied this source code completely!

Supply a name for your app ("DoOpen" is recommended) and save it. Next compile this software and then flash it to your Photon. If you are unsure how to perform any of these steps, review the online particle documentation at: https://docs.particle.io/guide/getting-started/start/photon/

While the software is being flashed to your Photon, the Photon will light up different colors on its multicolor LED, but it should eventually settle down to "breathing cyan". At this point, the software has successfully been loaded onto your Photon. Make sure that the compile was successful and that the flashing was successful, both from messages on the Particle Web IDE and by the Photon "breathing cyan" at the end of the flashing of the software.

Log off of your Particle.io account when this has been successfully accomplished.

3.4. Creating the IFTTT "DO recipe and placing a DO BUTTON on your smartphone.

Using any Internet connected computer, go to:

https://ifttt.com/

Click “Sign Up” if you don’t already have an IFTTT account to establish your free account. Then, Sign In to the IFTTT account that you created.

Click on “Channels” and type “Particle” to locate the Particle channel on IFTTT. Connect to the Particle channel following the instructions provided.

Next click on “My Recipes” and then click on the “DO” tab. Then click the “DO” button icon and download the DO app to your smartphone (Android or iOS). You can then log off of your IFTTT account.

Once you have the DO app on your phone, open the app, set it up (if the first time) and select the “+” symbol to add a button to the app. Select the “Particle” channel (it should show as being connected to your account) and select “+ Create a New Recipe”. Then select “call a function”. Supply a button title (such as “Door Open”) and then select the function “OpenDoor” on the Photon device that you are using for this project. Then enter “2000” in the “with input (Function Input)” text field. *NOTE: 2000 represents the number of milliseconds that the door strike will unlock after you press the Door Open DO button. 2000 ms = 2 seconds. If you want another value, enter the value that you want (e.g. 5000 for 5 seconds, 1500 for 1.5 seconds, etc.).* After entering the function value, click “ADD” to add the Door Open button to your DO app. Now when you open the DO app, you should be able to scroll to the Door Open button (or whatever you named it).

3.5. Testing the DO Button connection to the Photon.

With the Photon mounted on the Relay Board and powered and with the DoOpen software flashed onto the Photon and with the Photon “breathing cyan”, you can open the DO app on your smartphone, select the “Door Open” button that you created in the previous step and press it. After a few seconds, a little check box will appear at the top of the Door Open button when the message is actually sent to the IFTTT cloud. Then you will see the little LED above Relay #1 on the Relay Board light for the number of seconds that you designated in your DO button definition. You will also probably hear the relay click at this time. *NOTE: it may take 5 seconds or so for the message to get from the IFTTT cloud to your Photon – be patient*. Once you see the relay LED light up, your system is working and ready to wire up.

Disconnect the power from the Relay Board now by unplugging the power supply from the Relay Board’s barrel jack.

4. Hardware Mounting and Wiring.

4.1. Overview (schematic).

Figure 4.1 shows the schematic diagram for the Open Door hardware.

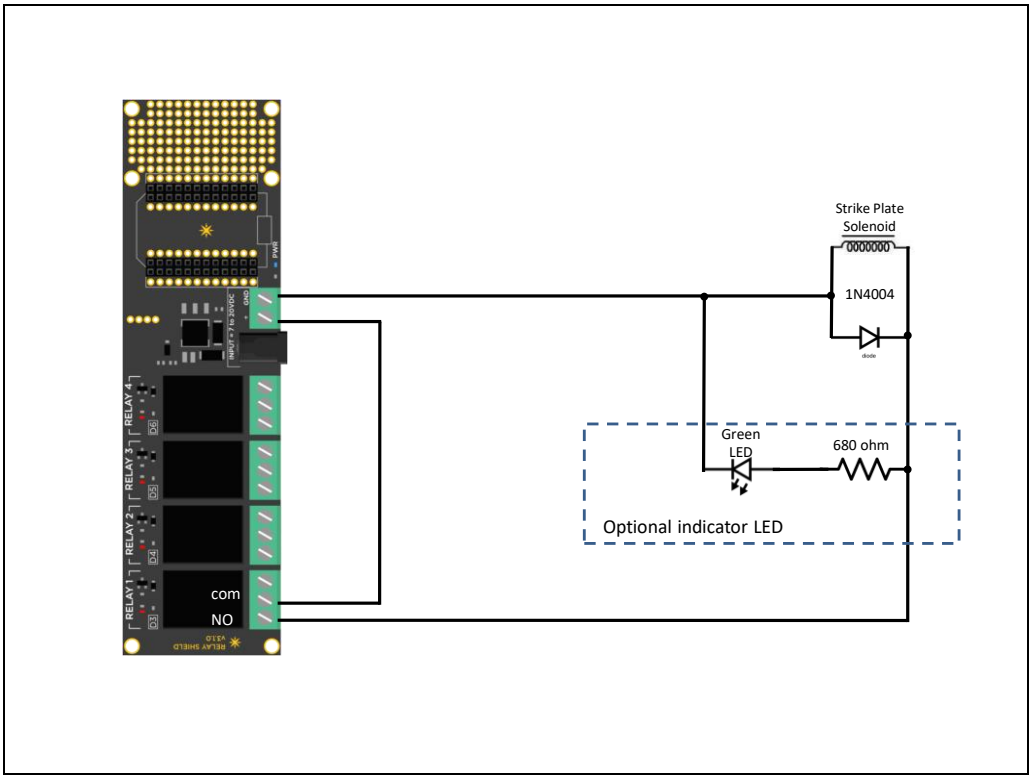

Figure 4.1 Schematic.

When 12 VDC is supplied to the Relay Board via the barrel jack, the "+" power screw terminal has the positive side of the power supply applied to it and the "GND" screw terminal has the negative side of the power supply applied to it. Place a wire between the "+" screw terminal and the "com" screw terminal for relay #1, as shown on the schematic. This applies +12 VDC power to relay #1 and when the relay is activated, the "NO" terminal will be connected to +12 VDC power.

The solenoid of the electric door strike is wired across the "NO" terminal of relay #1 and ground (GND), as shown on figure 4.1. Therefore, when relay #1 is activated by the Photon, the electric door strike will activate and the door will be unlocked for as long as the relay is activated.

There are three additional components in the circuit of figure 4.1:

- Diode: this is wired as a flyback diode across the relay contact. Its purpose is to protect the relay contacts from high voltages when the relay opens and the coil of the solenoid still has a magnetic field that wants to discharge. Use of this diode lengthens the life of the relay contact by suppressing arcing.

- LED: a panel mounted LED and its associated current limiting resistor is (optionally) wired across the door strike solenoid. The LED is intended to be mounted on an outside wall, near the door, so that the user knows when the door strike is activated.
- Resistor: a 680 ohm resistor is used to limit the current through the LED to approximately 15 ma. At this current, the LED will glow brightly but still remain within its maximum current limit.

You can leave out the LED and resistor if you don't need a visual indicator of when the door is unlatched. It is recommended to include it, however, because it may be hard to hear the door strike unlatch and re-latch.

NOTE: Panel mount LEDs are available with internal current limiting resistors. It is not recommended to use this, as a burglar could pull out the panel mount from the wall and the wires would then provide direct access to the door strike solenoid. The burglar could then attach a 12 volt battery to these wires and open your door. With only the LED wires and not the current limit resistor exposed, it would take a very high voltage to supply enough current through the LED wires to activate the solenoid.

4.2. Preparing the Terminal Block.

The Terminal Block provides a mechanism to mount and to connect the diode, LED and resistor into the circuit. It also provides a way to physically separate the Relay Board/Photon from the door strike and these other components. The Relay Board must be mounted in a location that is convenient for AC power to the power supply and also to get a strong WiFi signal for the Photon. The door strike must be located on the door frame and the LED must be mounted on the outside wall near the door. By wiring up a 6 column x 2 row Terminal Block as described in this section, only 2 wires (relay switched 12 volt power and ground) are needed to interconnect these two major subassemblies. This separation provides flexibility for any particular installation circumstance.

Figure 4.2 shows the assembled Terminal Block. Step by step assembly instructions are listed below. The Terminal Block assembly instructions use Shorting Jumpers between columns of the Terminal Block in a way that requires only one wire or lead to be attached to any screw terminal on the Terminal Block. I recommend this for reliability.

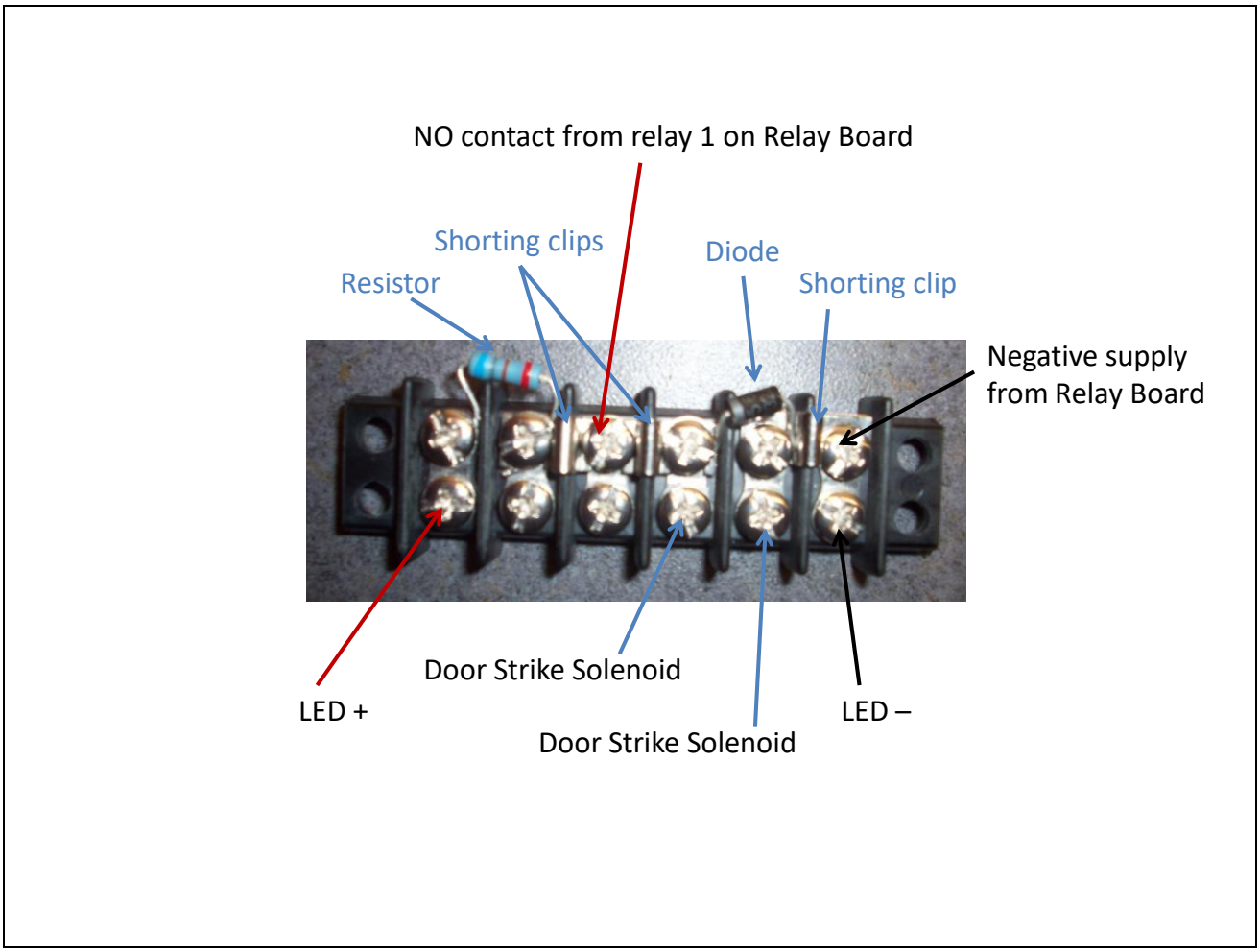

Figure 4.2. Terminal Block Assembly.

- Loosen the two rightmost screws on the top of the Terminal Block and insert a shorting jumper. Then tighten down the rightmost screw but not the next one to the left of it.
- Loosen the next three screws to the left of the two above, on the top of the Terminal Block. Place two shorting jumpers to short these three columns together, as shown in figure 4.2.
- Place the leads of the diode between the second and third terminals at the top of the Terminal Block terminals, as indicated in figure 4.2. *Take special care to place the diode with the silver band on the left side, exactly as shown in figure 4.2.* Make sure that the leads of the diode are underneath the screw terminals and not off to the side. Tighten down the screw terminals mounting the diode.
- Place the resistor leads under the leftmost two screws on the top row of the Terminal Block. The resistor is non-polarized; it does not matter which end goes under which

screw. Make sure that the leads of the resistor are underneath the screw terminals and not off to the side. Tighten down all loose screws on the top row of the Terminal Block. The Terminal Block assembly is complete.

4.3. Testing the Circuit.

I recommend wiring up the Relay Board to the Terminal Block, the door strike and the LED at this point for testing, prior to installation in the permanent location for these components. Use short lengths of hookup wire for this purpose so that everything is close together for observation, as shown in figure 4.3, below. Use figure 4.3 as a guide to the wiring, along with figure 4.2 and the schematic in figure 4.1.

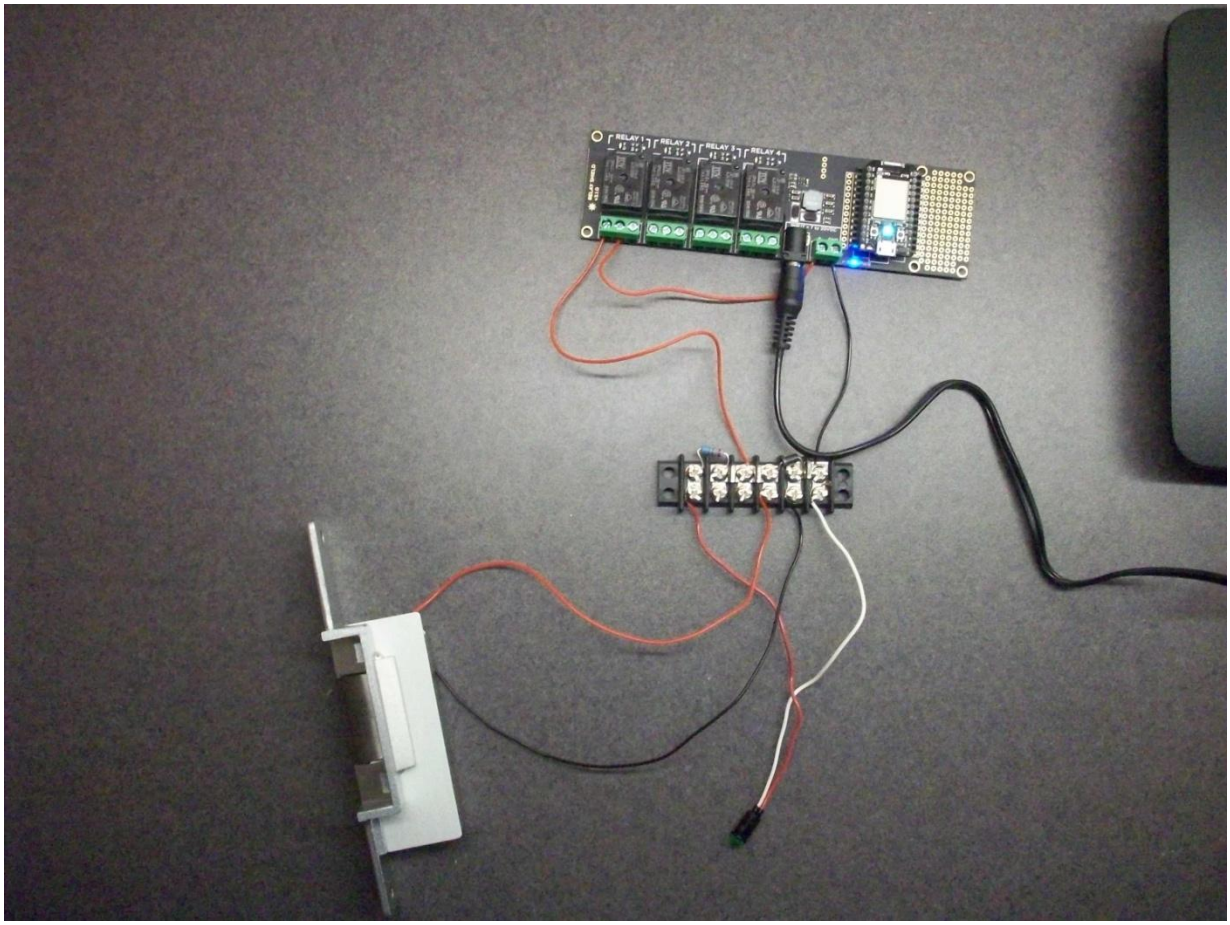

Figure 4.3. Test Wiring of the Complete Project.

When wiring up the circuit per figure 4.3, note the following:

- The LED is polarized. Make sure that the red wire attaches to the leftmost screw terminal (resistor) and that the white wire attaches to the rightmost screw terminal (GND). *The LED will not light if it is wired up backwards*.

- The wires on the door strike solenoid must be soldered to the tabs provided. Make sure to solder on the gauge, stiffness and length of wire that will be used to connect the solenoid to the Terminal Block in the final installation location. Leave some extra wire, as you may be fishing this wire through walls (you can always cut it back later). The solenoid is non-polarized, so it is not necessary to distinguish between the terminals of the solenoid when wiring it to the Terminal Block. *Note: it may help to fish the wires from the solenoid through walls if you twist the wires together*. Do this now, so that you have the proper wire length after twisting.

- Connect the solenoid wires to the Terminal Block as shown in figure 4.3 and tighten the screws.

Double check your wiring and make sure that all Terminal Block screws are tightened and that all leads and wires are solidly under the Terminal Block screws. Next, plug in the Rockbirds power supply and then plug the barrel connector of the power supply into the barrel jack of the Relay Board. The Relay Board power light should come on immediately and the multicolor LED on the Photon should start flashing through a sequence of colors as indicated on the particle.io site (https://docs.particle.io/guide/getting-started/modes/photon/). The Photon should eventually settle down to "breathing cyan", and the LED by pin D7 of the Photon should light for one second. At this point, the operation of the hardware is ready to be tested. See section 6 "Troubleshooting" if you are having problems getting to this point.

When the Photon is "breathing cyan" and the D7 LED has come on for one second and has gone back off, the system is ready to be activated using the Door Open DO Button app that you installed and created in section 3.4 and tested in section 3.5. Open the DO app, select and activate the Door Open (or whatever you called it) button. Within about 5 seconds, the following should happen:

- The relay #1 LED on the Relay Board should light up for about two seconds.
- Relay #1 should activate with a "click".
- The door strike back should unlatch for two seconds.
- The panel mount LED should light while the door strike is unlatched.

Go back and double check your wiring if any of these items does not work. Otherwise, your hardware is complete and you are ready to install!

4.4. OPTIONAL – Mounting the Relay Board in a Box.

The Relay Board can be mounted on a wall or other location without any enclosure. It is completely safe with everything exposed. Nevertheless, I prefer to place it in an enclosure to help protect it from accidental damage. The instructions in the section are completely optional and you can skip them if you do not wish to provide an enclosure for the Relay Board.

A plastic “pencil box” forms the enclosure for the Relay Board. In order to prepare the pencil box, it is necessary to drill holes in it, as shown in figure 4.4.

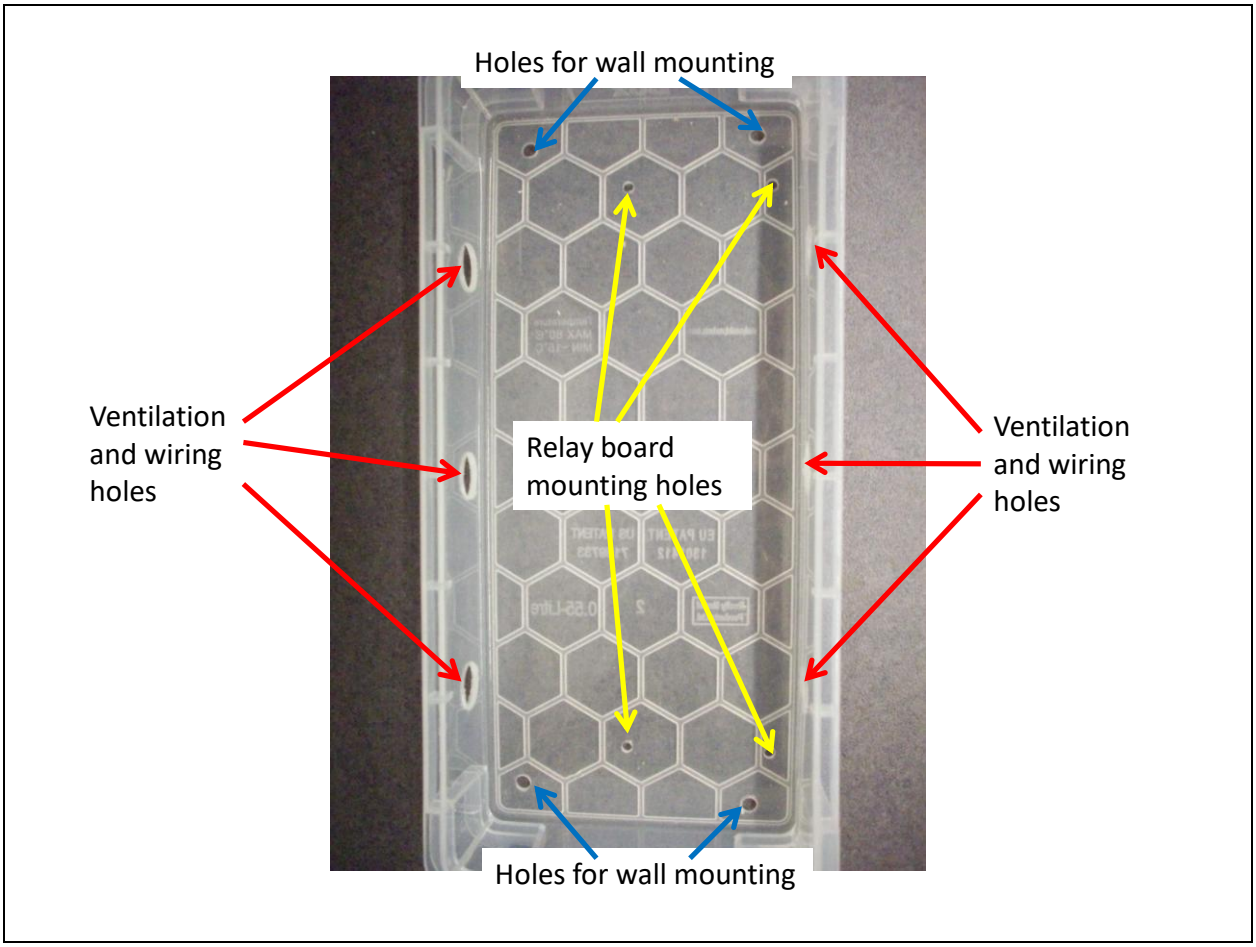

Figure 4.4. Drilling holes in the Pencil Box.

- Using the Relay Board as a template, center the board lengthwise in the box with the rear of the board very near one side of the box. Mark the 4 mounting hole locations on the inside of the box. Remove the Relay Board and check that the marked holes all fall inside of the hexagon patterns on the bottom of the box. Use a small drill bit to drill out pilot holes, then enlarge with a bit that creates holes big enough for the nylon screws that will mount the Relay Board to pass though.

- Locate 4 places near each corner of the box that are each inside of the hexagon pattern on the bottom of the box. These will be the locations for wall mounting screws, if the box is to be wall mounted. Drill out pilot holes first and then enlarge to fit the wall mounting hardware that you will use for the installation.

- Mark and drill out 3, ½" diameter holes in each side of the box, as shown in figure 4.4. These holes are for ventilation and wiring. The locations are not critical but center them on the sides of the box at locations similar to that shown in figure 4.4.

Temporarily mount the Relay Board into the pencil box using nylon screws and standoffs, as shown in figure 4.5

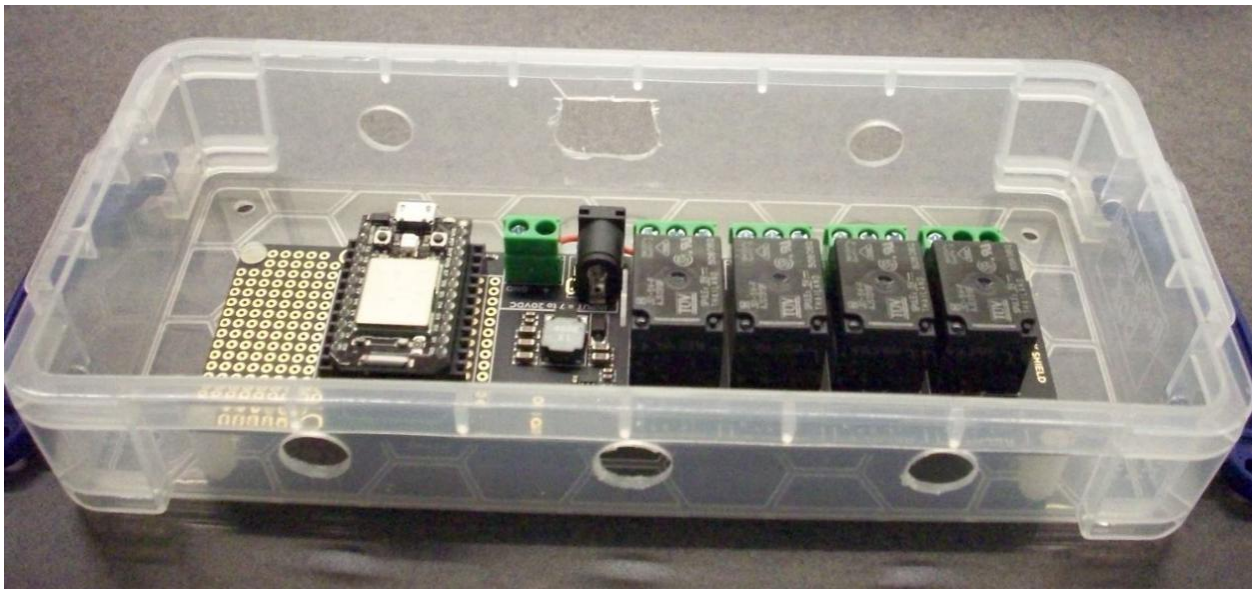

Figure 4.5. Access for Power.

Note the location of the barrel jack with respect to the opposite side of the box. Mark out the location where the power supply cord and plug will enter the box and then expand the center ½" hole to allow the power plug to enter the box through this side and comfortably plug into the barrel jack. You can enlarge the hole using a file, nibbling tool, or plastic knife. After measuring the enlargement, you may want to remove the Relay Board while cutting the side of the box in order to protect the board from damage. After enlarging the hole for the power plug, remount the Relay Board in the box and tighten down all nylon screws to firmly hold the Relay Board in place.

5. Installation and Testing.

Every installation of this project will be unique. The installation details depend upon, among other things:

- Details of the door frame into which the electric door strike is placed.
- Details of the outside and corresponding inside wall where the LED panel light is to be placed.
- Locations where the Terminal Block can be placed out of sight but where wires can be fished through walls to it (from the door strike and LED).
- Locations where the Relay Board/Photon can be placed where this assembly is out of sight yet has access to AC power and a good WiFi signal. An additional consideration is where wires can be dressed or fished through walls to connect the Relay Board with the Terminal Block.

In my installation, the electric door strike location is adjacent to a furnace closet. Once the strike is installed, the wires from the solenoid can be fished through the wall on which the door frame is set and exit a hole in the wall inside the furnace closet where it is out of sight and out of the way. Likewise, the logical place for the panel mount LED is the outside wall that is a few inches away from the door strike. A hole completely though the outside wall exits into the closet. Therefore, the ideal location for the Terminal Block is on the inside wall, inside the closet, that is opposite the LED location on the outside wall. Figure 5.1 illustrates this location.

Figure 5.1. Terminal Block location.

Note in figure 5.1 that the Terminal Block is mounted directly to the wall using drywall screws and anchors. It is located directly above a hole that is drilled into the inside wall, directly opposite the mounting hole for the LED on the outside wall. Note the red and white LED wires are long enough to go through a standard wall (2 x 4 with drywall on each side) and connect directly to the terminal block.

The door strike installation is not shown in figure 5.1. The door strike location is directly to the right of the gas pipe shown in the figure. Wires from the solenoid are fished through the wall and exit to the Terminal Block through this same hole in the inside wall of the furnace closet.

There is AC power in the furnace closet but the outlet is on the opposite wall of the closet. I used some 3-wire thermostat cable to wire the Terminal Block to the Relay Board. Only two of the three wires are used; the green wire is wrapped around the cable jacket in case I want to use it for something else in the future.

Figure 5.2 shows the location of the Relay Board, mounted inside a pencil box enclosure.

Figure 5.2. Relay Board and Enclosure Installation.

The Relay Board enclosure is mounted on the opposite wall from the Terminal Block, also inside of the furnace closet. I used drywall screws and wall anchors to affix the enclosure to the inside of the wall. There is only one AC outlet on this wall and it was used by a condensation pump. Therefore, I mounted on outlet strip on the wall so that there is room to plug both the condensation pump and the Rockbirds power supply into AC power. There is a good WiFi signal at this wall of the closet as well.

Since both the Relay Board and the Terminal Block are mounted inside the same closet, it was not necessary to fish the thermostat cable between them through any walls. I simply routed the cable down the wall, across the bottom of the closet and up the adjacent wall to the Terminal

Block. I used stick-on cable tie mounts to hold the cable in place and out of the way of the furnace and other equipment in the closet.

There is no practical limit to the length of the wires between the Relay Board and the Terminal Block. Pretty much any type of wire can be used. The wires need not be shielded nor twisted. However, a “cable” – wires inside a jacket – is easier to deal with, particularly if you need to fish it through walls.

Once everything is installed and powered, you should be able to operate your door strike using the “Door Open” DO button on your smartphone.

6. Troubleshooting.

This section contains some hints for troubleshooting your installation in the event that something does not work. Section 7 contains instructions for using a web-based "Debug Client" that can directly communicate with the Photon, bypassing the DO button app on your smartphone. This could be helpful if it is unclear why the DO button is not operating the Photon.

6.1. No Power to the Photon.

With the power supply plugged into an AC outlet and with the power supply barrel plug fully inserted into the Relay Board barrel jack, the power on LED on the Relay Board should light. If it is not lit, check the power supply and connections.

If the Relay Board is powered but the Photon is not (nothing on the multi-color LED on the Photon), check that the Photon is properly seated into its connector on the Relay Board and that it is in the proper orientation (micro USB connector facing the front of the board – where all of the screw terminal connectors are).

6.2. Photon not "breathing cyan".

If there is power to the Photon but the Photon's multi-color LED is not "breathing cyan", then there is some problem with the Photon or its WiFi connection to the Particle cloud. An explanation of the multi-color LED states and what they mean can be found on the Particle.io web site:

https://docs.particle.io/guide/getting-started/modes/photon/

Note that it may take a number of seconds for the Photon to connect to your WiFi, then use WiFi to connect to the Particle cloud, then initialize itself. If after a few seconds of flashing different colors, the Photon does not settle down to breathing cyan, consult the Particle.io on-line documentation for troubleshooting details.

6.3. Photon "breathing cyan" but Door Strike does not activate (relay does not activate).

If you press the Door Open DO button on your smartphone but the LED does not light or the door strike does not activate, first check the red LED by Relay #1 on the Relay Board. This LED should light when the relay is activated (independently of what is wired to the relay contacts). If the relay does not activate, try re-installing the Photon software and the Door Open DO button. Note that it takes approximately 5 seconds (the time is variable) for the DO button activation to get to the Photon. When installing the Photon software, make sure that the software compiles without error on the Particle Web IDE and then make sure that it flashes to the Photon correctly (without error on the IDE). Note that it make take several rounds of the Photon flashing purple, flashing green and perhaps flashing some other colors before the Photon settles down to breathing cyan. Be patient with this process!

Once you re-flash the software to the Photon, note that the D7 LED lights up for 1 second. This is an indication that the software is running and that the Photon is initialized (when the D7 LED goes out).

After correctly installing the Photon software, re-install the Door Open DO button. The installation process actually communicates with the Particle cloud, so all of this Internet communication should be working. Make sure that you put some number larger than 1000 in the "with input (Function Input)" text field when creating and saving the recipe. This number is in milliseconds, so don't put in some number like "2" or else the pulse will be too short to activate the relay and the door strike solenoid.

When operating the Door Open DO button, make sure that the little circle in the upper center of the button screen gets a check mark in it. If it doesn't, then your smartphone cannot communicate with the IFTTT cloud service (perhaps you are not in a location with a good Internet connection).

If all of these steps seem correct but the relay still won't activate, you might try using the Debug Client in lieu of the DO button – see section 7 below for details.

6.4. Photon "breathing cyan" but Door Strike does not activate (relay activates).

If the relay activates but either the LED does not light up or the door strike does not activate, then you have some wiring error. Check all of your wiring carefully. Here are a few specifics that you might look for:

- Ensure that there is a wire between the "+" power terminal screw connector and the "com" center screw connector on relay #1 of the Relay Board. If you have a multimeter handy, check that 12 volt DC power is on the "com" screw terminal of relay #1.
- Check that the flyback diode on the Terminal Block is connected properly. *If it is connected backwards, it will short out the solenoid power whenever the relay is activated!*
- Check all wiring and shorting jumpers on the Terminal Block. Make sure that the panel mount LED is wired through the resistor and not shorting the 12 VDC supply when the relay is activated.
- If the door strike solenoid works but the LED does not light, check that you wired the LED in the correct polarity.
- If the LED lights but the door strike does not activate, check that the wires that you soldered to the door strike did not come loose and check that these wires are connected to

the proper place on the Terminal Block. If you have a multimeter, check that there is 12 volts DC across the solenoid when the relay is activated.

7. Debug Client.

An on-line debug client is available that you can use to test out the operation of your Photon. This client communicates directly with the Particle cloud and bypasses IFTTT and the DO button app. It may be useful to test using the Debug Client if you suspect that you are having problems with IFTTT or the DO button app.

To launch the Debug Client, open a web browser on any Internet-connected computer (laptop, tablet, smartphone):

http://shrimpware.com/SIS/DebugSIS.html

Make sure that the web browser that you are using supports javascript. Internet Explorer, Safari, and Chrome are all known to work.

The page that you get will look like this:

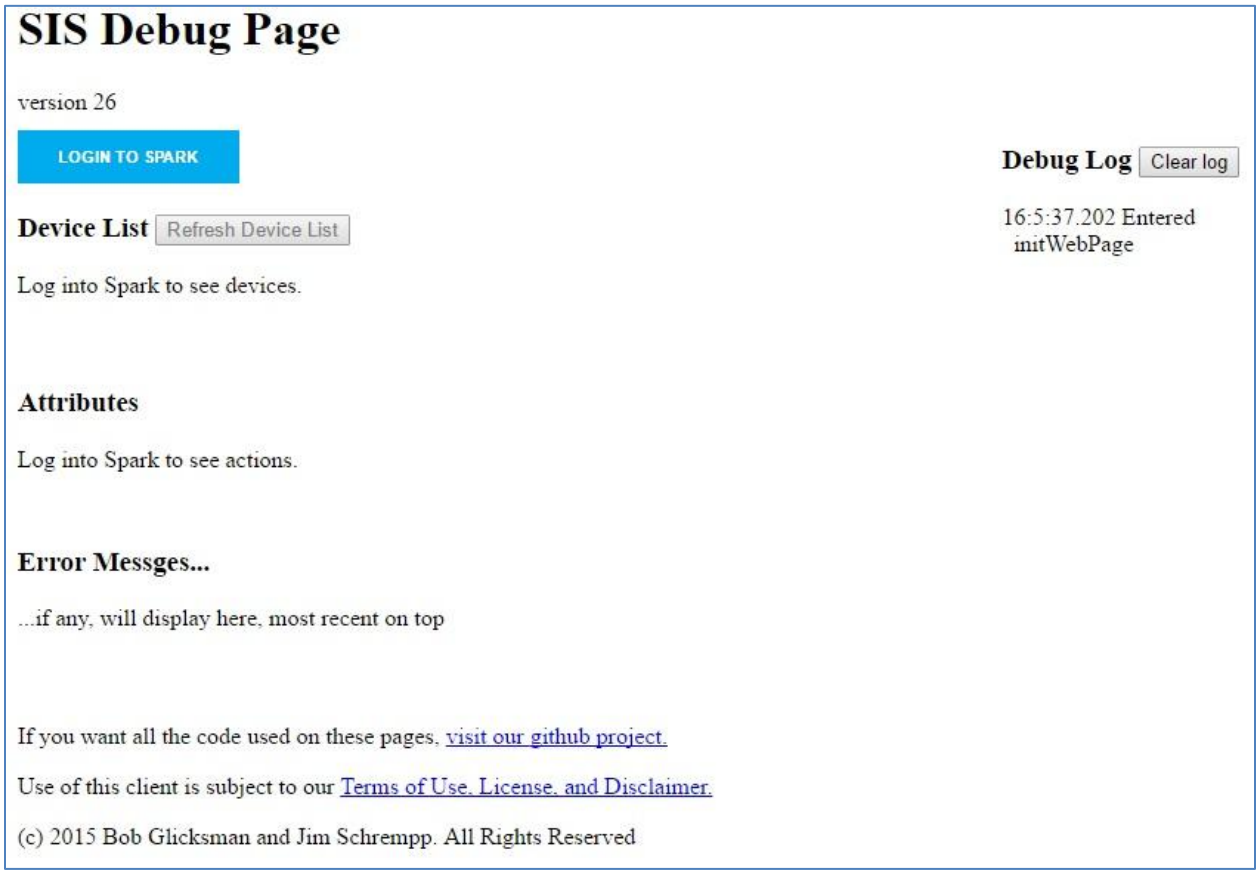

Figure 7.1. Debug Client login screen.

Click on the "LOGIN TO SPARK" button. A standard Particle login panel will pop up. Log in to your Particle.io account using this panel. You will then get a display similar to figure 7.2:

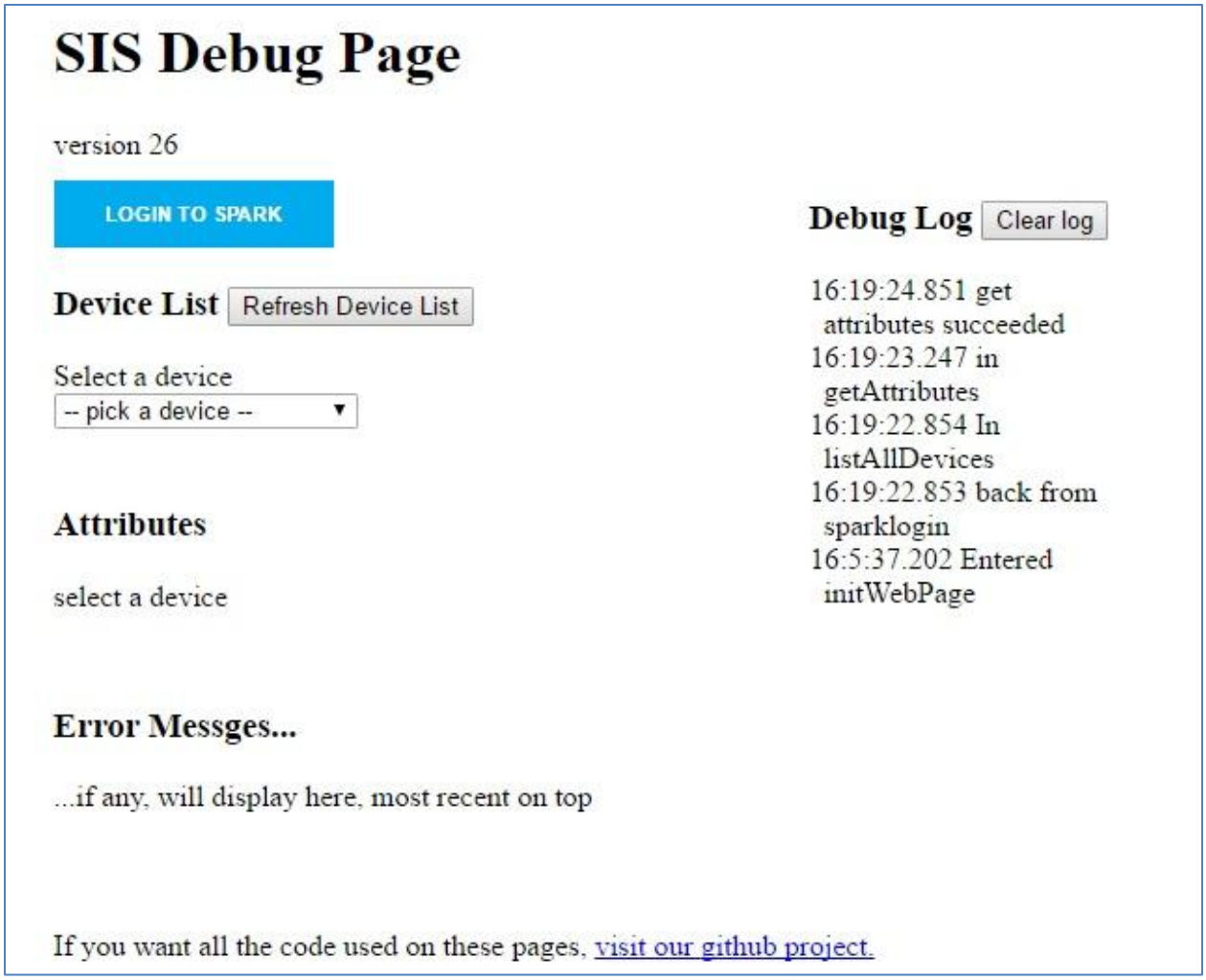

Figure 7.2. Device Selector.

Click on "—pick a device –". Your Photon should show in the drop down list and be noted as ONLINE. If it does not show up or if it is not shown as ONLINE, your Photon may be offline or otherwise not properly captured into your Particle account. If this is the case, go to Particle.io and follow the instructions to remedy the problem.

After selecting your ONLINE Photon, you will see a screen similar to figure 7.3:

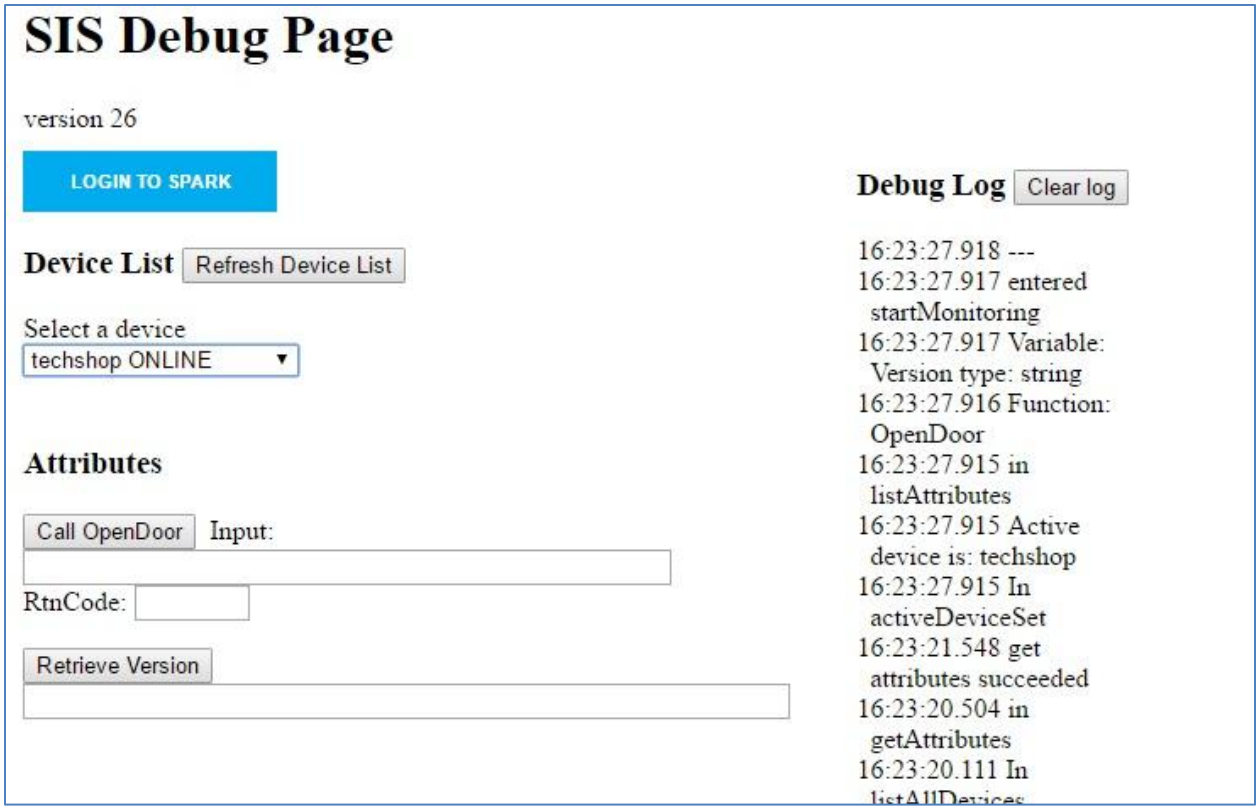

Figure 7.3. Selected Photon device.

In particular, you should see the cloud function "Call OpenDoor" and the cloud variable "Retrieve Version". Click on Retrieve Version and you should see the version of the software that is loaded on to your Photon, as in figure 7.4:

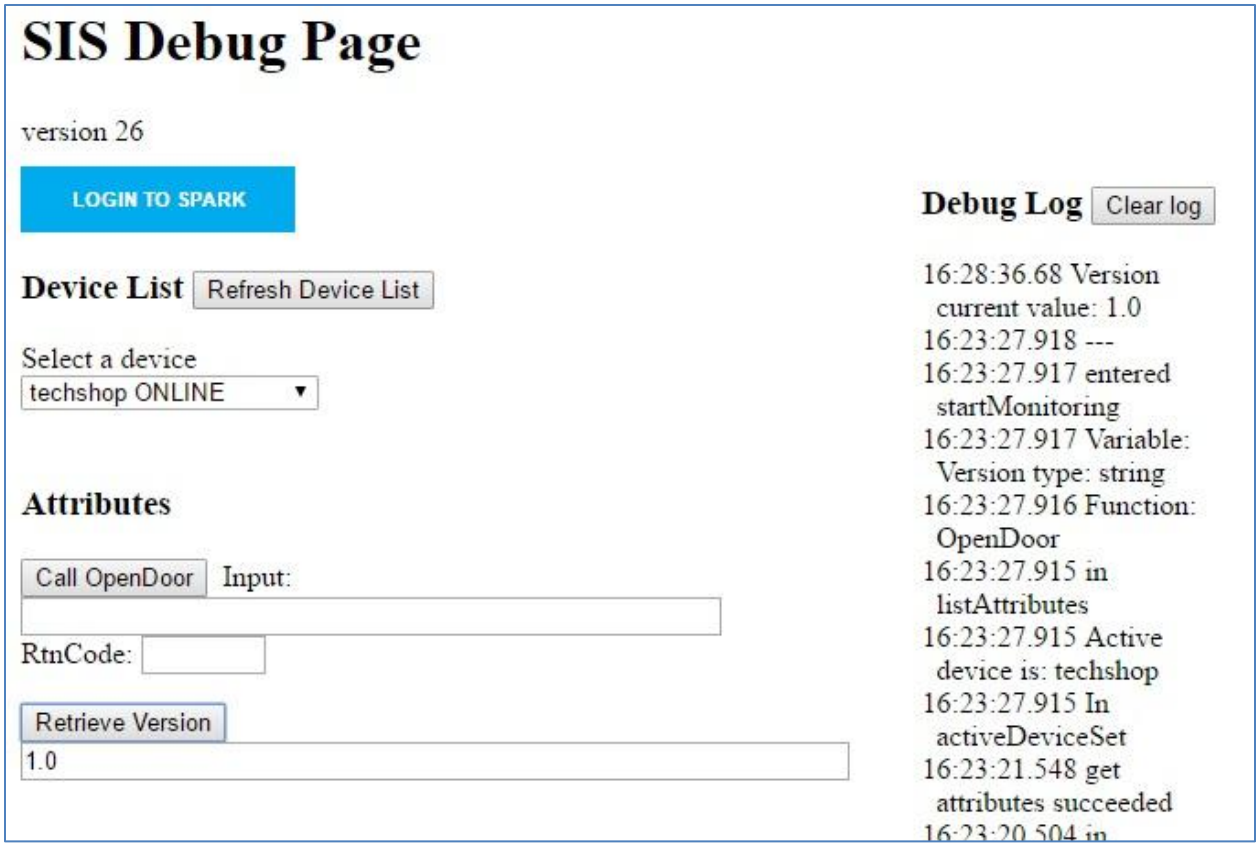

Figure 7.4. Software Version retrieved from Photon.

The current version of Photon software for this project as of this writing is "1.0", but this may change in the future. Next, enter a value such as "2000" in the text box under "Call OpenDoor". Then click on "Call OpenDoor". The relay on the Relay Board should activate for 2 seconds (2000 ms) and the door strike and LED should activate along with this. The result will be displayed as in figure 7.5:

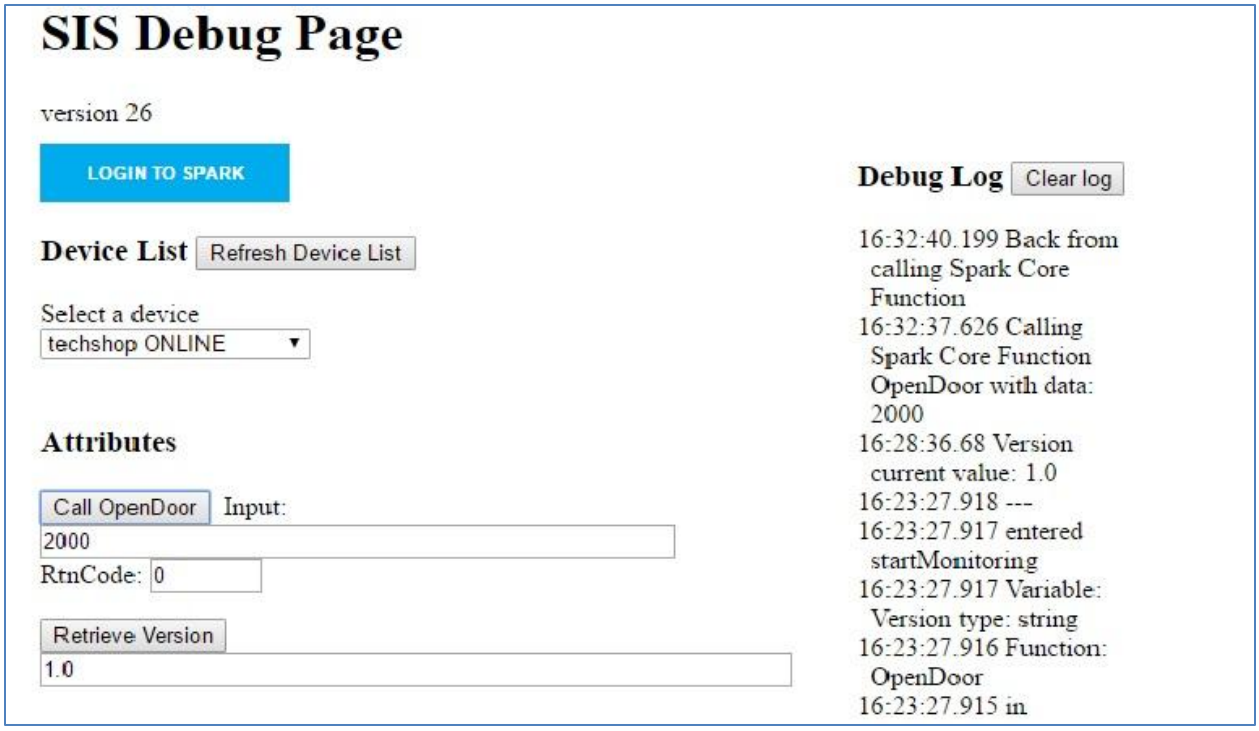

Figure 7.5. Function executed successfully.

A return code ("RtnCode") of 0 indicates that the function executed normally. An "RtnCode" of -1 indicates that the value that you entered was not valid (e.g. not a number) and the Photon software activated the relay anyway with a default value. If "RtnCode" shows "waiting" for an extended period of time (more than 2 seconds), then there is a problem communicating with the Particle cloud. Go to Particle.io and look at their dashboard for additional information. However, this is Particle's problem to fix and not yours!

Note that the Debug Client calls the OpenDoor function with little or no delay, as opposed to a typical 5 second delay through IFTTT when using the DO button.