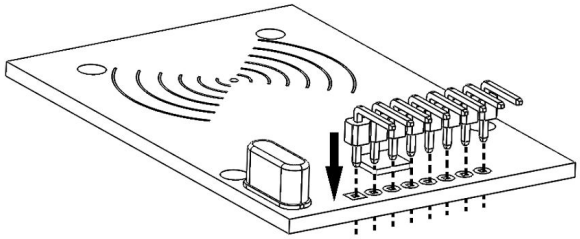
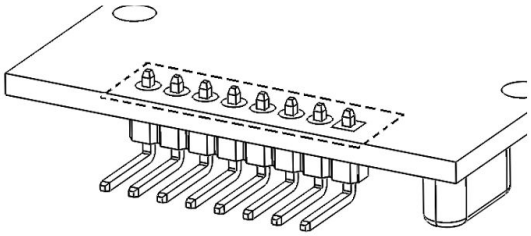
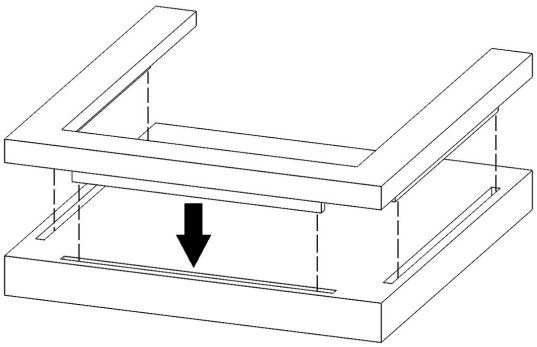
Begin by attaching header pins to the RFID reader. The header pins should be connected such that the exposed headers are on the same side of the board as the screen-printed text and MFRC522 chip.

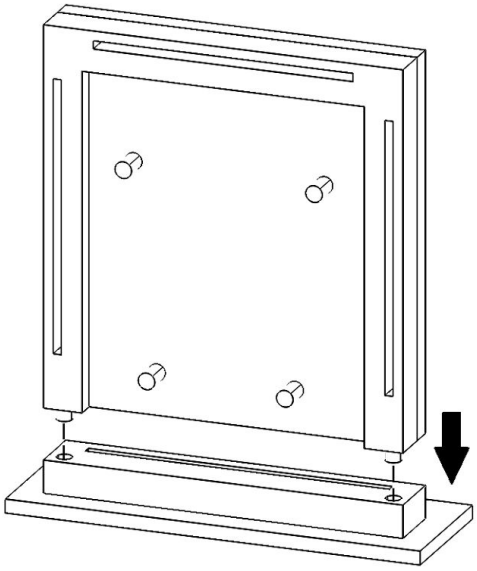




Reversing the board, solder the pins to the exposed pads on the underside. Set the RFID reader module aside for now.

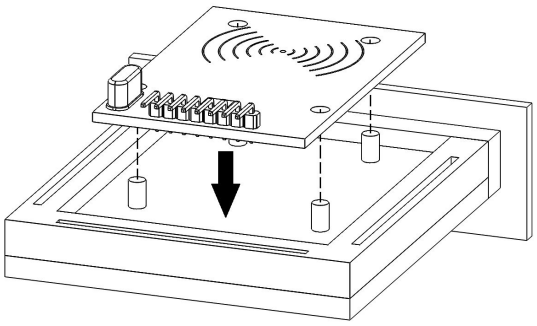
To assemble the card slot, begin by snapping together the front and back of the slot. Take care to correctly orient these pieces. Reversing the larger side will result in the mounting pegs blocking the card slot. Once you have ensured that this orientation is correct and the slot between them is clear of obstructions, attach the two halves using glue.

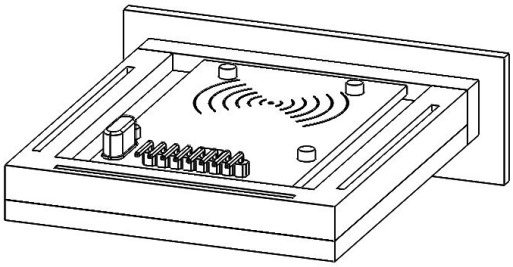




Attach the slot you have just created to the top portion of the card slot assembly. Again ensure that these pieces properly align as inverting either piece will impede the card's path when inserted. Once you have ensured that the pieces fit securely and a card can easily be inserted, attach the pieces using glue.

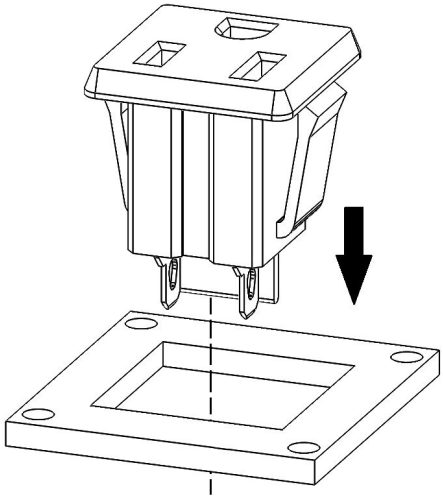
Slide the previously assembled RFID reader onto the mounting pegs to the rear of the card slot assembly. The RFID reader should slide onto the mounting pegs with little resistance but not fall off when the card slot assembly is inverted.

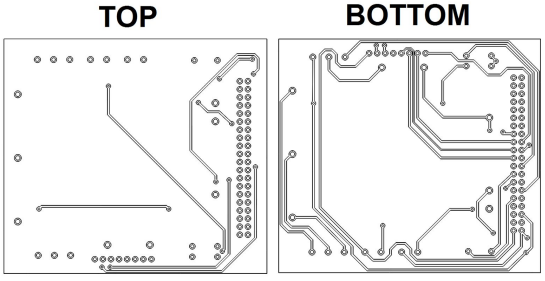




Set aside the card slot and RFID reader assembly until needed.

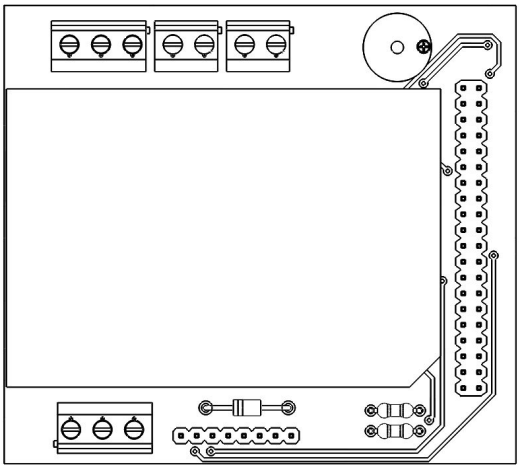
Snap the NEMA 5-15 outlet into the ⅛” acrylic outlet mount. It should snap into place when pressure is applied cannot be removed without depressing the tabs on either side. Set this component aside until needed.

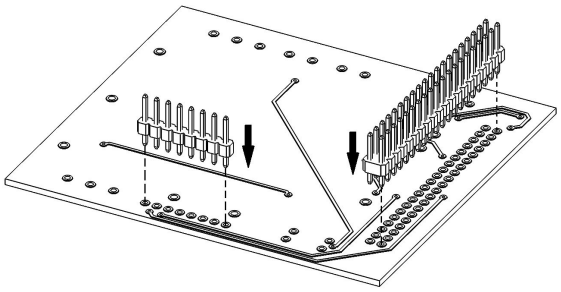




You will now begin assembling the printed circuit board (PCB). Ensure the board is in the proper orientation before beginning to mount components. Components will be placed on the top of the board but the through-hole pins will be soldered to the exposed pads on the PCBs bottom side.

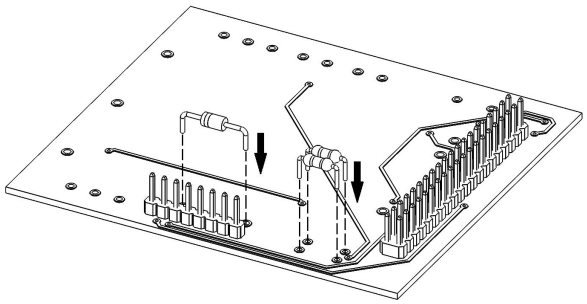
The final layout of the board will consist of eleven through-hole components. The image to the right may be used for reference to orientation if necessary. The components may be attached in any order but the following instructions outline the recommended process for assembly.

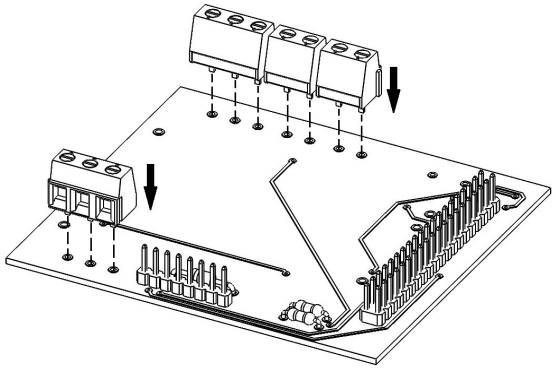




Mount the 1x8 and 2x20 header pin arrays to the PCB. Solder the exposed through-hole pins on the underside of the board.

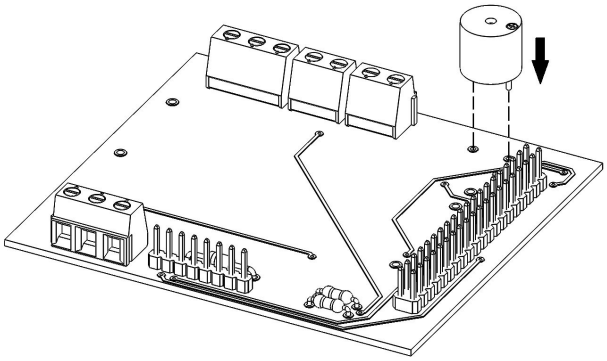
Mount the two resistors and the 1N4001 diode to the PCB. The 1kΩ resistor is mounted in the position closer to the board's edge. The diode is mounted such that the cathode mark is located on the side farthest from the resistors. Solder the through-hole pins on the bottom side of the board. The through-hole pins should be clipped after being mounted.

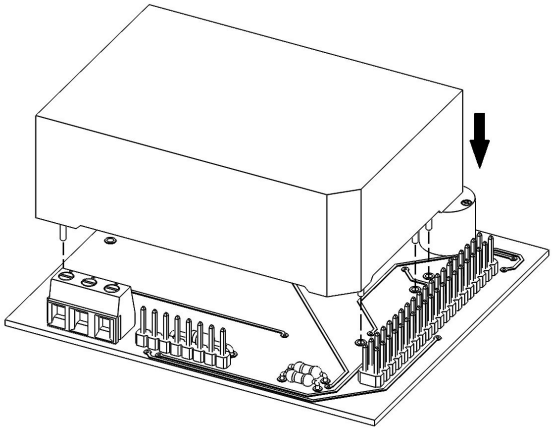




Mount the four terminal blocks to the PCB. Each block should be mounted such that wires can be inserted from the outside edge. If these terminal blocks are inverted, there will not be adequate room to insert wires. Solder the exposed through-hole pins on the bottom side of the board.

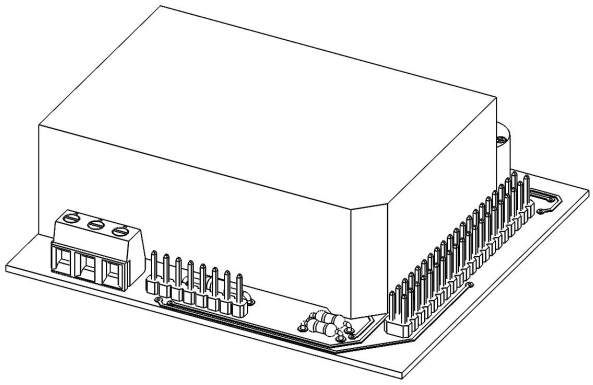
Mount the buzzer to the PCB. The buzzer should be oriented such that the positive lead is farthest from the terminal blocks. Solder the exposed through-hole pins on the bottom side of the board.

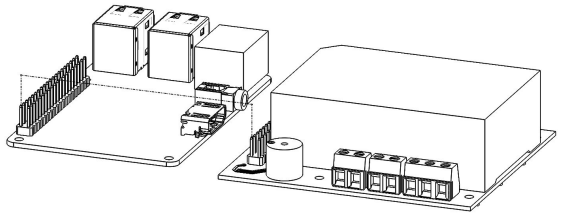




Mount the AC to DC converter to the PCB. The converter will only fit in one orientation due to the asymmetrical pin locations. Solder the exposed through-hole pins on the bottom side of the board.

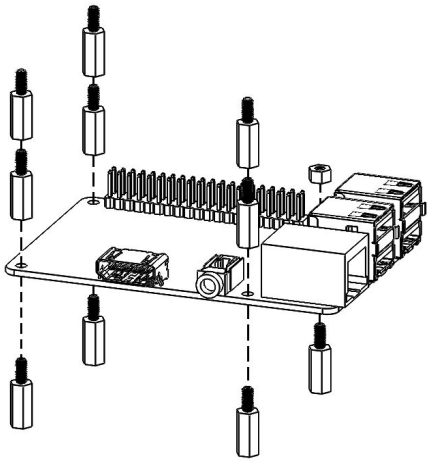
The PCB is now completed and is ready to be attached to the Raspberry Pi using the ribbon cable and standoffs.

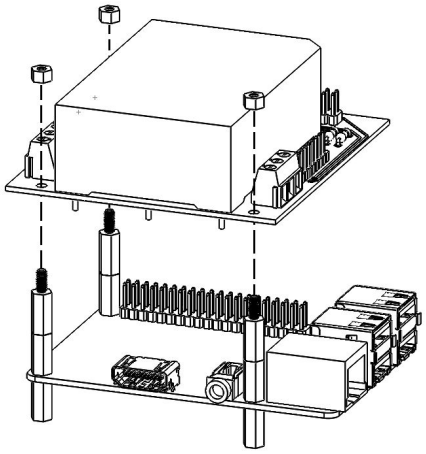




To attach the ribbon cable, place the Raspberry Pi and PCB in the shown orientation. When mounting using the standoffs, fold any additional length of cable in between the Raspberry Pi and the PCB.

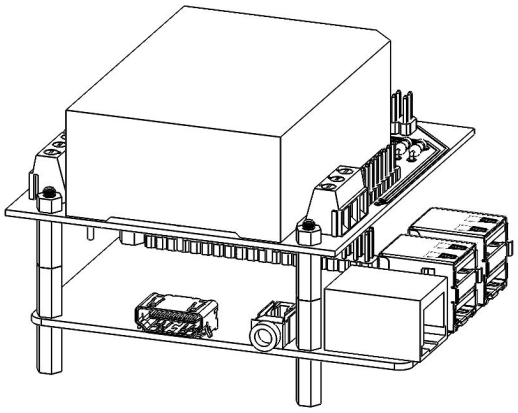
First mount the standoffs to the Raspberry Pi as shown. Note that the standoff placed directly behind the USB receptacle is attached directly to a nut and not to another standoff as is the case in the other three mounting holes.

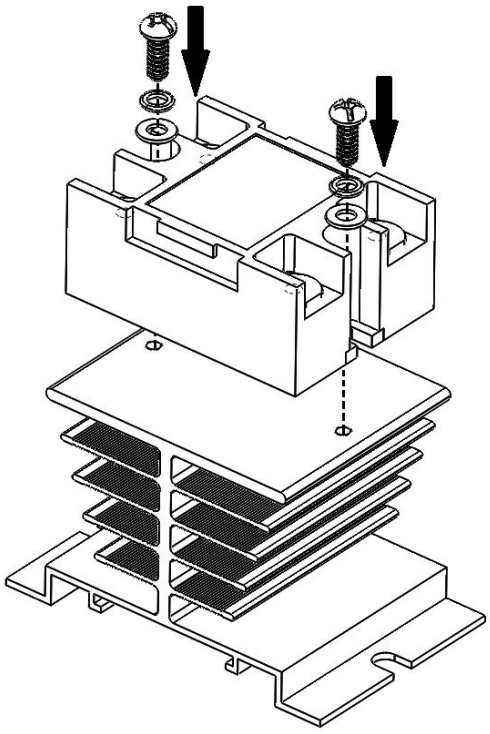




The PCB can now be mounted on top of the Raspberry Pi by aligning the mounting holes in the PCB with the standoffs. Note again that only three of the four mounting holes will be used.

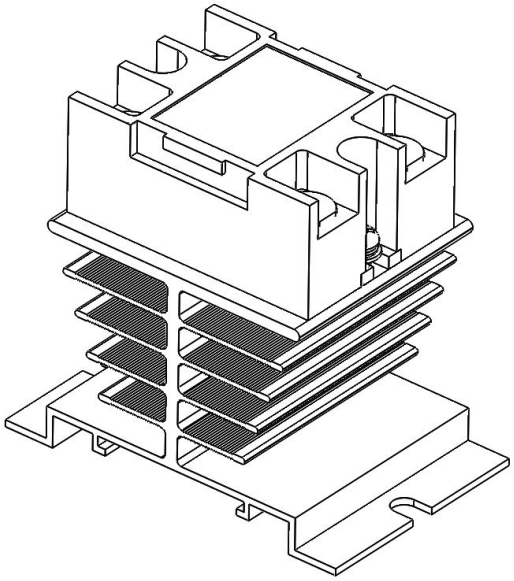
The completed assembly of the Raspberry Pi and PCB should appear as shown. Note also that the 2x20 headers should be connected with a ribbon cable at this point in the assembly procedure.

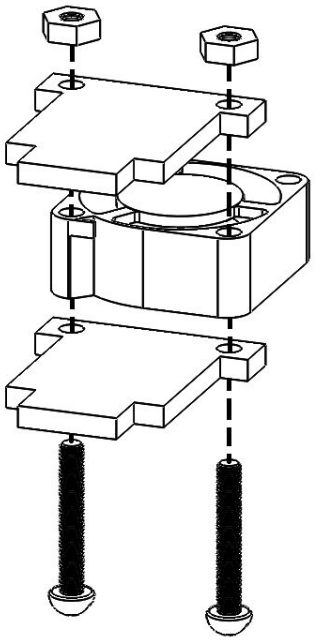




Mount the solid state relay (SSR) to the heat sink using the bolts and washers provided. Note that the smaller of the washers will be placed on the bolt first and the larger of the washers will contact the SSR directly. It is important in this step to **use thermal paste** between the SSR and heat sink. Place a small amount of thermal paste on the underside of the SSR before mounting it.

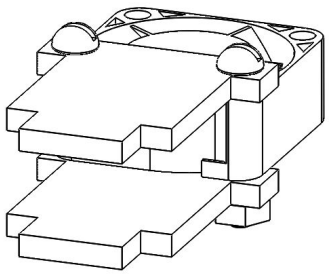
The completed assembly should appear as shown. If you failed to use thermal paste in the previous step, remove the SSR from the heat sink and repeat the previous step using thermal paste. Place the SSR and heat sink assembly aside until needed.

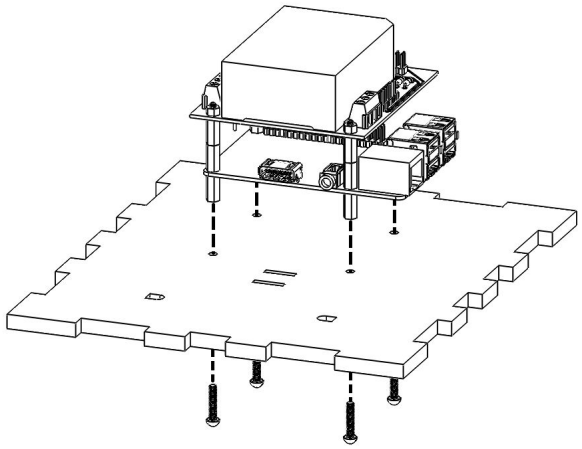




Attach the cooling fan to the ⅛” acrylic fan mounts as shown. Note that in the shown orientation, airflow will be directed toward the side of the mount on which the nuts are attached.

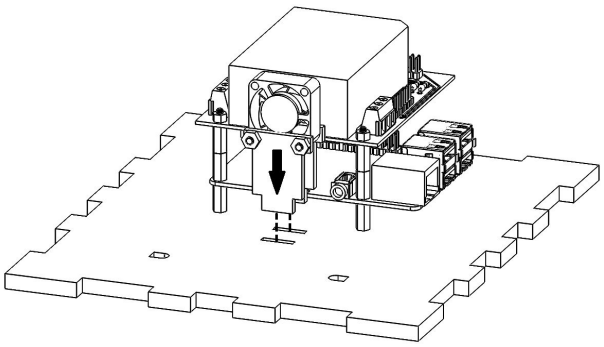
The completed assembly will appear as shown. Set the cooling fan assembly aside until needed.

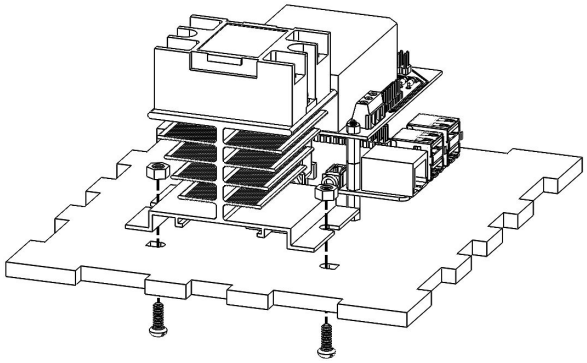




Begin assembling the final enclosure by mounting the previous assemblies to the enclosure’s bottom lasercut from ¼” acrylic. First mount the Raspberry Pi and PCB assembly. Screw bolts through the mounting holes in the acrylic and up into the threaded bottoms of the standoffs.

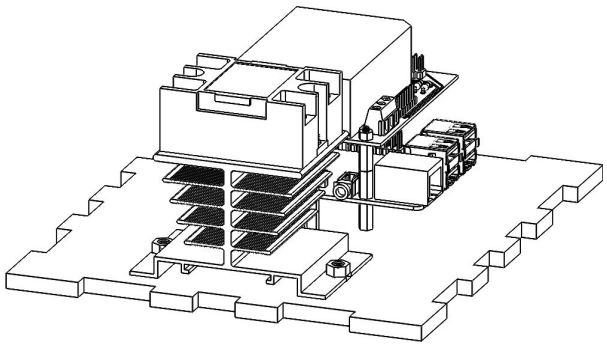
Next mount the cooling fan assembly. This assembly is pressure fit into the mounting slots in the acrylic. The cooling fan should be oriented such that air is blown away from the Raspberry Pi and PCB assembly. If assembled as shown, the assembly will be oriented such that the nuts are facing away from the Raspberry Pi and PCB assembly.

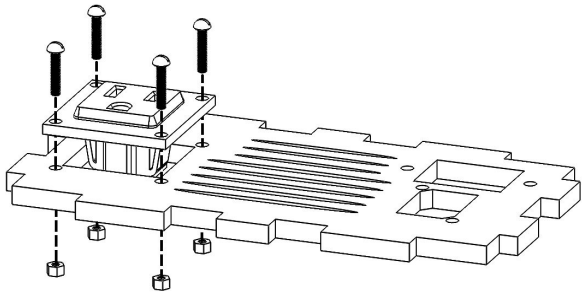




Next mount the SSR and heat sink assembly to the acrylic. This assembly should be mounted by running bolts up through the bottom of the acrylic and screwing them into nuts placed on the mounting slots in the heat sink. Note that the SSR should be oriented with the terminals labeled 1 and 2 to the left in the image shown and the terminals labeled 3 and 4 to the right in the image shown.

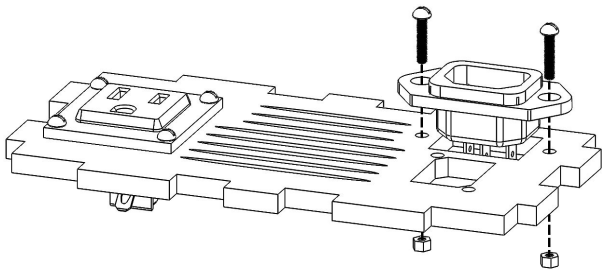
The finalized bottom assembly should appear as shown. Again note the orientation of the SSR. The terminals labeled 3 and 4 should be on the same side of the assembly as the ethernet and USB receptacles of the Raspberry Pi. Also note that the view shown of the assembly is from the rear.

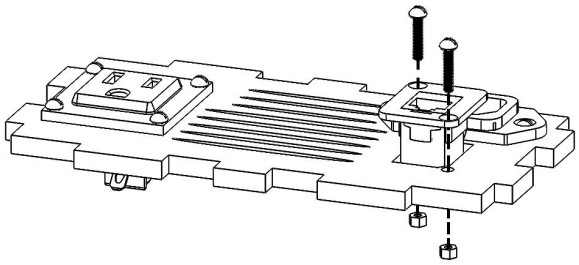




Continue assembling the module by mounting the outlet assembly to the rear acrylic face lasercut from ¼” acrylic. Begin by mounting the outlet assembly by running bolts through the external face and securing these to nuts on the inside face of the acrylic.

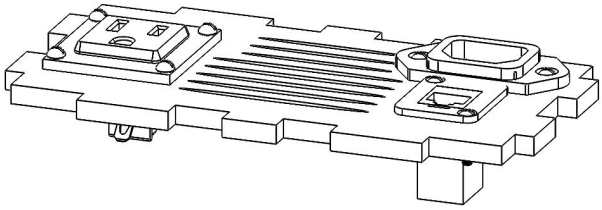
Continue by attaching the inlet to the rear acrylic face. Mount the inlet by running bolts through the external face and securing these to nuts on the inside face of the acrylic.

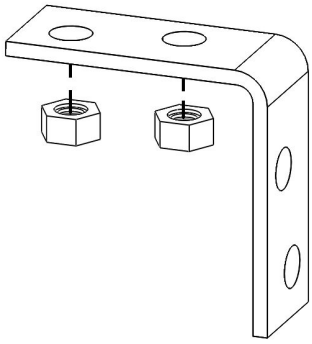




Mount the ethernet receptacle to acrylic face in the final mounting hole. Mount the receptacle by running bolts through the external face and securing these to nuts on the inside face of the acrylic.

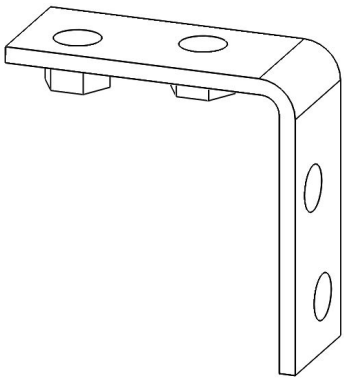
The completed rear face assembly should appear as shown. Ensure that all of the cooling slots are unobstructed to allow for optimal airflow. Set this face aside until needed.

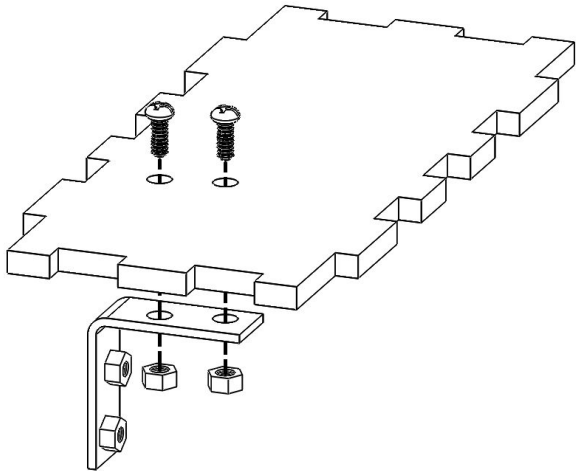




Prepare the L-bracket by gluing nuts to two of the holes. These nuts will be used to secure the top of the enclosure once the module is fully assembled.

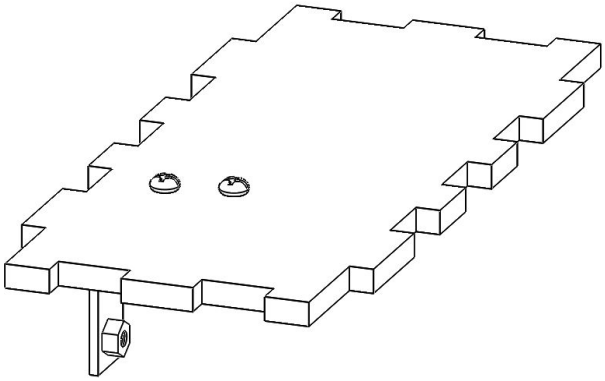
Be sure to allow adequate time for the glue to dry before proceeding. The L-bracket with attached nuts should appear as shown and may now be mounted to the acrylic.

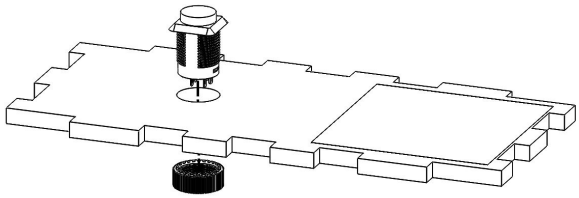




Mount the prepared L-bracket to the lasercut acrylic side of the enclosure. Mount The L-bracket by running bolts through the external face and securing these to nuts on the inside face of the L-bracket.

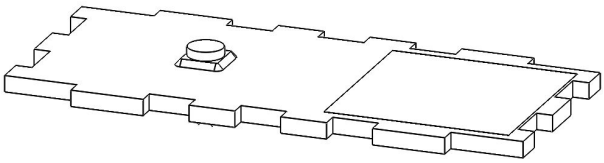
The assembled side of the enclosure should appear as shown. Set this face aside until needed.

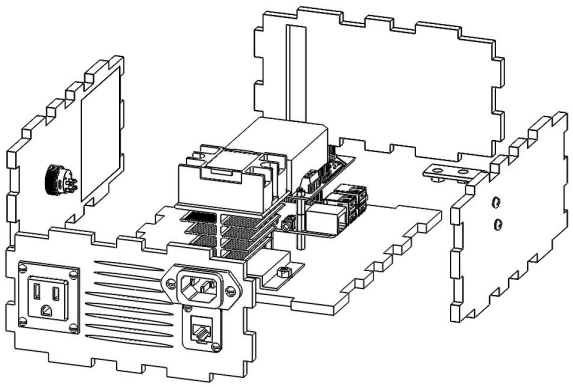




Mount the button to the corresponding acrylic face. Mount the button by unscrewing the threaded ring from the button's body, inserting the button through the mounting hole, and screwing the threaded ring back on.

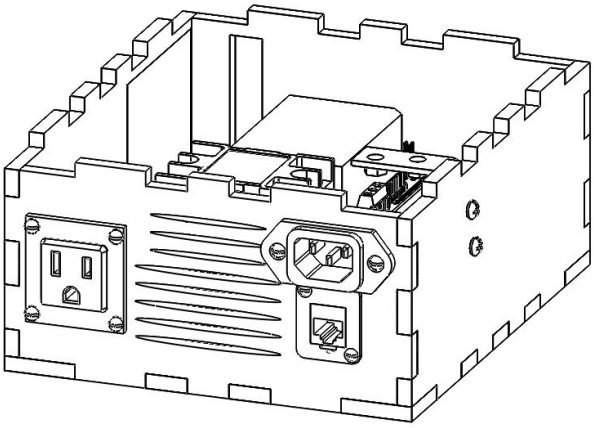
The assembled face should appear as shown. You will now move onto assembling the faces of the enclosure.

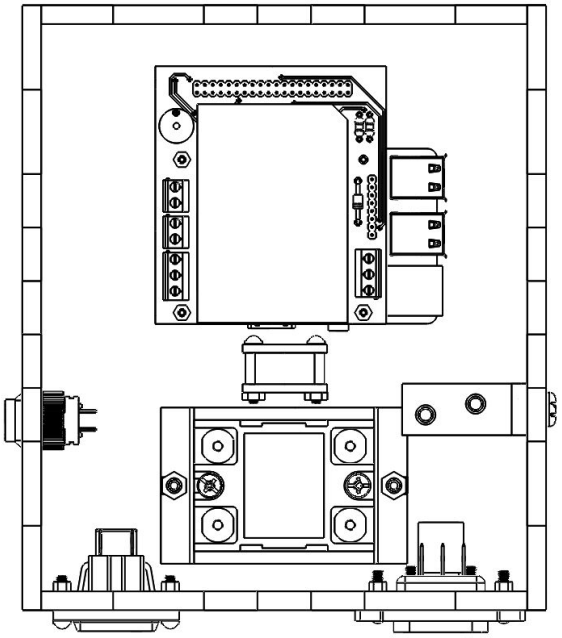




Attach the acrylic faces as shown. Note the orientation of each face. As shown in the image, the lasercut mounting slot for the card slot assembly should be located on the side of the enclosure with the button. Attach these faces by pressure fitting them, using glue, or using an acrylic solvent.

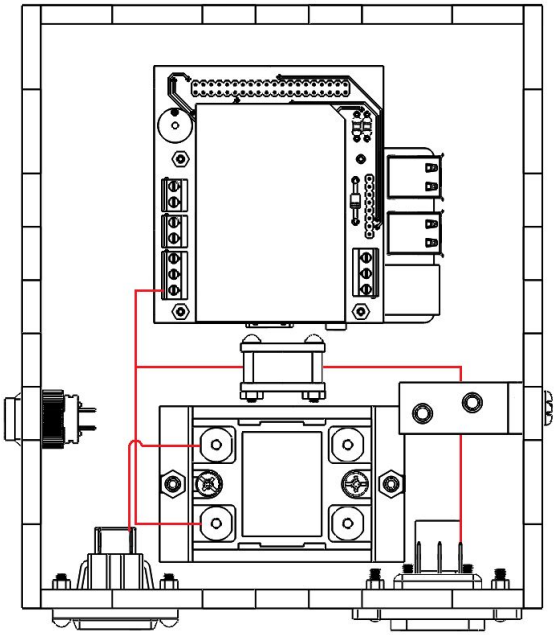
The assembly should appear as shown. Note again that this view is from the rear of the assembly.

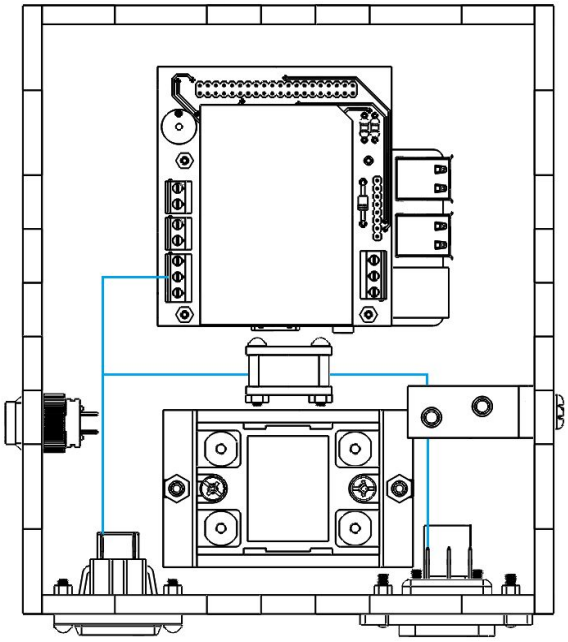




A top view of the assembly is shown as reference. Note that the card slot assembly has not yet been added to the assembly. The following diagrams show the paths of electrical connectivity which should be made using the wires prepared previously. Connections to the terminal blocks on the PCB should be made by using the screw terminals to secure exposed copper. Connections to the inlet and outlet should be made by using female spade quick connect terminals. Connections to the SSR should be made using ring quick connect terminals secured with the screws that come in the SSR.

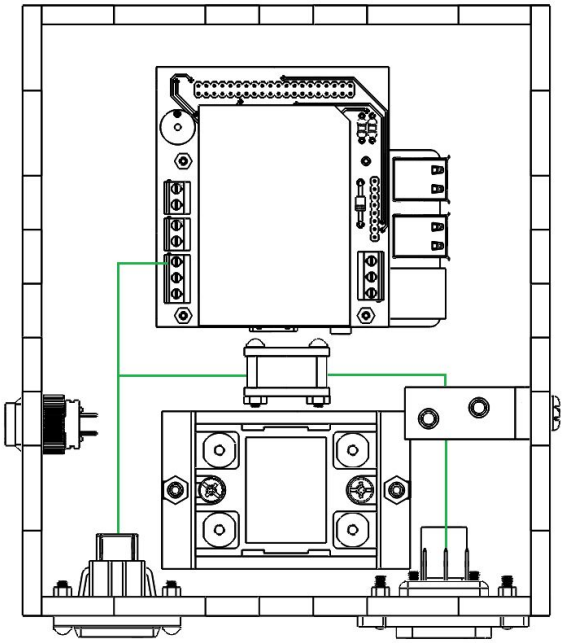
The red line in the shown image traces the path of the black 14 or 16 AWG live wire. Note that the wire passes underneath the cooling fan assembly in the space between the fan mounts. Note also that the SSR is in series with the live wire and that there is no direct electrical connection between the inlet and outlet.

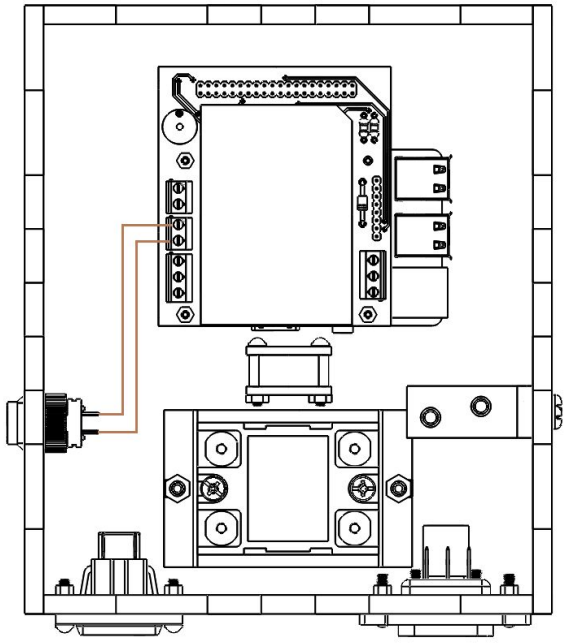




The blue line in the shown image traces the path of the white 14 or 16 AWG neutral wire. Note that the wire passes underneath the cooling fan assembly in the space between the fan mounts. Note also that there is a direct electrical connection between the inlet and outlet.

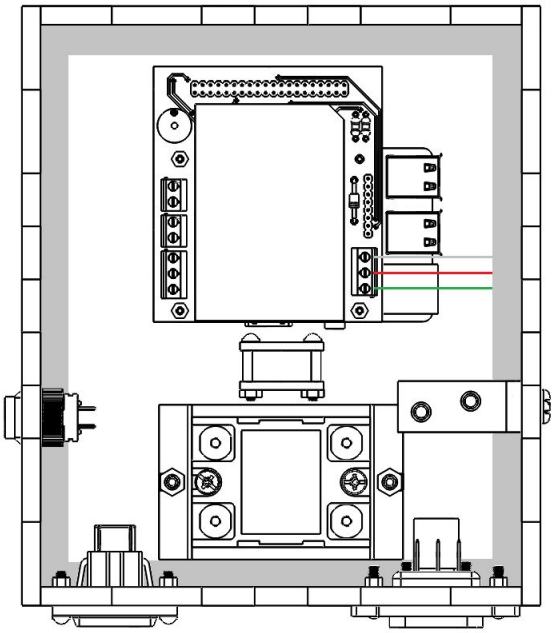
The green line in the shown image traces the path of the green 14 or 16 AWG ground wire. Note that the wire passes underneath the cooling fan assembly in the space between the fan mounts. Note also that there is a direct electrical connection between the inlet and outlet.

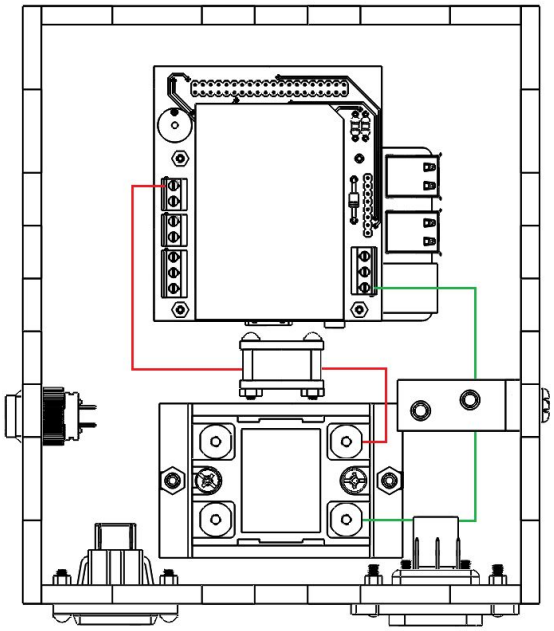




The brown lines in the shown image trace the paths of the signal wire between the button's leads and a terminal block on the PCB. Speaker wire or a twisted pair of wires is recommended to keep the space as organized as possible. Solder the wire to the leads of the button that are not labeled for power (depressing the button should produce a closed circuit between these leads while these leads are in a normally open state). The orientation of these wires is not significant as they are only responsible for creating a short between the two pins of the terminal block.

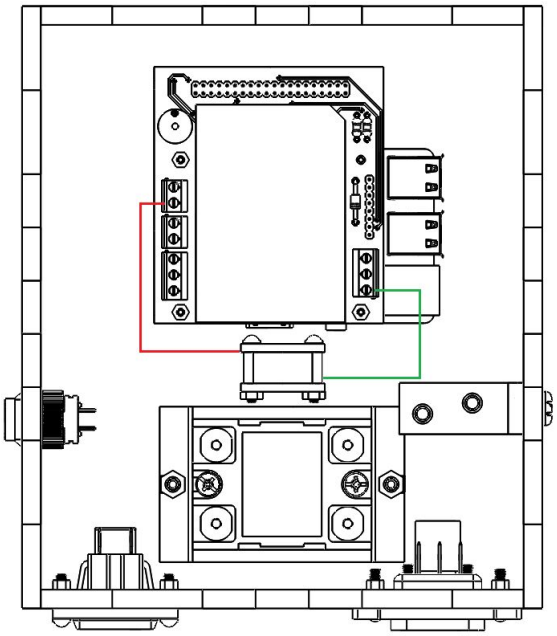
The grey border within the box represents the area in which the LED strip should be run. It is recommended that the LED strip be run along the base of the enclosure with the LEDs facing inward. The green line represents the ground wire (there are two but they are electrically connected internally; one can simply be cut and taped off), the red line represents the red voltage input wire, and the grey line represents the white signal wire. After wrapping the LED strip around the entirety of the enclosure's perimeter, the remaining length can be coiled and tucked under the corner of the Raspberry Pi.

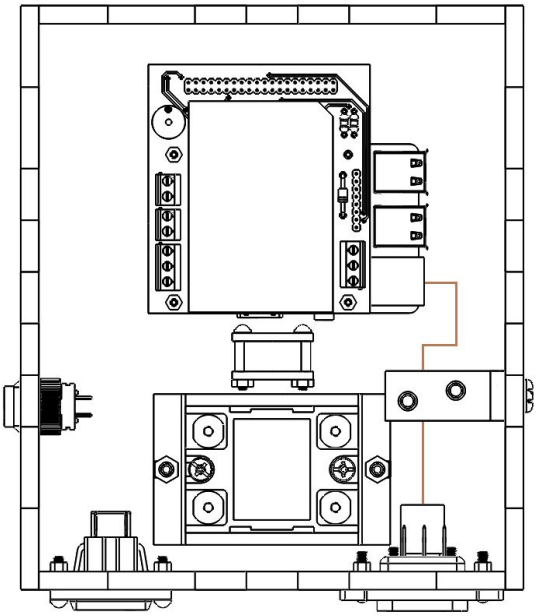




The paths shown in the accompanying diagram are for the signal leads of the SSR. The green line represents the ground wire that should be attached to terminal 4 on the SSR. The red line represents the positive signal wire that should be attached to terminal 3 on the SSR.

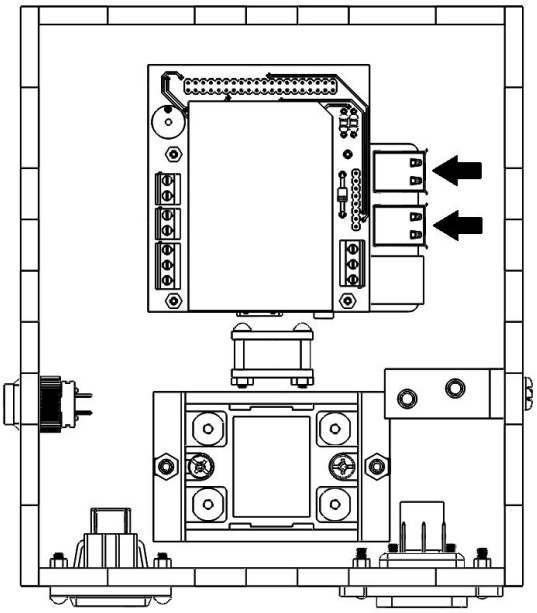
The paths shown in the accompanying diagram are for the power and ground wires from the cooling fan. The green line traces the path for the black ground wire for the cooling fan. The red line traces the path for the red power wire for the cooling fan.

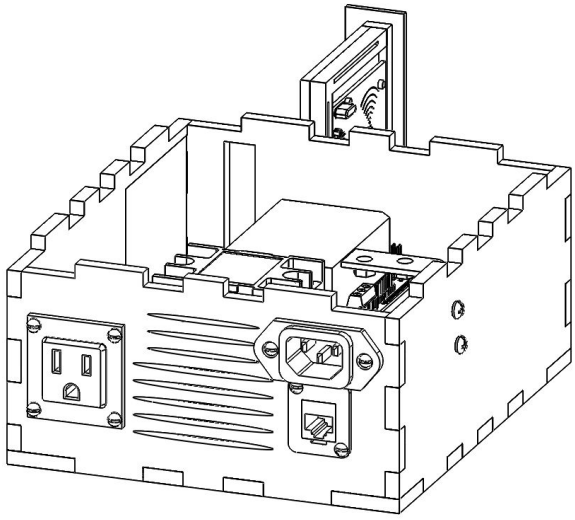




If ethernet will not be available in the target resource location, skip this step and continue. If ethernet will be available in the target resource location, connect an ethernet patch cable from the ethernet port of the Raspberry Pi to the ethernet receptacle mounted on the rear acrylic face of the module enclosure.

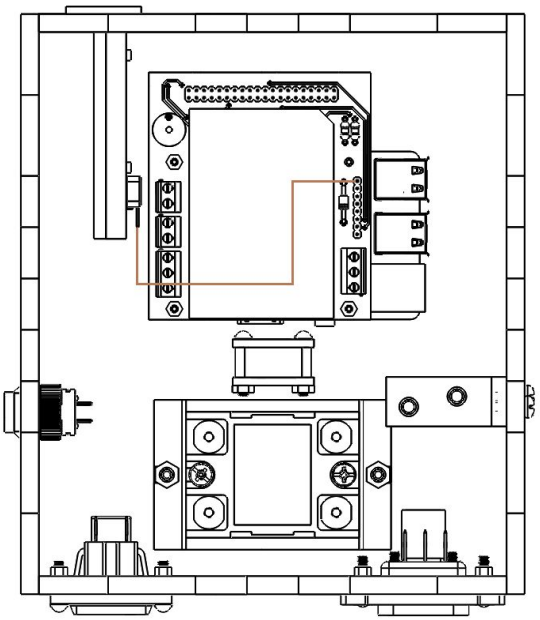
If you attached an ethernet patch cable previously, skip this step. If not, insert the USB WiFi dongle into one of the four available USB ports on the Raspberry Pi.

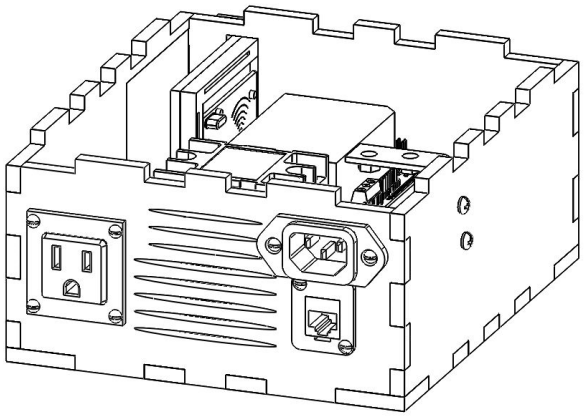




It is now time to attach the card slot assembly to the rest of the module. Attach the 1x8 ribbon cable to the leads of the RFID reader and feed them through the mounting slot. Now insert the card slot assembly into the mounting slot with the RFID reader facing inward toward the Raspberry Pi and PCB. You may need to rotate the LED strip next to the mounting slot if it impedes the card slot assembly. If the orientation is correct, the face of a card inserted into the card slot will be visible through the untextured portion of the enclosure wall. If this orientation is correct, attach the card slot assembly to the enclosure using glue.

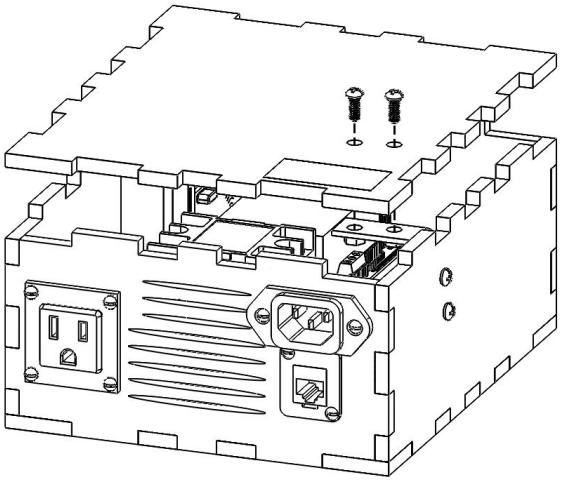
The ribbon cable should be attached to the 1x8 array of header pins on the PCB. The line traced in the image shows the path of the top pin of the RFID reader (from the shown perspective). This corresponds to the pin of the RFID reader labeled SDA.

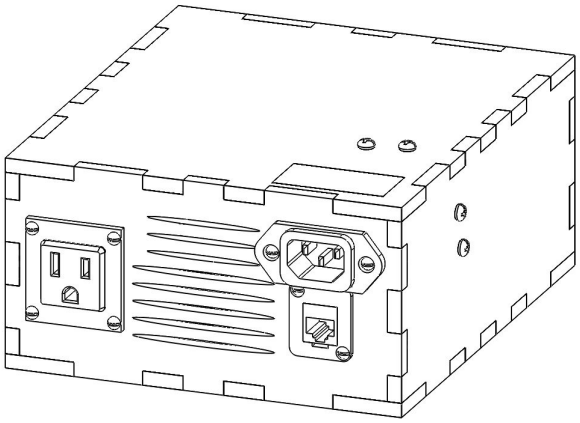




The assembled module should appear as shown. The Module should be fully functional at this point.

Place the acrylic top on the enclosure by pressing it into the corresponding slots in the frame. Screw the final two bolts into the nuts attached to the underside of the L-bracket.





The module should now appear as shown. Place the adhesive rubber feet on the face that will serve as the bottom of the module. The module is now ready to be implemented. To implement, attach ethernet to the exposed ethernet port on the box (if using ethernet and not WiFi). Power can then be applied to the inlet using a 14 AWG power cord.