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| v1 | v1.0 Board.jpgChapR Manufacturing Instructions  N  S  N  S  v1.0 PCB October 29, 2013 |

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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.

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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. |
|  | * 1. After finishing the RN-42, test using voltmeter to find shorts. |

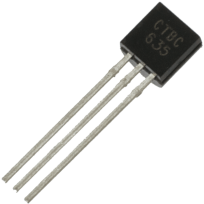
# http://maelabs.ucsd.edu/mae_es/partsnlinks/PopDataShts/Resistors_files/image018.gifPCB – Resistors

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|  | * 1. 400px-Resistor_color_code_chart_modPlace resistors on top of PCB – ensure that they are flat |
|  | * 1. Solder from top of board |
|  | * 1. Inspect all solder joints |
|  | * 1. Clip leads |

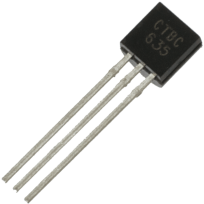
# PCB –Diodes

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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 |
|  | * 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 – note positioning of 3906 and 3904. Insert as indicated and press down to position about ¼ inch above PCB. |
|  | * 1. Bend one pin at the bottom of PCB to keep in place and solder from bottom, the other two pins |
|  | * 1. Un-bend the other pin and solder it |
|  | * 1. Inspect all solder joints |
|  | * 1. Clip leads |

# PCB – Arduino Preparation

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. |
|  | * 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 onto the PCB   Top Jumper |
|  | * 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. |
|  | * 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 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. |
|  | * 1. Solder the button to the PCB using a significant amount of solder |
|  | * 1. Mount the action button (black) and bend the flanges to be flush with the bottom of the PCB. |
|  | * 1. Solder the button to the PCB using a significant amount of solder. |

# 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. TODO – LED fixing instructions |
|  | * 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 11) |
|  | * 1. Drill holes in lid using template. |
|  | * 1. Clip a small passageway for battery cord on battery case. |
|  | * 1. Tie knot in battery cord near board. |
|  | * 1. Machine the front plate…\* |
|  | * 1. Label the lid of the case and hunt down Rachel, Ben and Akshay so they’ll sign it, then sign exactly where Rachel instructs so the cases all look the same |
|  | * 1. Put a label (from the label maker) on the bottom right corner of the front plate |

# 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?\* |