LushOne Echo Synth Module
Build Instructions

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Getting started

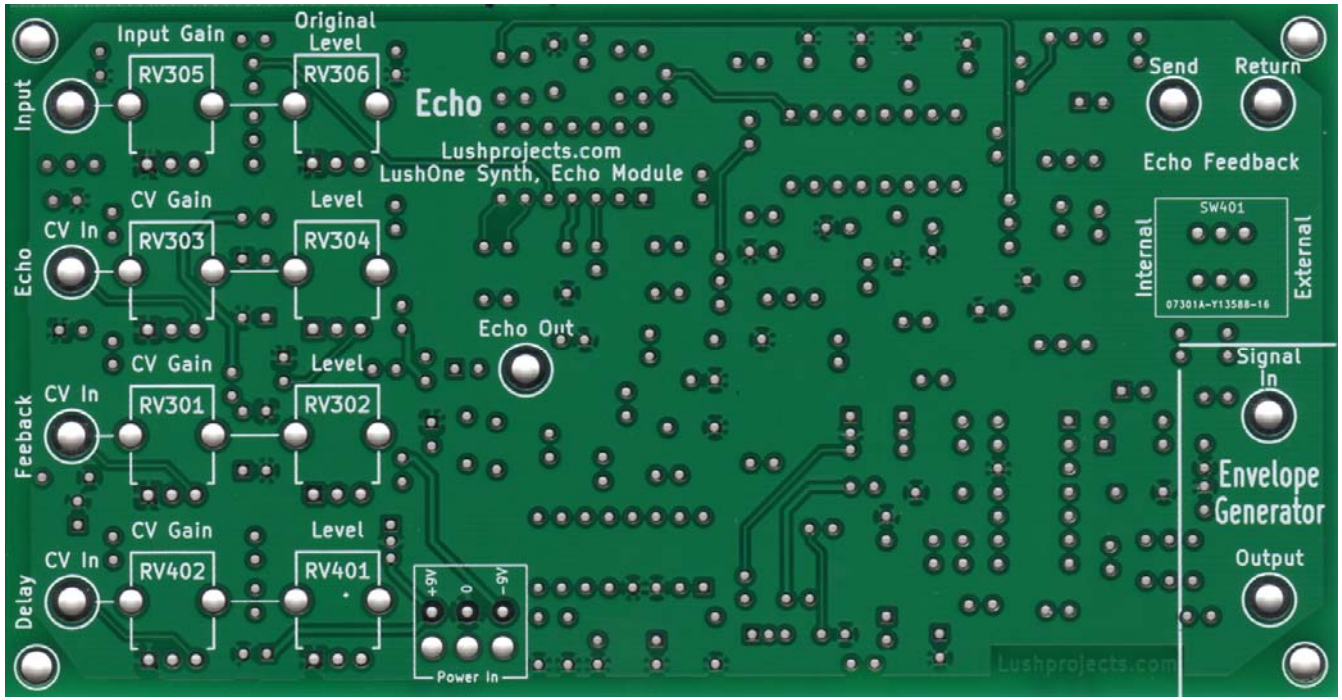
- If you can build the LushOne base module then then building the Echo should be easy
- Remember:
  - Accuracy and neatness is more important than speed
    - Get it working first time
  - These instructions will guide you but I assume you are familiar with basic techniques and equipment
- All components except the power-in are mounted on the circuit board – no slow, fiddly point to point wiring!

Build order

Build in any order you like, but I suggest:

- Patch sockets
- ICs
- Resistors, capacitors
- Transistor, diodes
- Power leads
- Internal/External feedback switch
- Variable resistors

Front



The following components are mounted from the front:

- Patch sockets
- Variable resistors

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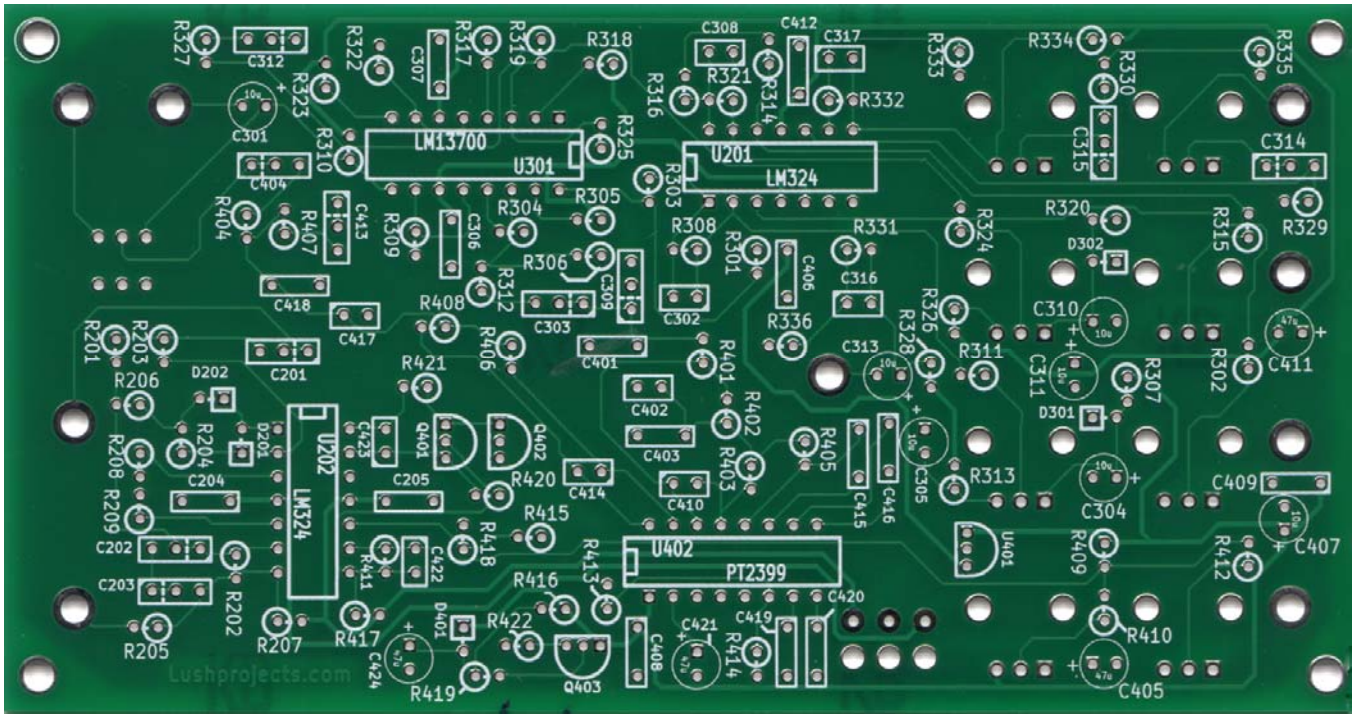
Back



The following components are mounted from the back:

- Everything not on the front!

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Patch sockets

- 9 small silver patch sockets fit from front of board
- Fit in the large, labelled circles
  - Not the four mounting holes in the extreme corners
- Solder round rim on back
- Suggest you fit first so you can make them sit nicely flush with the board

ICs

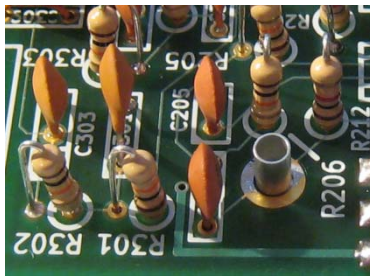
Designation	Type	Comment
U201,U202	LM324	14 Pin
U301	LM13700	16 Pin
U401	78L05	3 Pin transistor-style case
U402	PT2399	16 Pin

- All ICs are mounted from the back
- ICs are provided unsocketed
  - You can add sockets if you like!
- Positions and orientations are marked on the silk-screen
  - Pin 1 also has a square pad
- The voltage regulator has the same case as the transistors – check the labels!
  - Orientation is shown on silk-screen

Resistors

Value	Resistors
220R	R413
470R	R205, R304, R306, R317, R319
1k	R307, R320
1.5k	R421
2.2k	R207, R310, R323, R328, R334, R411, R418
2.7k	R401
4.7k	R303, R316, R417, R422
5.6k	R209
8.2k	R305, R318
10k	R206, R208, R313, R326, R403, R404, R407, R416
15k	R402, R405, R406, R408
22k	R201, R203, R204
27k	R312, R325
33k	R309, R322
47k	R202, R332, R335, R419
68k	R415
100k	R327, R329, R330, R331, R333, R336, R410, R412, R414
180k	R409
330k	R301, R302, R308, R311, R314, R315, R321, R324
1M	R420

- All resistors are mounted from the back
- Resistors are all mounted vertically
- Labels are not in a set position relative to the symbol – look for the closest label
- The round silk-screen symbol shown in the photo shows the resistor locations
- Resistor colours are on next page

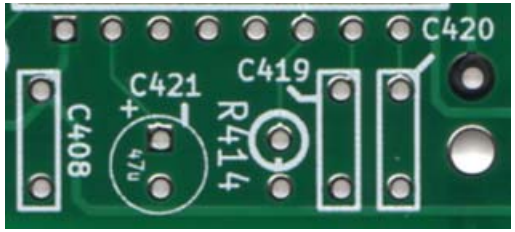


Resistor colours

Value	Colours
220R	Red, Red, Brown, Gold
470R	Yellow, Purple, Brown, Gold
1k	Brown, Black, Red, Gold
1.5k	Brown, Green, Red, Gold
2.2k	Red, Red, Red, Gold
2.7k	Red, Purple, Red, Gold
4.7k	Yellow, Purple, Red, Gold
5.6k	Green, Blue, Red, Gold
8.2k	Grey, Red, Red, Gold
10k	Brown, Black, Orange, Gold
15k	Brown, Green, Orange, Gold
22k	Red, Red, Orange, Gold
27k	Red, Purple, Orange, Gold
33k	Orange, Orange, Orange, Gold
47k	Yellow, Purple, Orange, Gold
68k	Blue, Grey, Orange, Gold
100k	Brown, Black, Yellow, Gold
180k	Brown, Grey, Yellow, Gold
330k	Orange, Orange, Yellow, Gold
1M	Brown, Black, Green, Gold

Capacitors

Value	Capacitors	Type
22p	C302, C308, C316, C317, C422	Ceramic
100p	C423	Ceramic
560p	C410, C414	Ceramic
1n	C402, C417	Ceramic
4.7n	C403, C418	Ceramic
10n	C401	Ceramic
100n	C204, C205, C306, C307, C406, C408, C409, C412, C415, C416, C419, C420	Ceramic
1u	C201, C202, C203, C303, C309, C312, C314, C315, C404, C413	Ceramic (Multi-Layer)
10u	C301, C304, C305, C310, C311, C313, C407	Electrolytic
47u	C405, C411, C421, C424	Electrolytic



- All capacitors are mounted from the back
- Capacitors are marked with one of the symbols shown above
- For electrolytic capacitors the “+” lead (longer lead) is labelled and indicated by the square pad.
- Some capacitors may come with either wide or narrow leg spacing. Connect as shown below.

Connect narrow legs to these pads

Connect wide legs to these pads

Capacitor markings

Value	Marking
22p	220
100p	101
560p	561
1n	102
4.7n	472
10n	103
100n	104
1u	105 or 1u

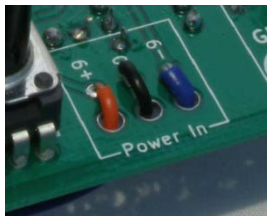
Transistors, diodes

Q401, Q402	2N3904 NPN
Q403	2N2906 NPN

D201, D202, D301, D302, D401	1N4148

- All Transistors and diodes are mounted from the back.
- Transistors are marked showing the package orientation. Check you have the transistors and not the voltage regulator!
- There are both NPN and PNP transistors – check you have the right one
- Diodes are all vertically mounted and shown with the square symbol.
  - The diode's stripe should be towards the printed square / square pad
  - Small line coming out of square on silk screen shows direction of the lead.

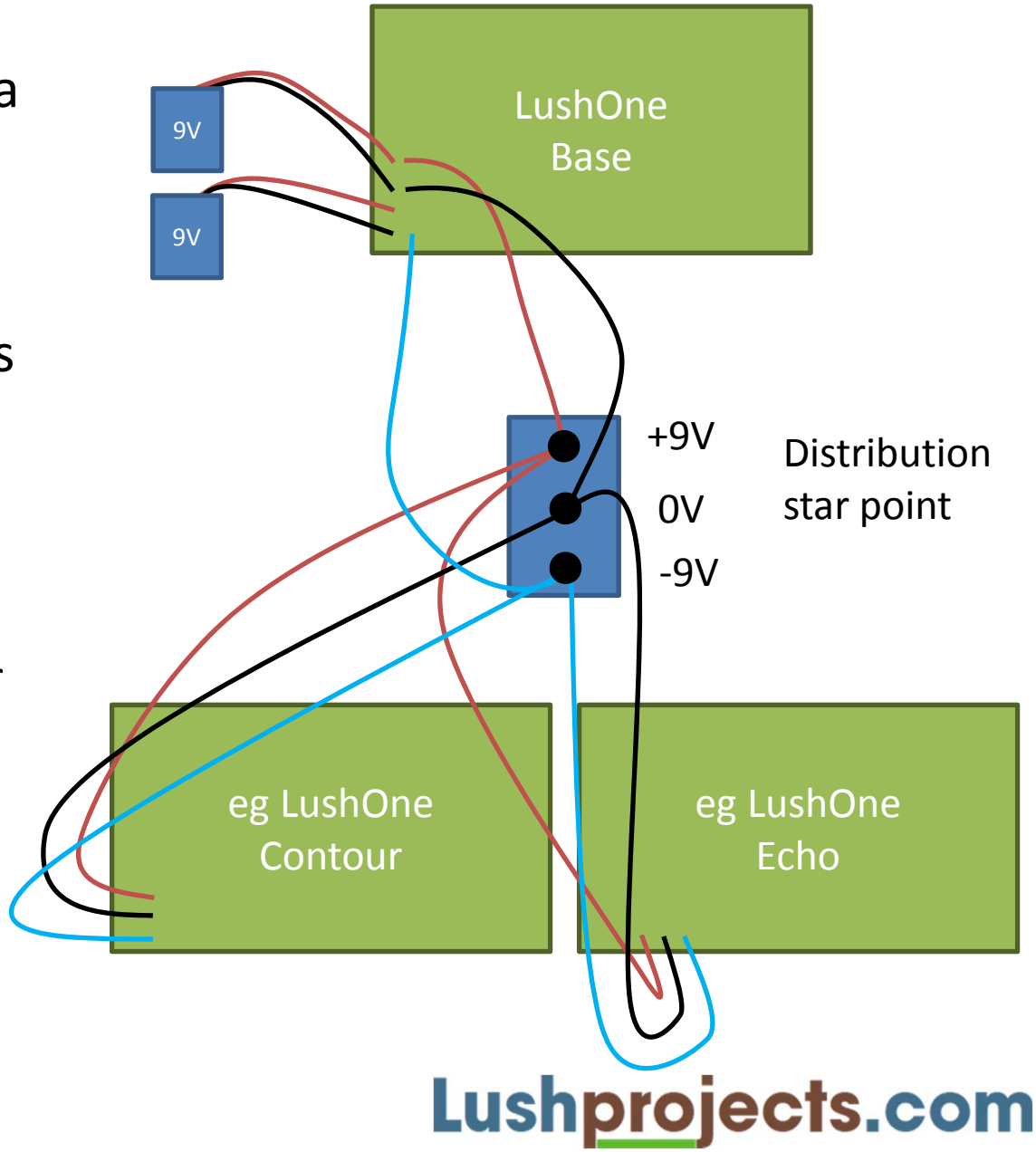
Power leads



- The LushOne Echo can be connected to the LushOne base module for power
- Connect three leads to the LushOne Echo “Power In” connectors
- Suggest:
  - Red = +9V
  - Black = 0V
  - Blue = -9V
- Connect other end of power leads to the spare terminals next to the Power In on the LushOne base
- If you have more than two modules in your system see next slide

Power with more than two LushOne modules

- To connect more than one LushOne module to a LushOne base it is desirable to use a “star” power connection point
- A simple terminal block is an easy choice
- Connect as shown in the diagram
  - Switched output of LushOne base goes to star point
  - Each additional module connects to the star point for its power



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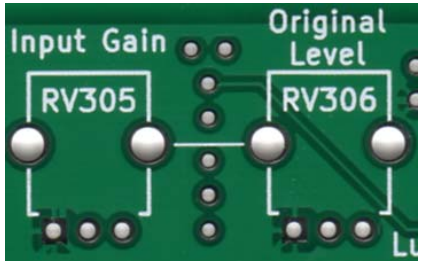
Internal/External switch

- Connect the Internet/External feedback switch to the front of the board where indicated
- The switch can go in either way round

Variable resistors



RV301, RV302, RV303, RV304, RV305, RV306, RV401, RV402	10k

- Eight variable resistors are mounted where shown on front of board
- You may need to bend the pins slightly to make them sit properly

Checking time

- Congratulations – building should now be complete!
  - Take a break
- Time to check:
  - No parts left-over
  - All parts (particularly ICs) in the right way
  - No bad solder joints or unsoldered joints
  - Power connectors on correctly (very important!)
  - No solder bridges or other problems
- Good luck

Testing

Follow the quick reference guide or the tutorials to test the functions of the LushOne Echo

…now go play