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| v1 | v1.0 Board.jpgChapR Manufacturing Instructions  N  S  N  S  v1.3 PCB October 19th, 2014 |

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| Name: |  |  | Date: |  |  | ChapR #: |  |
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# http://media.digikey.com/Photos/Roving%20Networks%20Photos/RN-42.jpgPCB – RN-42

Soldering the RN-42 is one of the most key things for creating a ChapR. The pins are VERY close together and need to be lined-up perfectly with the PCB. **NOTE:** This step has likely already been done for you.

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|  | * 1. Tin the bottom pads of the RN-42 – wick afterwards to ensure no shorts. |
|  | * 1. Used double-sided tape on the bottom of the RN-42, so you can position it on the pads on the PCB. Ensure ***perfect positioning!*** |
|  | * 1. Solder one pad to lock-down the RN-42. |
|  | * 1. Re-inspect for ***perfect positioning***. If not, redo the previous step. |
|  | * 1. Solder all other pads, using wick if necessary to remove shorts. Check for shorts that may not be visible using the multimeter. |

# Soldering tips

When soldering, touch the side of the tip to the pad (gold ring on PCB (printed circuit board)) and the wire of the component you are soldering. Then push the solder against the junction. The solder should melt and cover the area. Apply extra solder to ensure that the solder flows through to the bottom of the board. Make sure you minimize the time the soldering iron spends touching a component, since components like the Arduino and transistors can be damaged by high heat. Remember not to create shorts while soldering, and clean the tip regularly to prevent shorts.

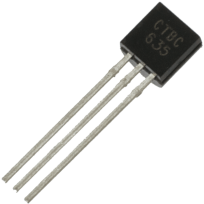
# http://maelabs.ucsd.edu/mae_es/partsnlinks/PopDataShts/Resistors_files/image018.gifPCB – Resistors

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|  | * 1. 400px-Resistor_color_code_chart_modPlace resistors on top of PCB. It is best to create a ninety degree angle at the junction of the resistor and wire, so that the resistor is flush to the board. The diagram and chart to the right will tell you what kind of LED you have (multiplier means 10^multiplier). You can look on the silkscreen (the white lettering on the board) to find where that specific resistor goes. |
|  | * 1. Solder from top of board. |
|  | * 1. Inspect all solder joints. |
|  | * 1. Clip leads. |

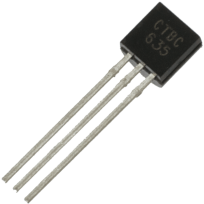
# PCB –Diodes

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|  | * 1. Place diodes on top of PCB – ensure that they are flat and LINED UP correctly. The lines must match the PCB illustration. That is, the black line on the diode should match up with the white line on the diode. |
|  | * 1. Solder from top of PCB.   Line |
|  | * 1. Inspect all solder joints. |
|  | * 1. Clip leads. |

# PCB – Transistors



3906



3904

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|  | * 1. Two transistors are mounted from top of PCB – the silkscreen should have the numbers 3906 and 3904, which indicate the correct resistor to use. Use the shape of the transistor to match the shape of the symbol on the silkscreen. Press down to position about 1/2 inch above PCB. |
|  | * 1. Bend one pin at the bottom of PCB to keep in place and solder the other two pins from the bottom. |
|  | * 1. Un-bend the other pin and solder it. |
|  | * 1. Inspect all solder joints. |
|  | * 1. Clip leads. |

# PCB – Arduino Preparation

CAUTION: Please do not perform this step or any after it if there isn’t a RN42 on your board. It is incredibly difficult to solder an RN42 on with an Arduino or VDIP in the way.

The Arduino is first “prepared” before it is soldered. This consists of soldering the pins to the Arduino board but NOT soldering it to the PCB yet. The PCB is used, however, as the line-up mechanism for the pins for the Arduino board.

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|  | * 1. Place ***two*** 12-pin headers on PCB in appropriate positions for Arduino with the long pins of the header in the PCB. |
|  | * 1. Place ***two*** 2-pin header in the positions marked XXXXX on the PCB with the long pins of the header in the PCB. This matches the two holes on the Arduino close to VCC/A3/A2. |
|  | * 1. Orient and place the Arduino, face up, on top of the pins and solder all headers to the Arduino. |
|  | * 1. Inspect all solder joints. |
|  | * 1. http://www.codingcolor.com/wp-content/uploads/2010/11/setUpProMini_breakaway.jpghttp://www.codingcolor.com/wp-content/uploads/2010/11/setUpProMini_breakaway.jpgRemove Arduino from PCB and insert 6-pin header ON TOP of Arduino – the short pins of the header go into the Arduino board. |
|  | * 1. Place Arduino upside-down on table, allowing 6-pin header to flare outwards. Solder the 6-pin header from the bottom of the Arduino. |

# PCB – Arduino Installation

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|  | * 1. Place the prepared Arduino on the PCB, pushing it down onto the board as flush as possible. You may need to use your pinky to hold the Arduino to the board for the first two pins. |
|  | * 1. While holding the Arduino flush, solder two opposite corner pins on the Arduino from the bottom of the PCB – to keep it flush. |
|  | * 1. Solder all remaining pins. |
|  | * 1. Inspect all solder joints. |

# PCB – VDIP

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|  | * 1. Insert the VDIP into the PCB. |
|  | * 1. While holding the VDIP as flush as possible to the PCB, bend down two corner pins under the PCB to lock the VDIP in place. Then ensure that it is flush to the PCB.   Top Jumper |
|  | * 1. Solder all remaining other (non-bent) pins. |
|  | * 1. Unbend and solder the two corner pins. |
|  | * 1. Inspect all solder joints. |
|  | * 1. Move the top(right, east) jumper to the other two pins. |

# PCB – Buttons

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|  | * 1. Mount the power button (red) and bend the flanges to be flush with the bottom of the PCB (placement direction doesn’t matter). Red goes on the left. |
|  | * 1. First, solder one flange. Then check the straightness of the button. Once you’ve determined that the button is straight, solder the other flange. |
|  | * 1. Mount the action button (black) and bend the flanges to be flush with the bottom of the PCB (placement direction doesn’t matter). Black goes on the right. |
|  | * 1. First, solder one flange. Then check the straightness of the button. Once you’ve determined that the button is straight, solder the other flange. |

# PCB – Speaker

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|  | * 1. Check the backside of the speaker for the plus sign and line it up with the plus sign on the board. |
|  | * 1. Bend one pin on the back to hold it in place and solder the other pin from the bottom. |
|  | * 1. Bend the pin back and solder, clip. |

# PCB – LEDs



Short  
Node

Identify the long lead of each LED – this is the positive lead. If the LED leads have been cut, the long lead side can be determined by finding the short node inside the LED.



Long Lead

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|  | * 1. Starting with the green LED, insert it next to the black button with the positive side South (long lead). Line up the top of the LED to the top of the black button when pressed, and bend the long lead so that the LED hangs at the right height when the PCB is upside down. Solder the short lead. |
|  | * 1. Unbend the long lead and go back to the top side of the PCB and ensure that the LED is aligned to the center of the buttons. |
|  | * 1. Solder the long lead. |
|  | * 1. Insert the blue LED with the long lead South, bending the long lead to allow the blue LED to hang at the same height as the green LED. Solder the short lead. |
|  | * 1. Unbend the long lead and go back to the top side of the PCB and ensure that the LED is aligned to the center of the buttons. |
|  | * 1. Solder the long lead. |
|  | * 1. Clip leads. |

# PCB – 9V Snap

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|  | * 1. Tin the wires to stiffen them. |
|  | * 1. Insert and bend opposite ways. BLACK IS NEGATIVE. |
|  | * 1. Solder to board, making sure that black is lined up with minus sign and it sticks up above the board. |

# Case Creation

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|  | * 1. Clip northwest or southeast pylon on case. |
|  | * 1. Screw down board to case. |
|  | * 1. Hand off the ChapR to Rachel (so she can execute step 14) |
|  | * 1. Drill holes in lid using template. |
|  | * 1. Clip a small passageway for battery cord on battery case. You should make a V |
|  | * 1. Tie knot in battery cord near board. |
|  | * 1. Put a label (from the label maker) on the bottom right corner of the end cap, using the number you receive from board bring up. |

# Initial Programming & Bring-up

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|  | * 1. Label the bottom half of the case in Sharpie |
|  | * 1. Plug in the battery and make sure nothing happens. Then take out the battery. |
|  | * 1. Load the program and run through board bring-up |
|  | * 1. Unplug the ChapR from the computer and boot the ChapR in pairing mode (should take approximately 2 seconds to boot) |
|  | * 1. Connect to the ChapR via Bluetooth |
|  | * 1. Use remote start to start the testing program |
|  | * 1. Check action button, basic responses and kill switch |
|  | * 1. Power off the ChapR (should take two seconds to shut down) |
|  | * 1. Put in a battery known to be under 6.5V and check that the green LED flashes when the ChapR is turned on |
|  | * 1. Turn the ChapR back off, then put the original (and hopefully good) battery back |
|  | * 1. Turn on the ChapR and connect it to a different brick with a USB cable |
|  | * 1. Wait for connection, then turn off the ChapR and log it in the spreadsheet |

# Shipping

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|  | * 1. Check the jumpers on the VDIP, the LED fixing, the stress relief on the battery (notch and knot), the signatures on the top part of the case and the label on the front and inside of the case. |
|  | * 1. Assemble the ChapR |
|  | * 1. Put in a battery and make sure the ChapR turns on |
|  | * 1. Connect to a brick and run button tester before turning the ChapR off |
|  | * 1. Fill out a mailing label and put it in the lower right corner of a box |
|  | * 1. Make sure the spreadsheet entry is updated |
|  | * 1. Put down two layers of bubble wrap, then set the ChapR inside |
|  | * 1. Take out the 9V battery, then put a baggy-with-a-9V next to the ChapR |
|  | * 1. Fill all the spaces with packing peanuts |
|  | * 1. Place the USB cord (and a programmer if need be) on top of the ChapR |
|  | * 1. Close the box and tape all the edges |
|  | * 1. Shake to be sure nothing rattles |
|  | * 1. Ship it! |
|  | * 1. Get tracking number?\* |
|  | * 1. Make sure an email is sent?\* |