

Hydronium Tabletop Assembly Guide

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Tabletop

Skills required

This is an intermediate skill level kit. We strongly suggest you practice on a simpler synth DIY project before beginning here. In addition, it can help you to have basic knowledge of electricity, and be familiar with the use of a digital multimeter.

You must be able to read fine print and identify colors. Use a magnifying glass, loupe, etc., to read the printing on the PCB, identify the colored stripes on the resistors, and read the faint laser markings on the chips and capacitors.

Work space

You should work on a suitable work surface such as a large, clean desk. You must have bright lighting at the workstation to avoid assembly errors. Use a tray to keep the parts organized as you unpack the kit.

Avoid breathing flux vapor. Use a fan for airflow across the desk, work near an open window, or use a smoke absorber.

Tools required

Your soldering iron must be of good quality (Hakko, Weller, MetCal, etc.). Don't use an oversized 50-year old soldering iron from the vacuum tube era, or an *el Cheapo* hobby store iron. The tip of your soldering iron must have a fine point.

To test the soldering iron:

- Plug it in and set it to a medium-high heat level. Wait 5 minutes.
- Wipe the tip on a damp sponge, then touch your solder to the tip of the iron. Observe what happens.

The solder must melt immediately, releasing a puff of flux vapor. The molten metal must cling to the tip of the iron, flowing freely to coat it like it has been wet with a drop of water. But, if the solder is reluctant to melt, and forms a bead that “runs away” from the tip, then the iron is bad, so don't use it or you will risk ruining the project.

You'll also need: fine tipped flush-cutting pliers, small needle-nose pliers, wire stripper, and a visual magnification aid such as a magnifying glass or jeweler's loupe. Hex sockets of various sizes are useful to tighten the panel nuts.

Solder

Use an electronics-type solder that is 0.032" diameter with rosin flux core. It can be lead-free (SAC305) or Sn/Pb alloy.

DO NOT use water-soluble flux. DO NOT use "paste flux". RA Flux, RMA Flux, No-Clean, and Glow-Core are ok.

De-soldering

You must be very careful when soldering. It takes much more effort to remove solder than to add it.

A common error is to let the tip of the iron touch two solder pads at the same time. You'll make a good connection where you wanted it, but the molten solder will also flow into the open hole of the adjacent pad and plug it. Then you won't be able to insert a component later, until after you have cleared the unwanted solder that is plugging the pad.

To remove solder, you can use de-soldering braid ("solder wick") or a vacuum syringe ("solder sucker").

If you aren't careful when de-soldering components, it is easy to damage the PCB copper foil. That's because the PCB material becomes soft while it is hot. In that state, the thin copper foil can easily lift off (de-laminate) and tear, requiring careful repair.

Resistors

This kit has a lot of resistors. Use a magnifying glass and desk lamp to read the color codes. To keep them organized, leave the carrier tape on the resistors until just before you assemble them.

We have tried to supply all the resistors of each value as a continuous section of cut tape. However you may find that 12 resistors of one value are divided into two strips of 4 + 8, for example.

The body of the resistors may be blue or brown. Try not to think of them as "blue ones" vs. "brown ones", because the selection will vary from kit to kit. In any case, they're all metal film type, of 1% tolerance and 1/8-watt rating. The only important feature is the color-coded stripes... so ignore the blue or brown background color.

Capacitors

Press all of the capacitors tight against the PCB when you solder them. There should be no air gap between the PCB and the capacitors. If the capacitors are sticking up off the board, they will interfere with the control panel when you assemble the unit.

Integrated circuits (IC's, chips)

This kit does not include sockets for most of the chips. Sockets are not necessary in most cases, and cheap sockets can actually decrease the reliability of the unit.

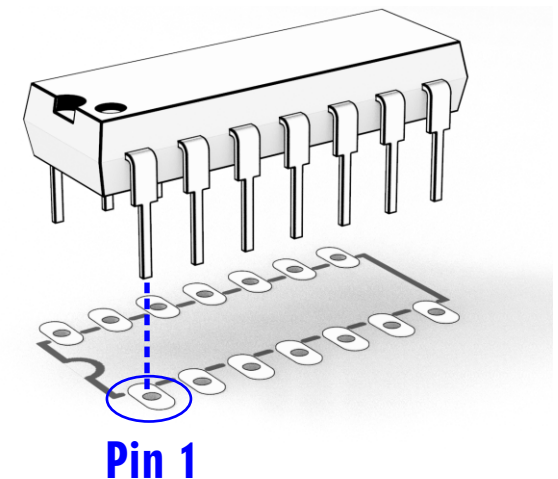
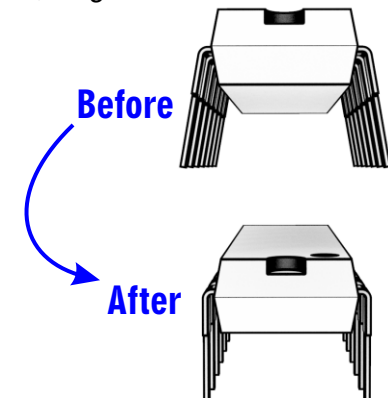
On a new chip, the leads are angled outwards from its body. (It makes them compatible with automatic assembly equipment). So before you can install your chips, you'll need to straighten their leads so they will easily fit into the holes in the PCB. Press the chip against an anti-static surface like aluminum foil to bend its leads straight.

You must be very careful not to put the chips in backwards when you solder them to the PCB. If you solder a chip in backwards, there is no way to remove it and re-use it. To remove a chip, you will have to cut each of its leads, then throw it away. Next, carefully remove the remaining solder from each hole. As you can imagine, its not easy... so don't get caught in this position!

The best way to be sure a chip is installed properly is to identify its Pin 1. The Pin 1 is marked on most chips by a dot on the top, and a semicircular indentation in the left edge. The printed outline on the PCB has a notch next to Pin 1. Always double-check before touching a chip with the soldering iron.

Handle the chips as little as possible, since they may be damaged by static electricity. Leave them in the anti-static foam material until you use them.

Straighten its leads before inserting a chip



Fine print

The printing on the PCB is small, and some of the numerals can be mistaken for others. Use a magnifier to avoid reading errors.

If you can't see any print on the chips, try moving the light source off to the side. The light must strike the surface from a low angle for laser markings to be visible.

Some digits look similar to others..



Support Policy

The parts included with your kit have been carefully counted. If you require replacements, we will provide you the URL of a commercial source (Mouser, DigiKey, etc.) for the part.

Limited technical support is available by email. If your kit doesn't work properly after assembly, and you are unable to correct the errors after discussing it by email, you may send your kit materials back to us, and Rare Waves will repair it, for a US\$75 bench fee plus shipping. If your PCB has been damaged beyond repair, then additional replacement cost will apply.

service@rarewaves.net

Sorry, we can't review your PCB assembly work and identify problems from a shaky cameraphone video. Please don't send us a shaky cameraphone video of the PCB and ask what's wrong with it.

Count

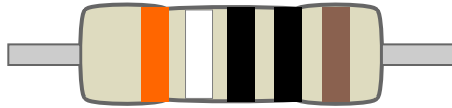
13

Reference

R10,R14,R15,R22,R35,R39,R41,
R47,R49,R53,R62,R63,R64

Value

390 Ω

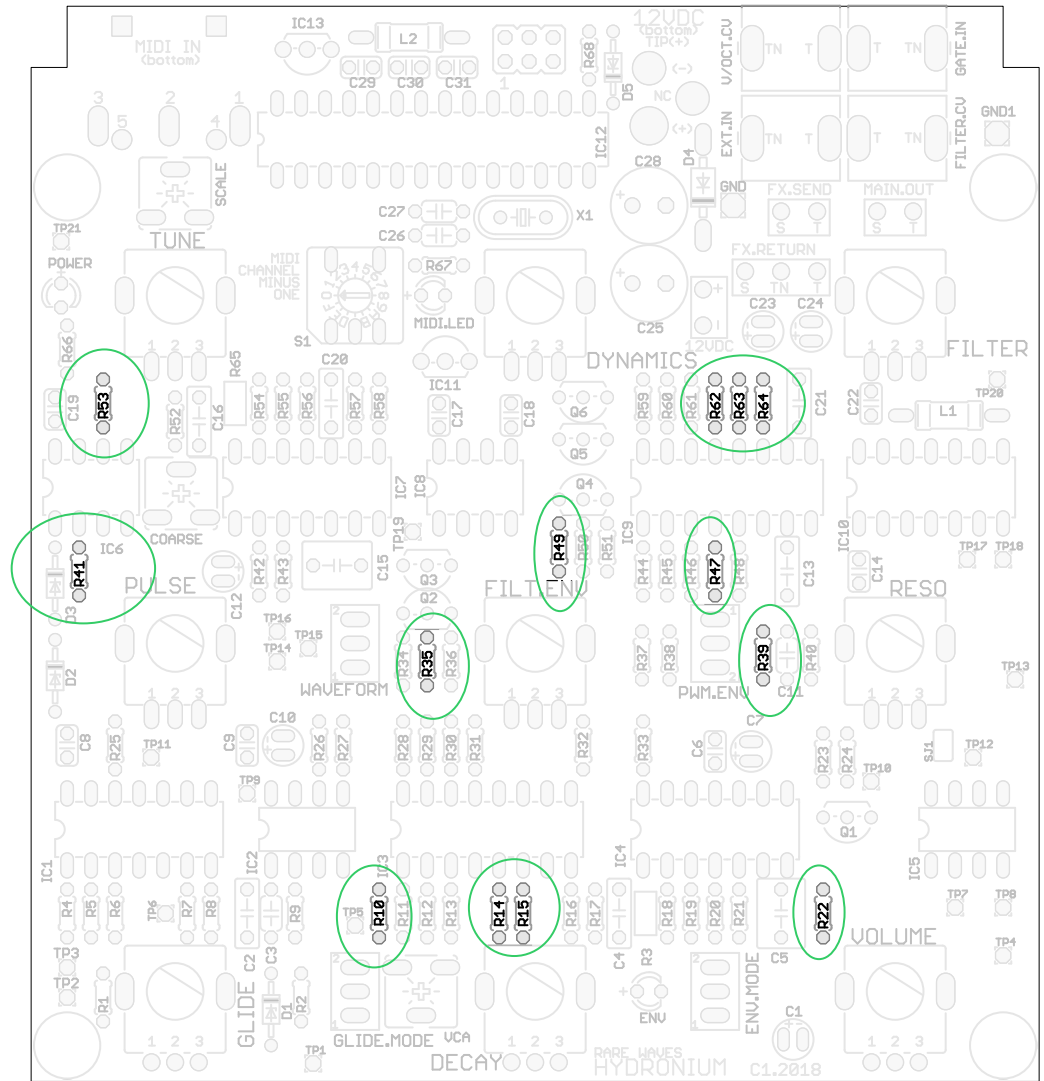


Type

Metal film resistor 1% 1/8W

Assembly Note

Bend leads at right angle to body, then insert through holes,
solder, then clip off excess length.



Step 1



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Count

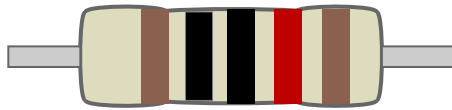
12

Reference

R9,R11,R16,R26,R27,R28,
R31,R42,R43,R44,R58,R59

Value

10 k Ω



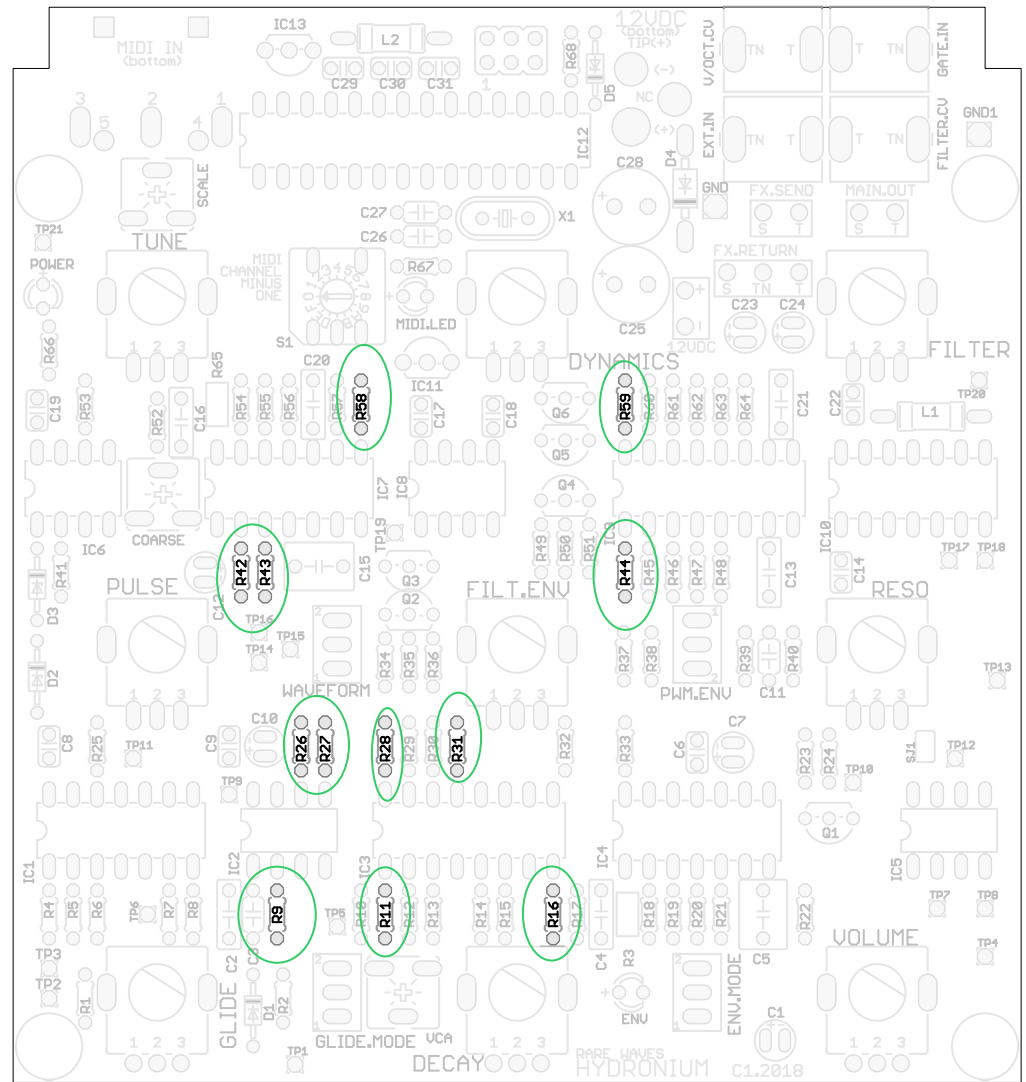
Type

Metal film resistor 1% 1/8W

Assembly Note

Bend leads at right angle to body, then insert through holes, solder, then clip off excess length.

Don't confuse these with the 20k resistors. Be sure you recognize the difference in color between red and brown stripes.



Step 2



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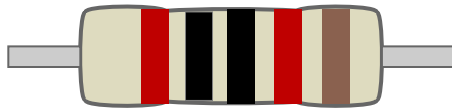
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Count _____
12

Reference _____
R1,R2,R6,R13,R24,R38,
R48,R57,R61,R66,R67,R68

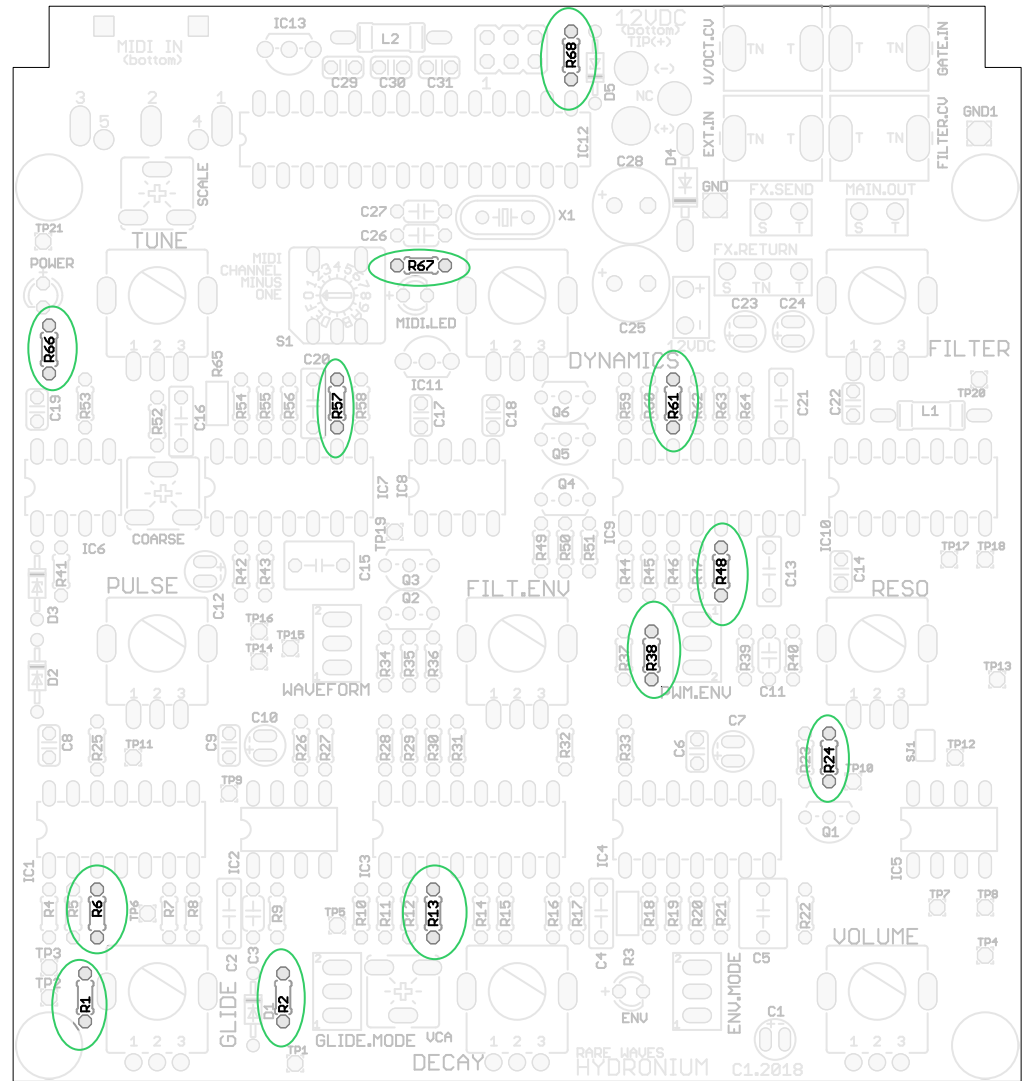
Value _____
20 k Ω



Type _____
Metal film resistor 1% 1/8W

Assembly Note
Bend leads at right angle to body, then insert through holes, solder, then clip off excess length.

Don't confuse these with the 10k resistors. Be sure you recognize the difference in color between red and brown stripes.



Step 3



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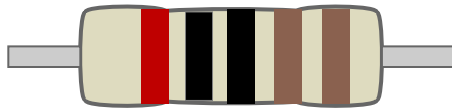
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Count 5

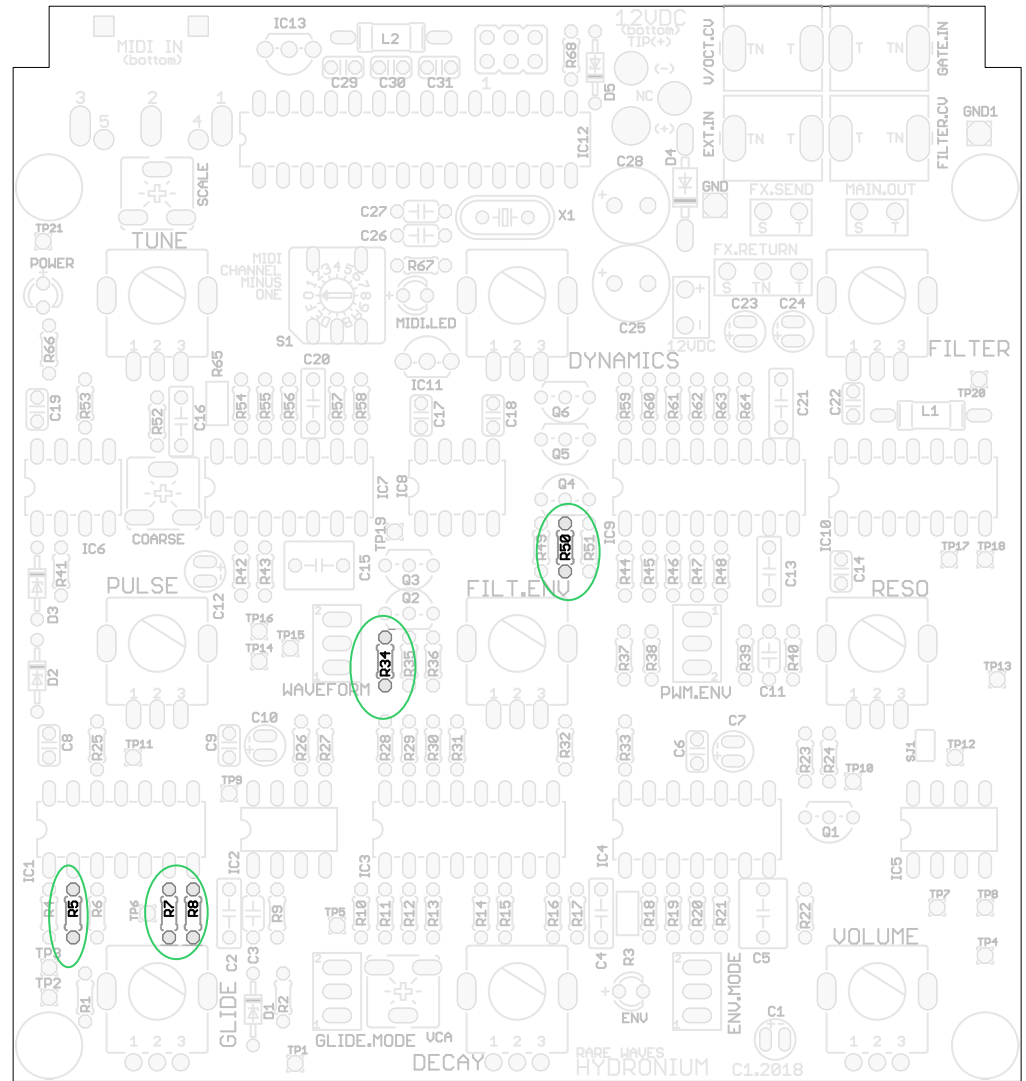
Reference R5,R7,R8,R34,R50

Value 2 k Ω



Type Metal film resistor 1% 1/8W

Assembly Note
Bend leads at right angle to body, then insert through holes, solder, then clip off excess length.



Count 4

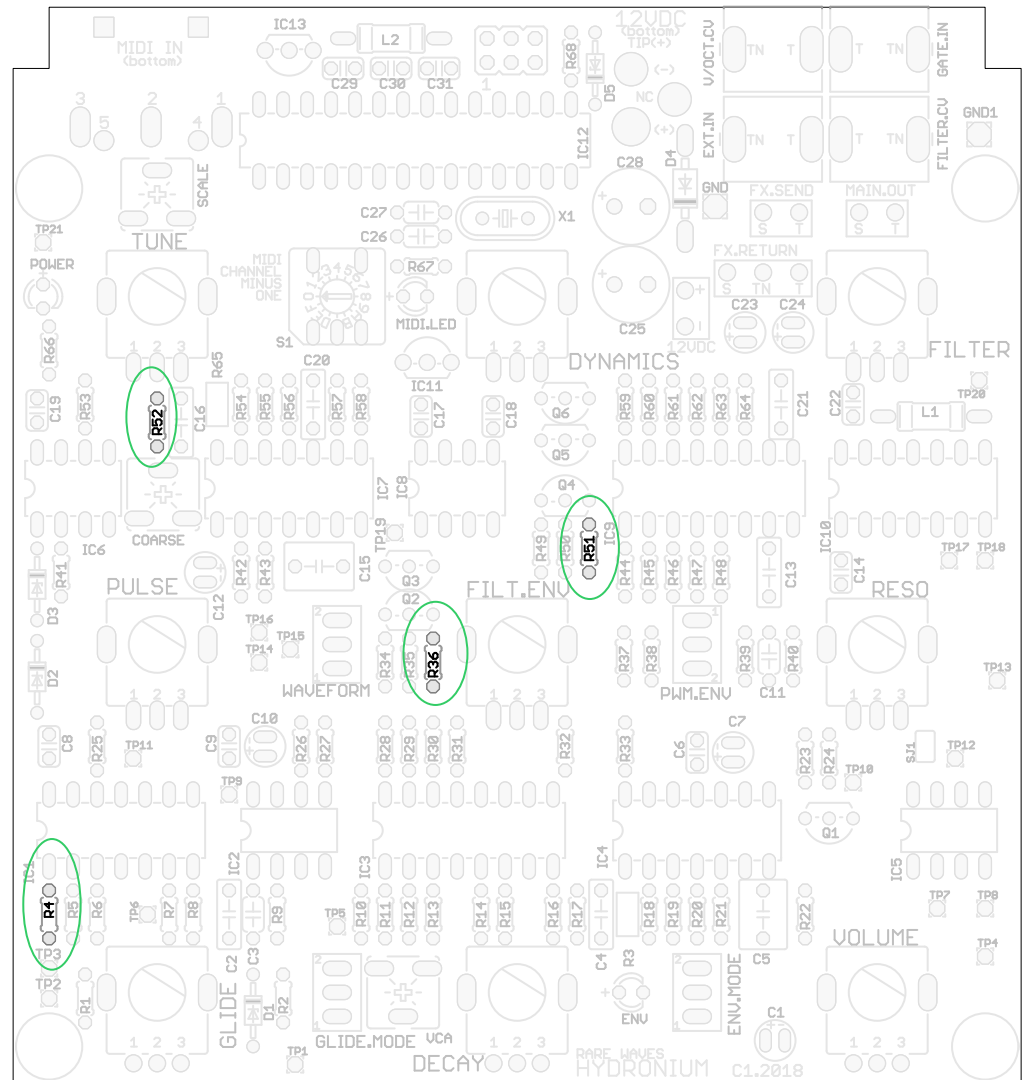
Reference R4,R36,R51,R52

Value 1 MΩ



Type Metal film resistor 1% 1/8W

Assembly Note
Bend leads at right angle to body, then insert through holes, solder, then clip off excess length.



Step 6



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Count

4

Reference

R29,R32,R33,R37

Value

3.32 k Ω

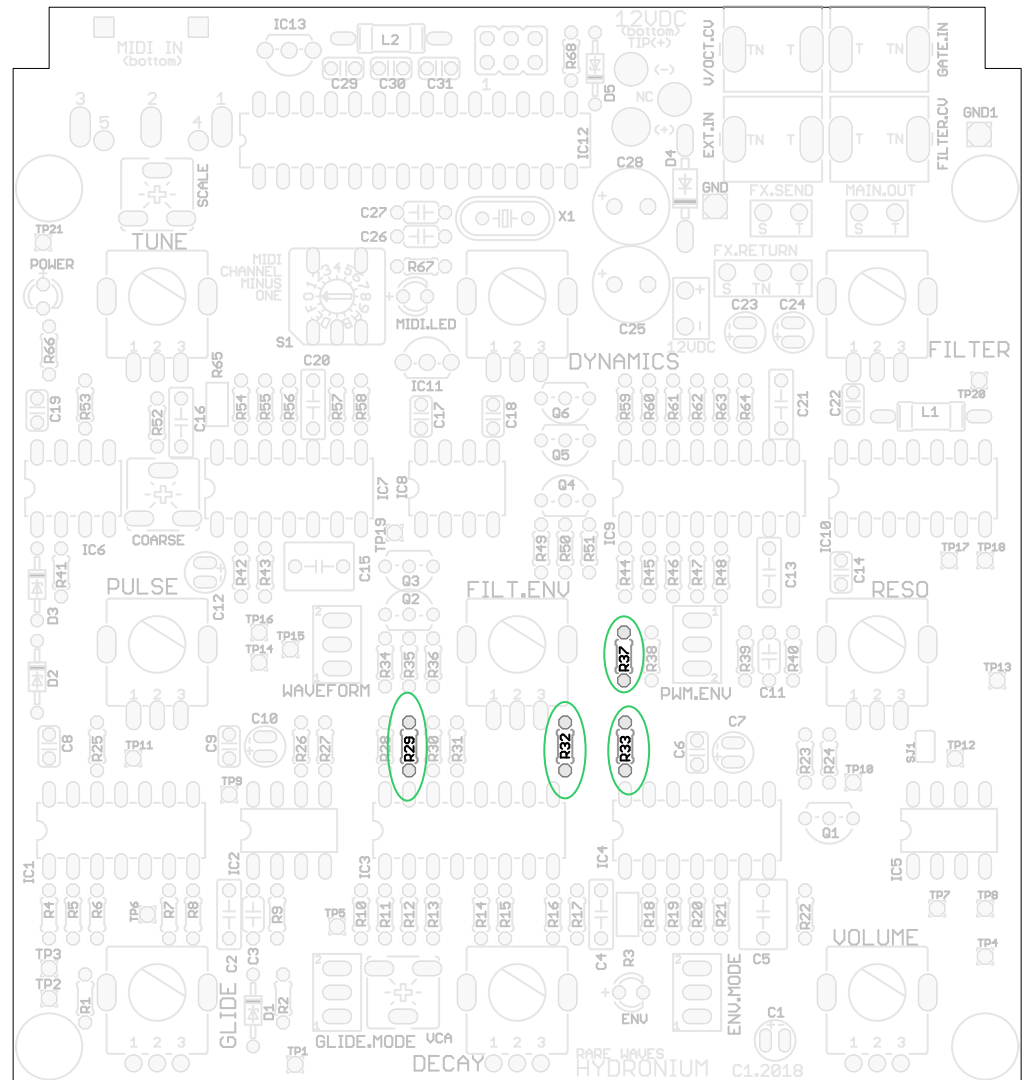


Type

Metal film resistor 1% 1/8W

Assembly Note

Bend leads at right angle to body, then insert through holes, solder, then clip off excess length.



Step 7



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Count 3

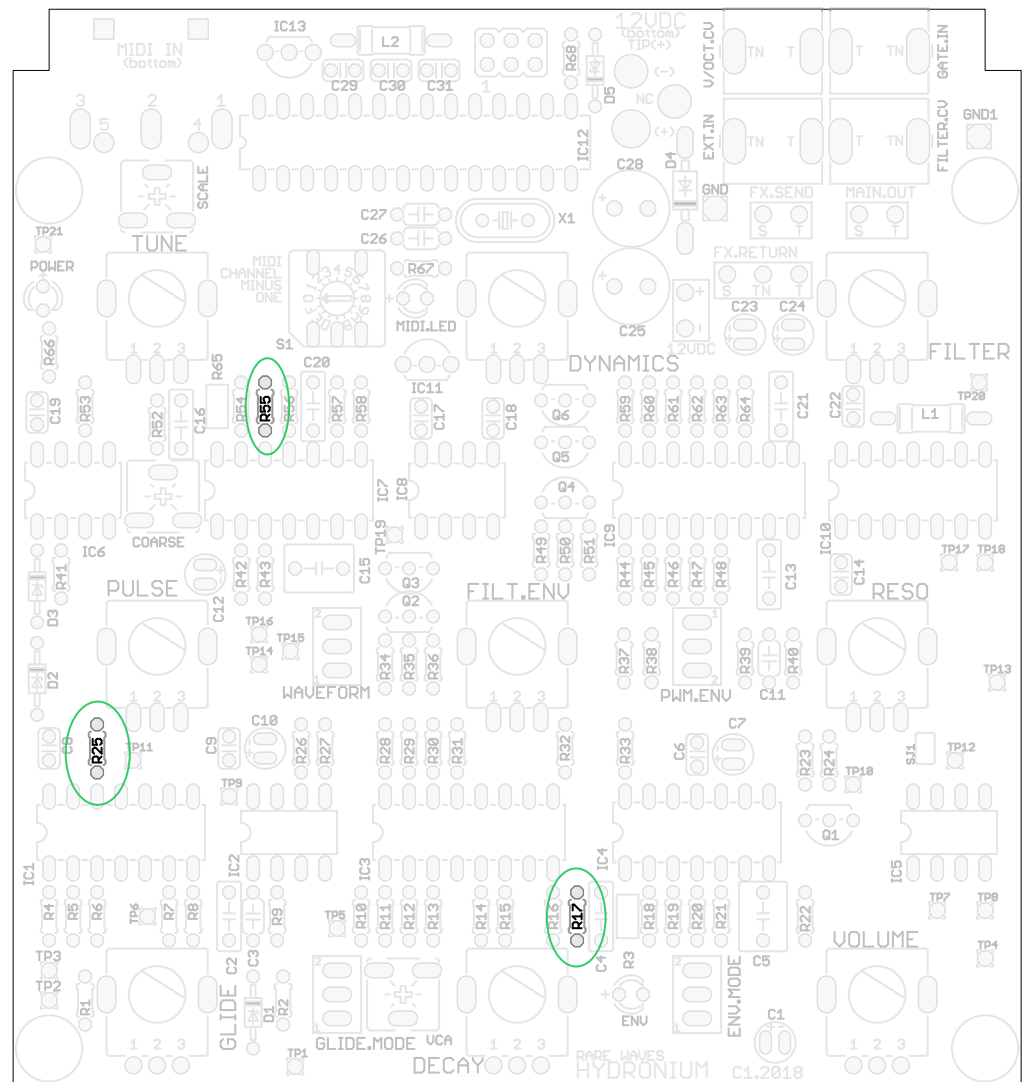
Reference R17,R25,R55

Value 100 k Ω



Type Metal film resistor 1% 1/8W

Assembly Note
Bend leads at right angle to body, then insert through holes, solder, then clip off excess length.



Step 8

Count _____ 2

Reference _____ R46,R54

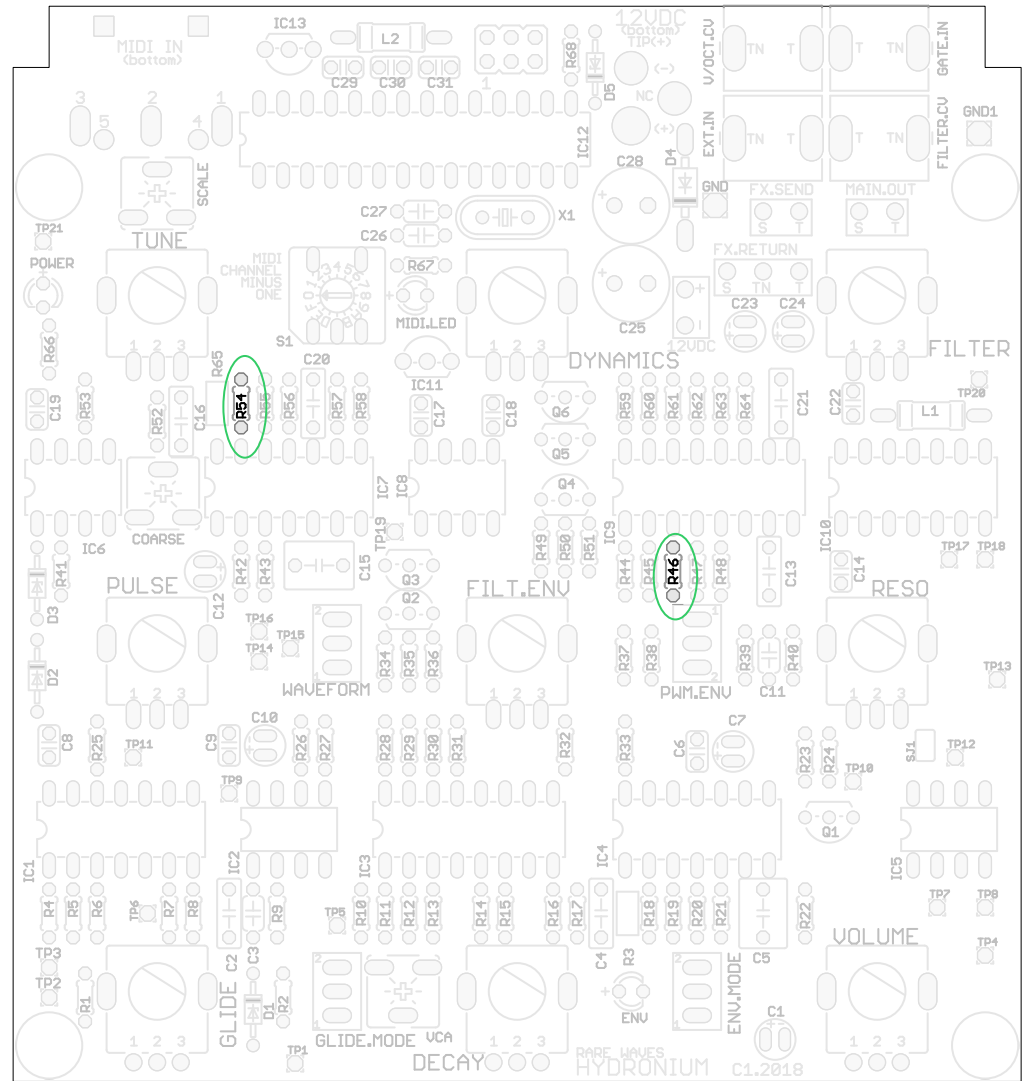
Value _____ 150 k Ω



Type _____ Metal film resistor 1% 1/8W

Assembly Note

Bend leads at right angle to body, then insert through holes, solder, then clip off excess length.



Step 10



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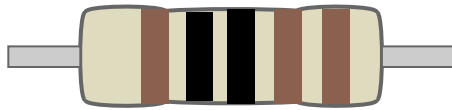
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Count _____ 2

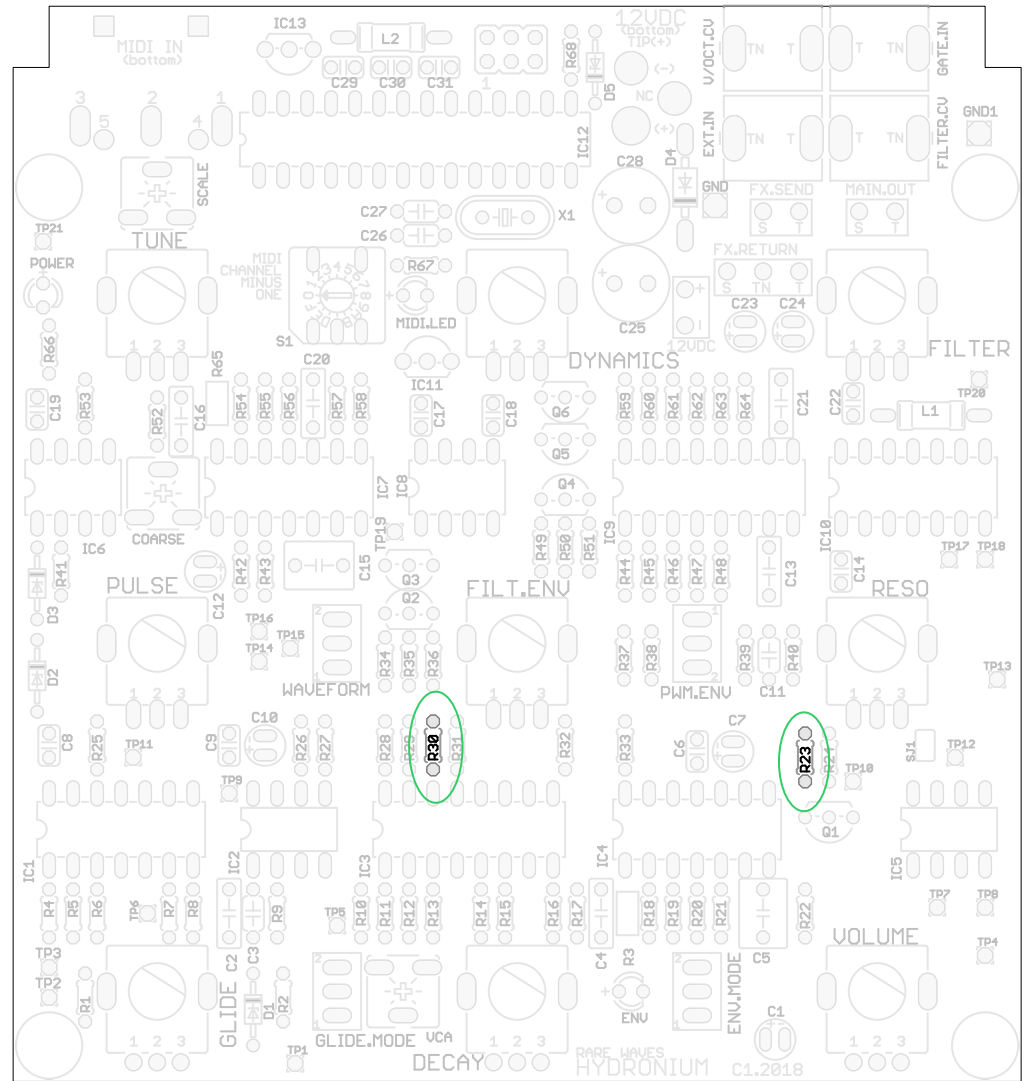
Reference _____ R23,R30

Value _____ 1 k Ω



Type _____ Metal film resistor 1% 1/8W

Assembly Note
Bend leads at right angle to body, then insert through holes, solder, then clip off excess length.



Step 11



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Count 4

Reference D1,D2,D3,D5

Value 1N5233B

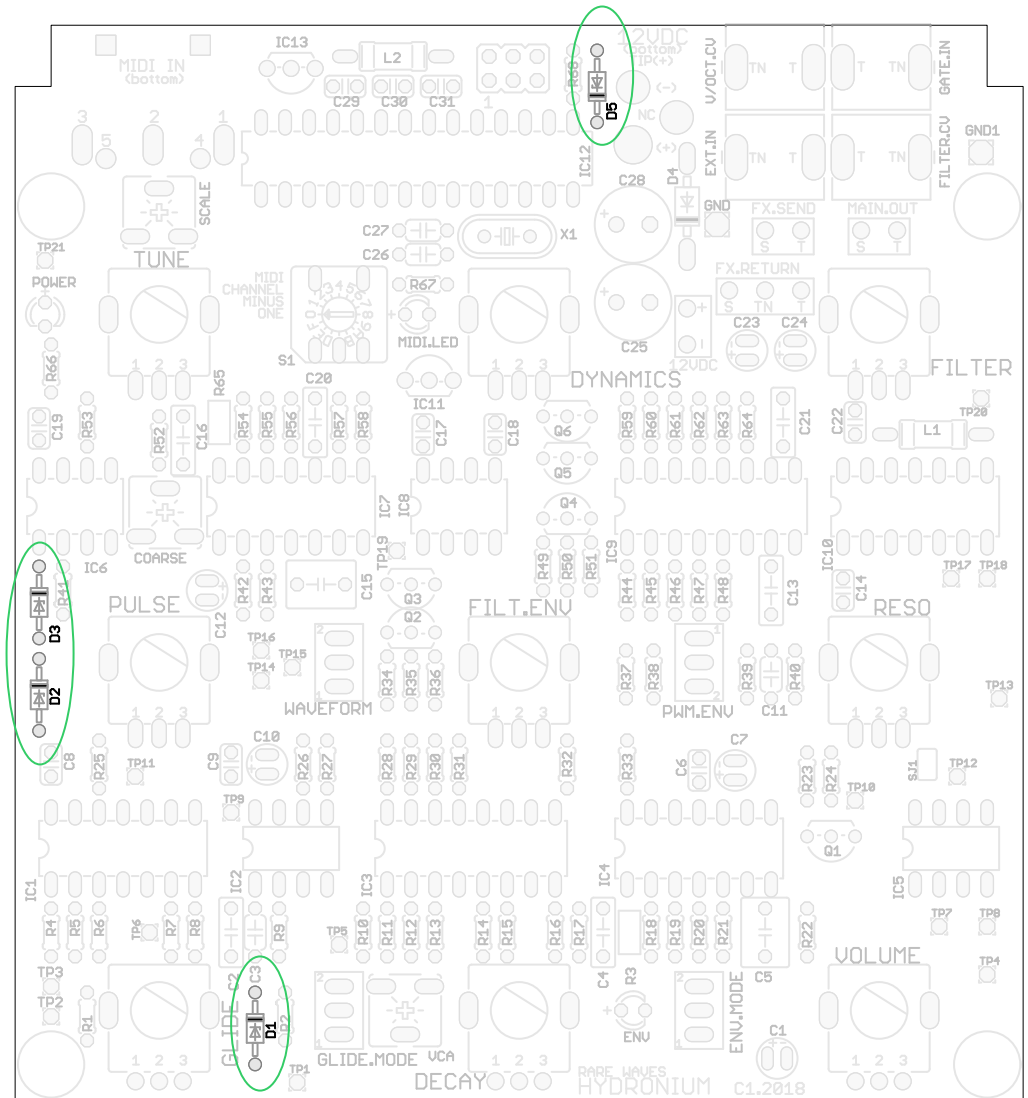
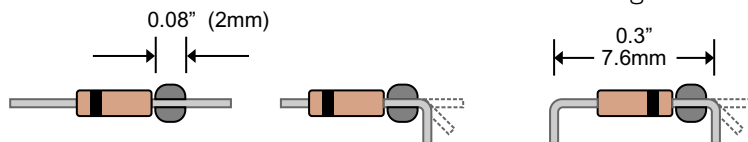


Type Zener diode 6.0V, DO-35

Assembly Note

Orient the part so its striped end matches the stripe printed on the PCB.

The part is made of glass. To prevent damage, grip the leads with tweezers or needle nose pliers close to the body while making the bends.



Step 12

Count

Reference

D4

Value

1N4001



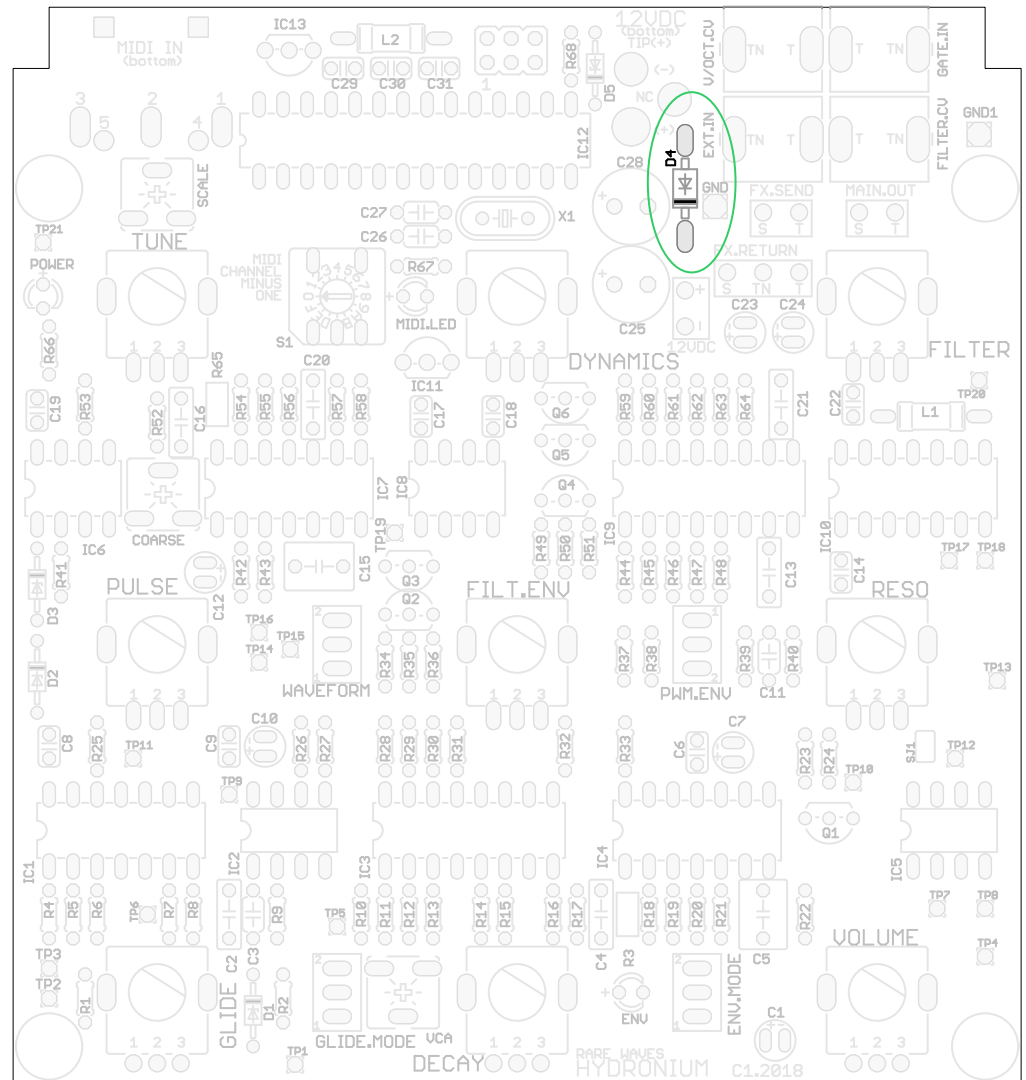
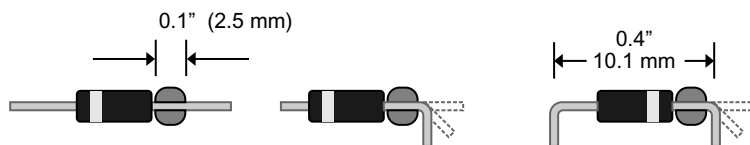
Type

Silicon rectifier diode, DO-41

Assembly Note

Orient the part so its striped end matches the printing on the PCB.

For best appearance, grip the leads with tweezers or needle nose pliers close to the body while making the bends.



Step 13



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Count _____ 2

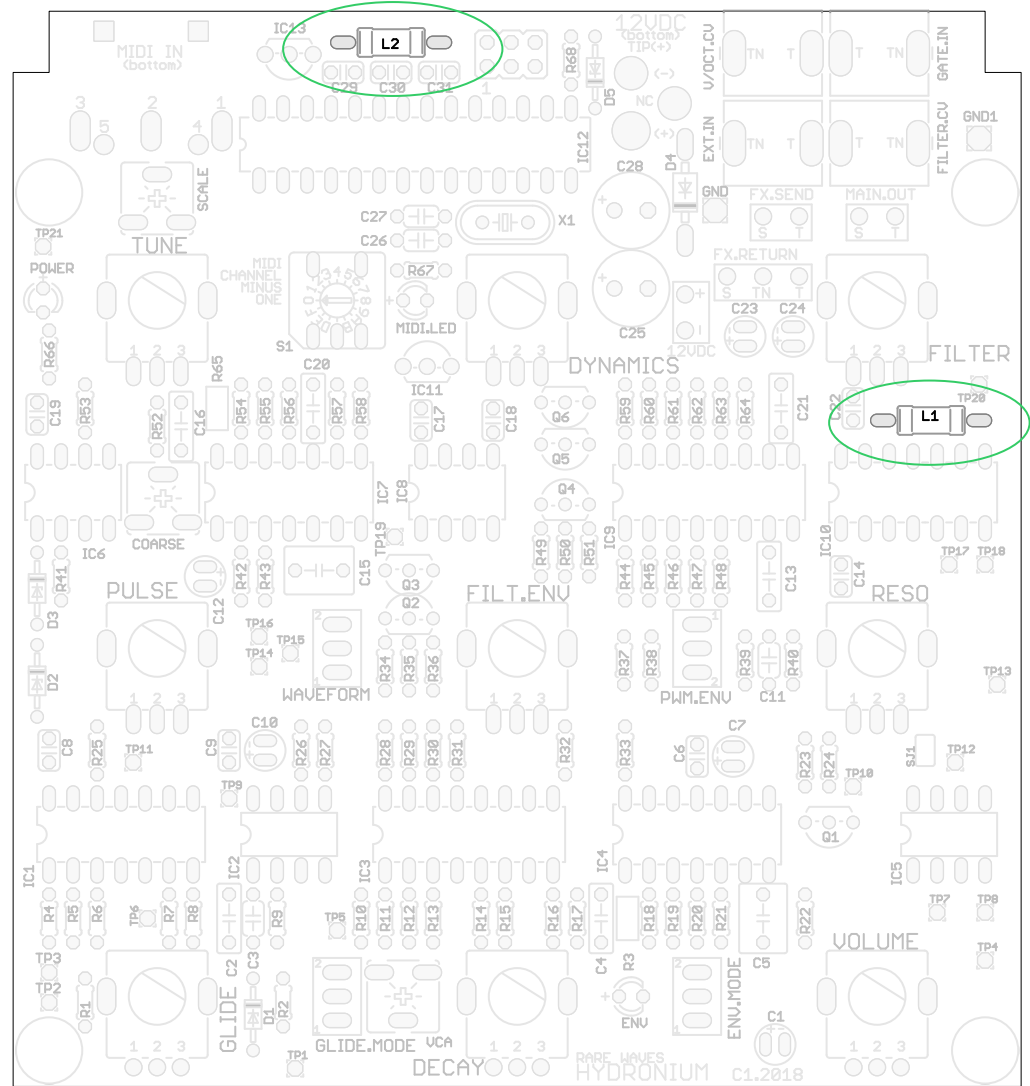
Reference _____ L1,L2

Value _____ 220 μH



Type _____ RF choke inductor, axial leads

Assembly Note
Bend leads at right angle to body, then insert through holes, solder, then clip off excess length.



Step 14



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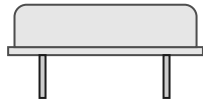
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Count _____

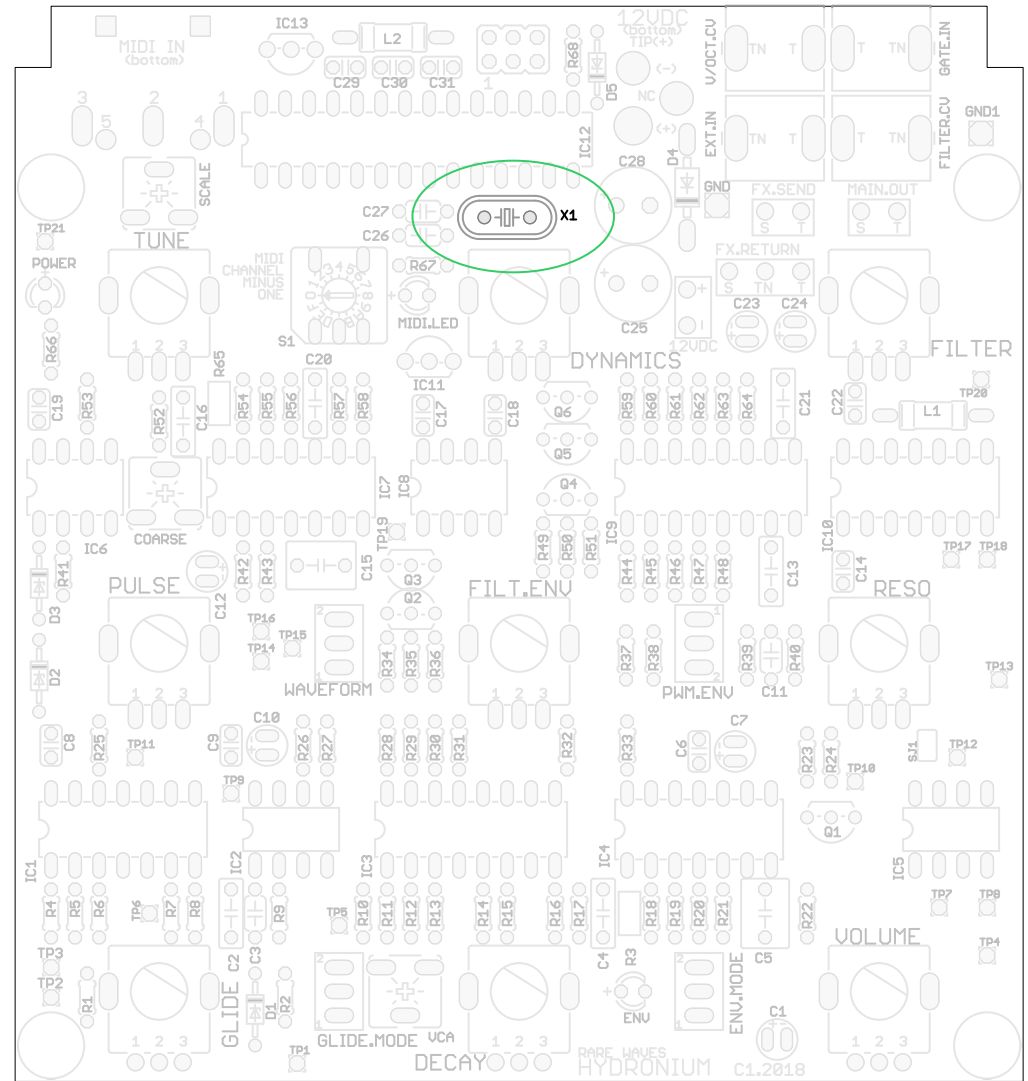
Reference _____ XI

Value _____ 8.000 MHz



Type _____ Frequency control crystal HC49-U

Assembly Note _____ Non-polar



Step 15



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Count

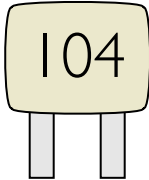
11

Reference

C6,C8,C9,C14,C17,
C18,C19,C22,C29,C30,C31

Value

0.1 μ F

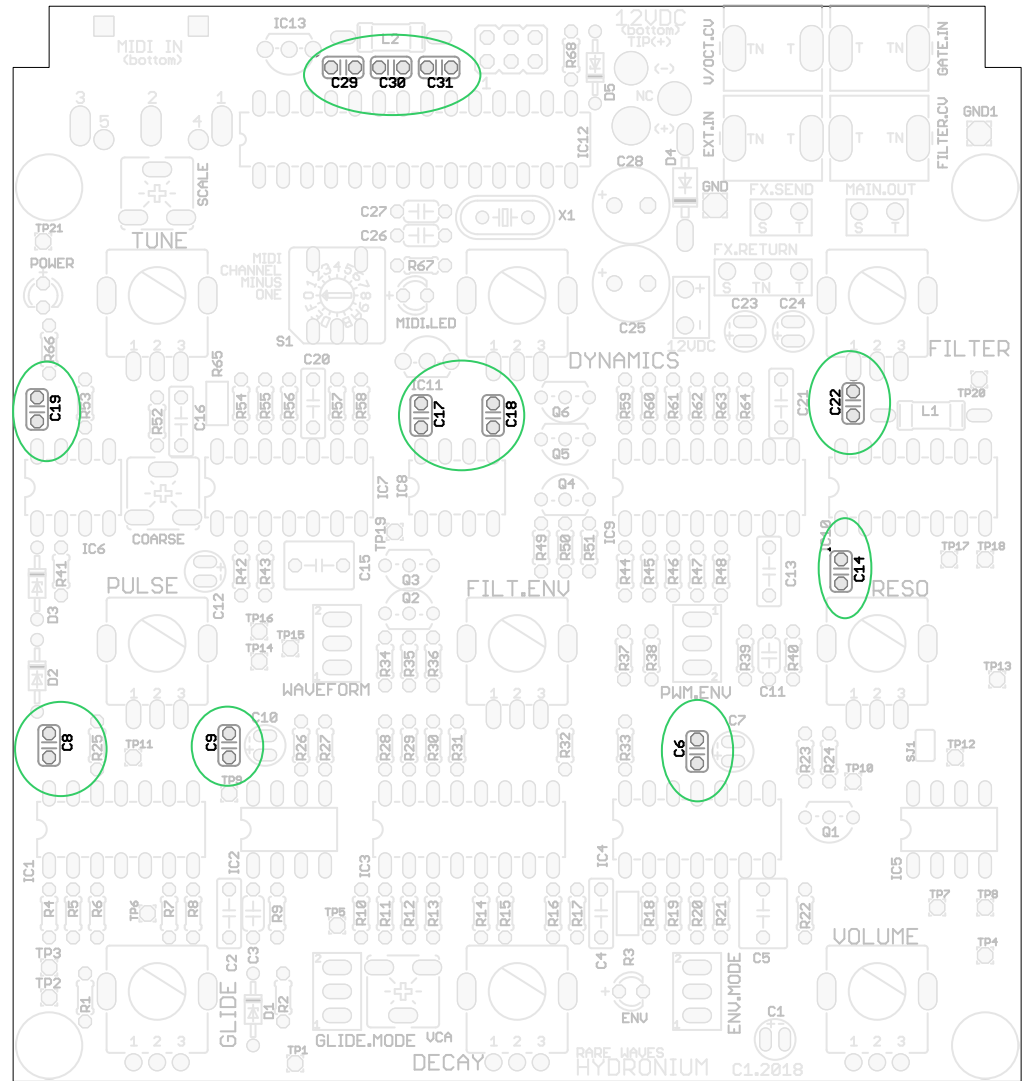


Type

Ceramic capacitor, X7R 20%

Assembly Note

Non-polar



Step 16



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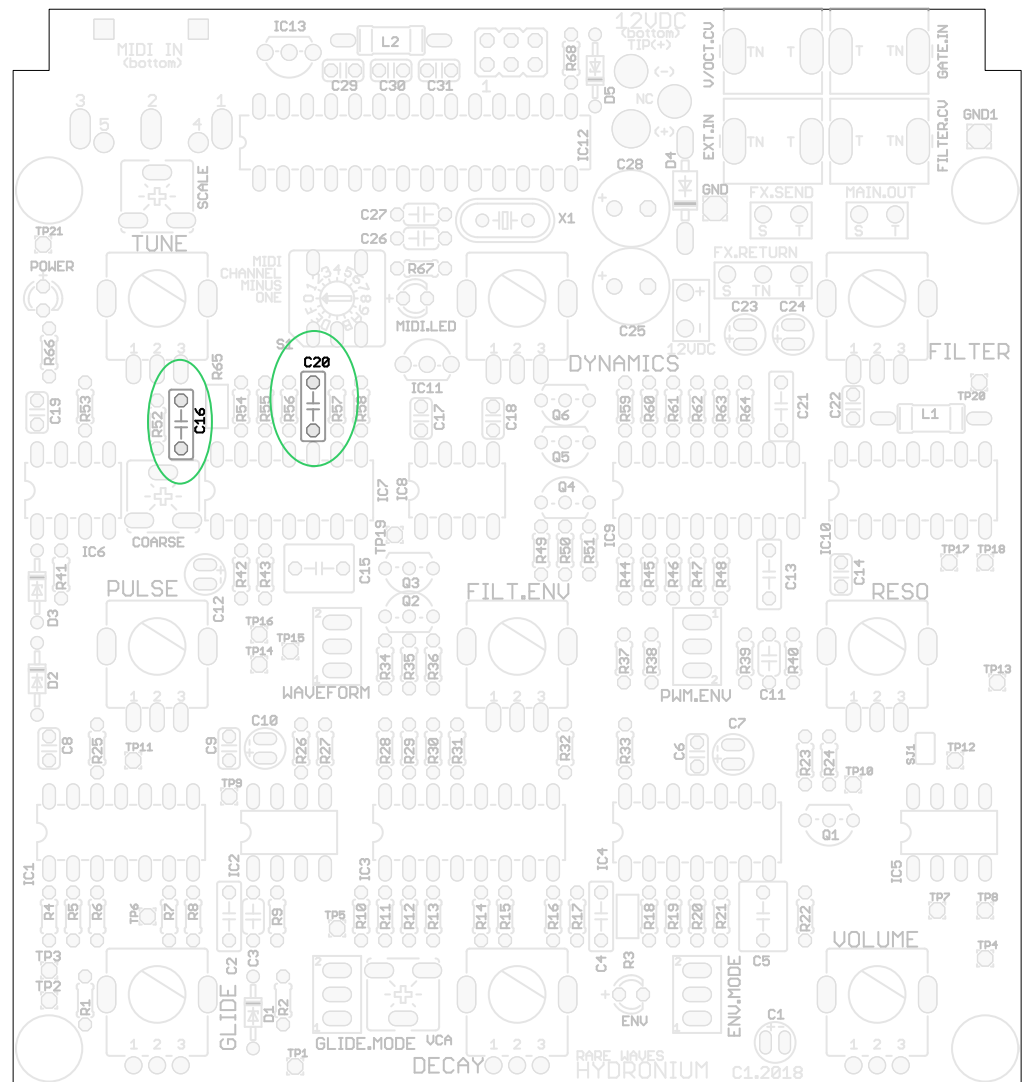
Count _____ 2

Reference _____ C16,C20

Value _____ 1 nF

Type _____ PET film box capacitor 5%

Assembly Note _____ Non-polar



Step 17



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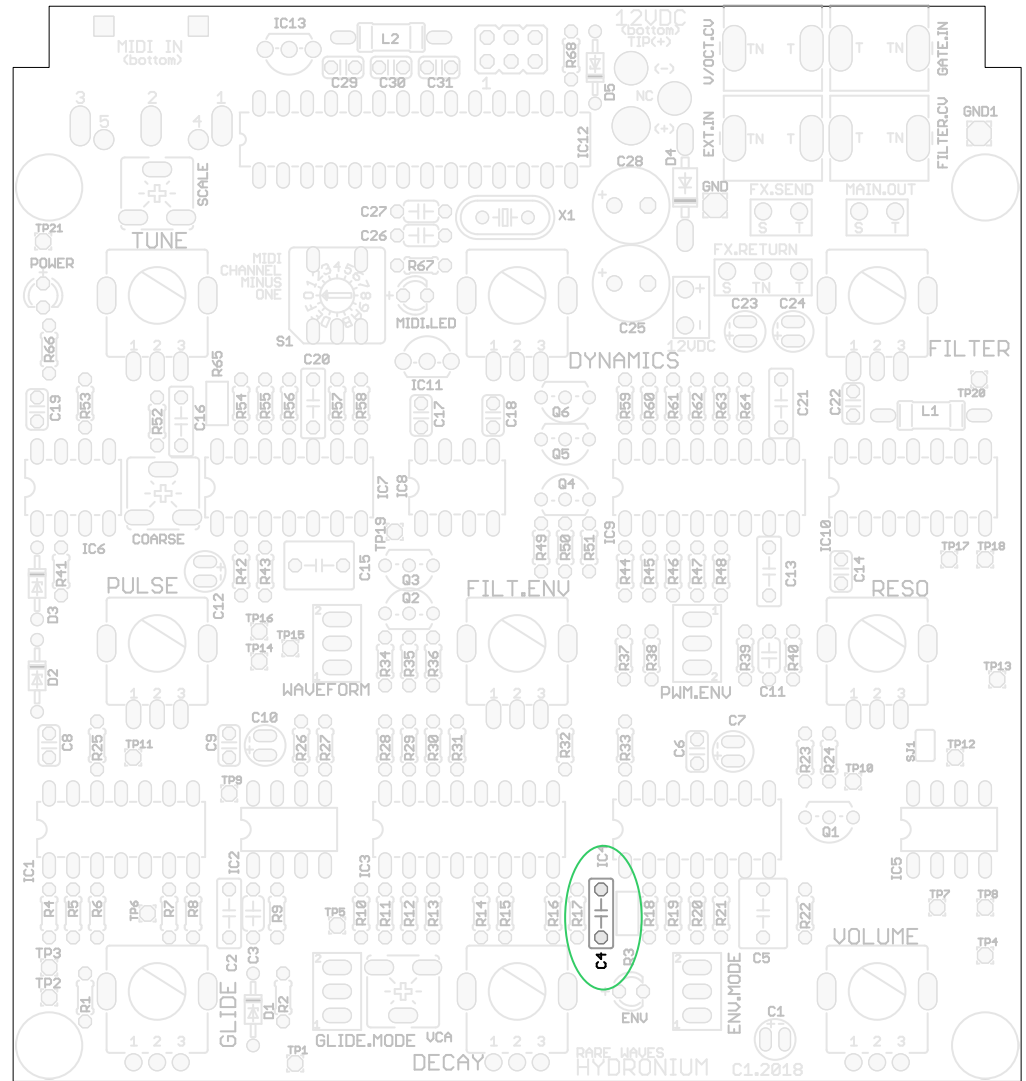
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C4

Diagram showing three resistors connected to a common node, which is then connected to a capacitor labeled 10 nF . The resistors are labeled 10n , 0.01 , and 103 .

PET film box capacitor 5%

Non-polar



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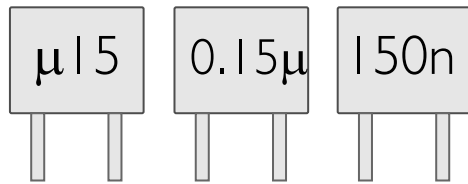
Count

Reference

C2

Value

150 nF

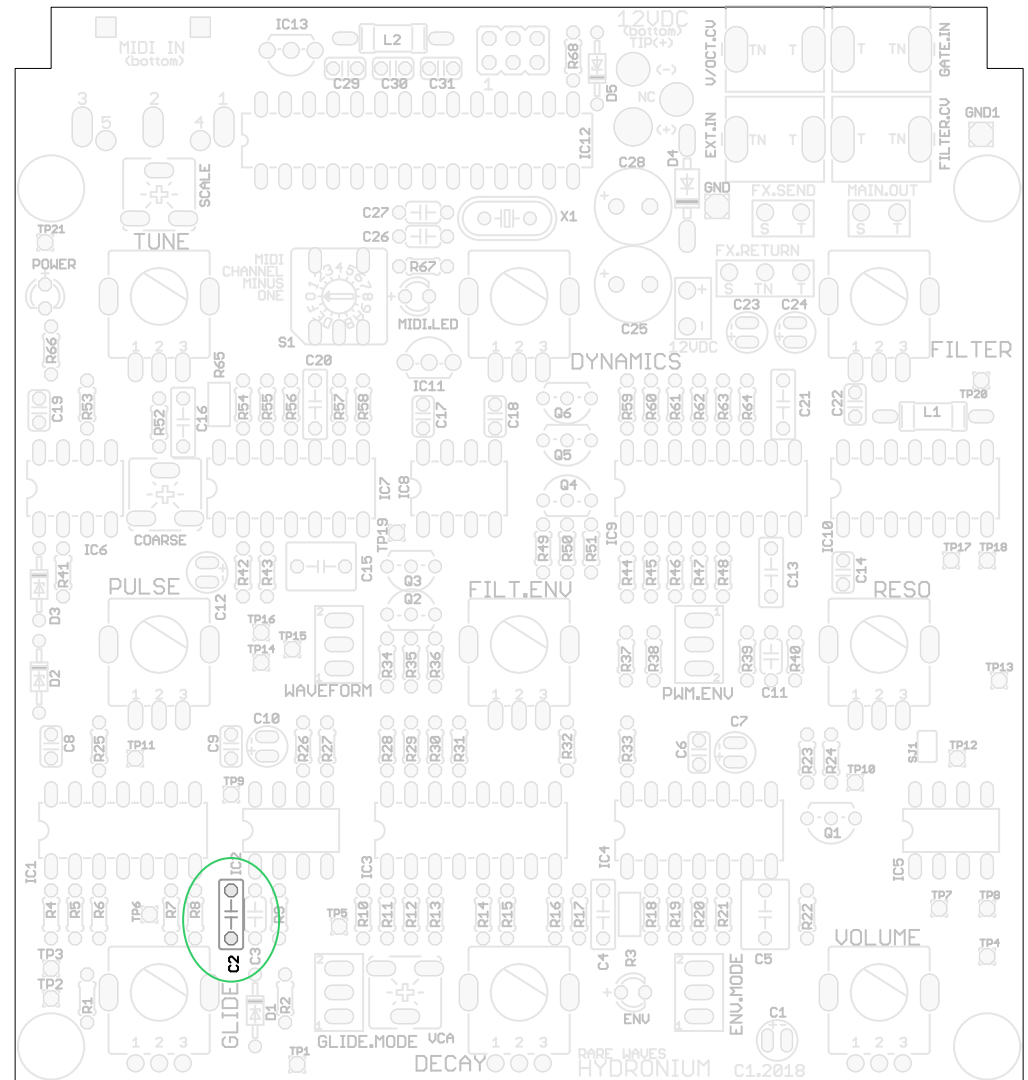


Type

PET film box capacitor 5%

Assembly Note

Non-polar



Step 19



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Count _____
6

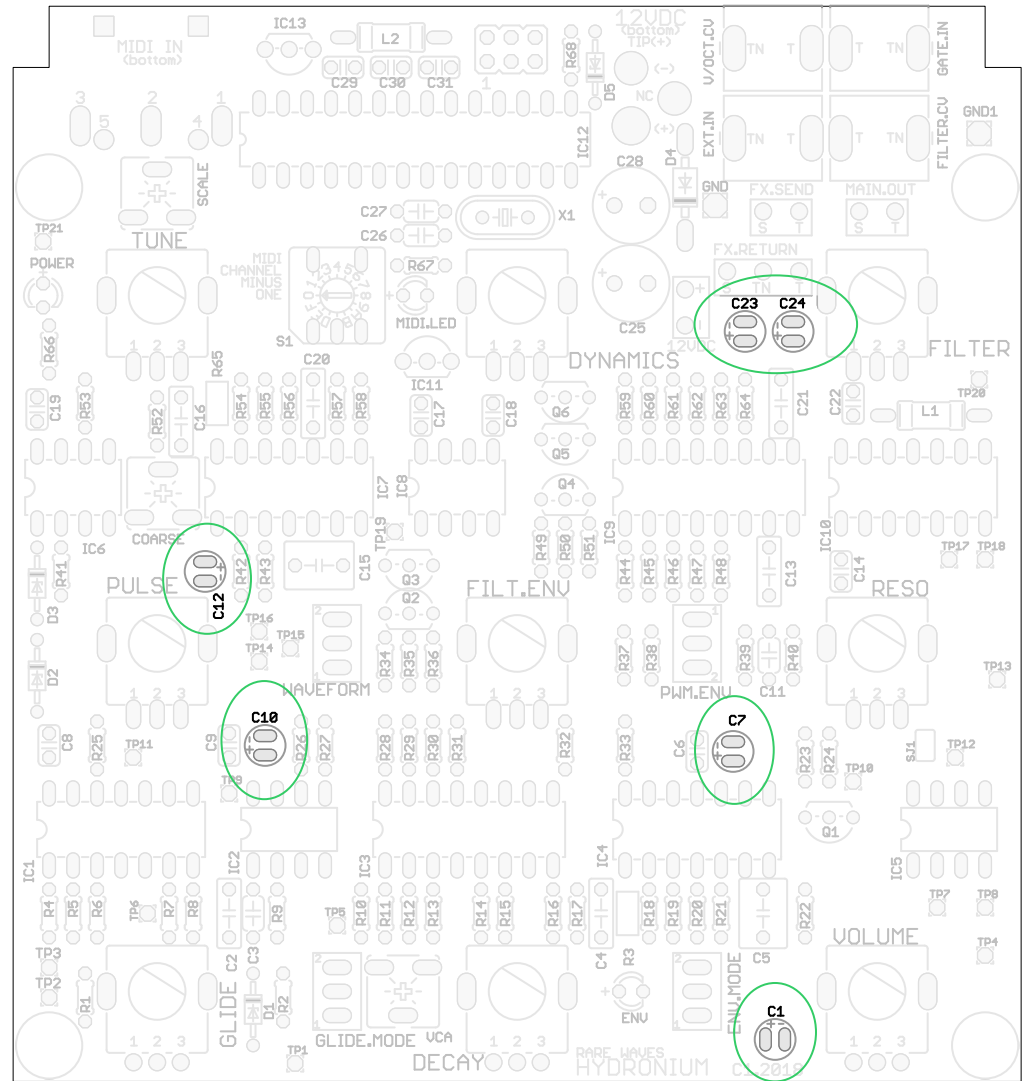
Reference _____
C1,C7,C10,C12,C23,C24

Value _____
22 μ F



Type _____
Electrolytic capacitor 4mm (d) x 7mm (h)

Assembly Note _____
The long lead must go into the hole marked (+)



Step 20



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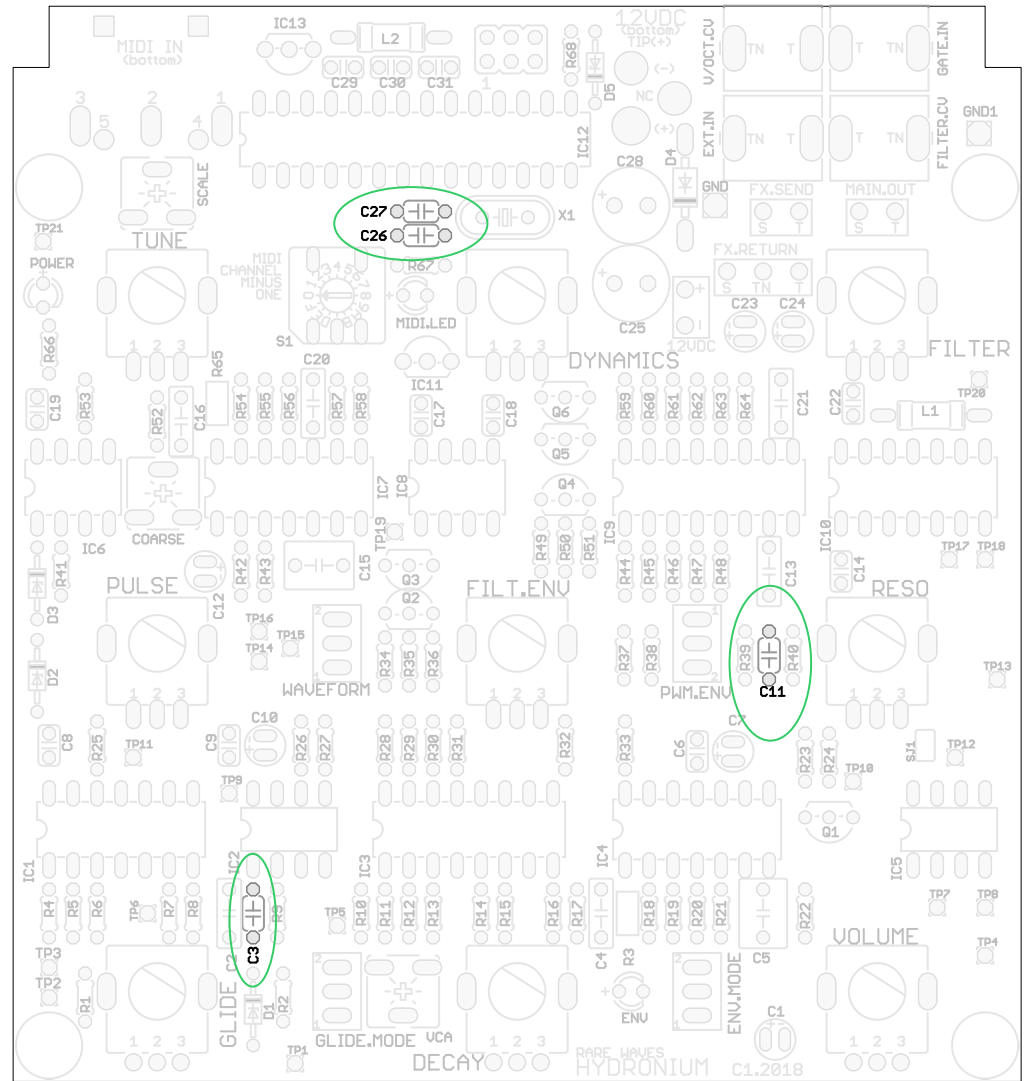
Count 4

Reference C3,C11,C26,C27

Value 22 pF

Type Ceramic capacitor 10%

Assembly Note
The number "220" is printed on the part...
Don't confuse these parts with the 220pF capacitors!

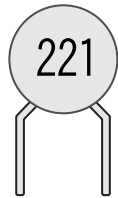


Step 21

Count _____ 2

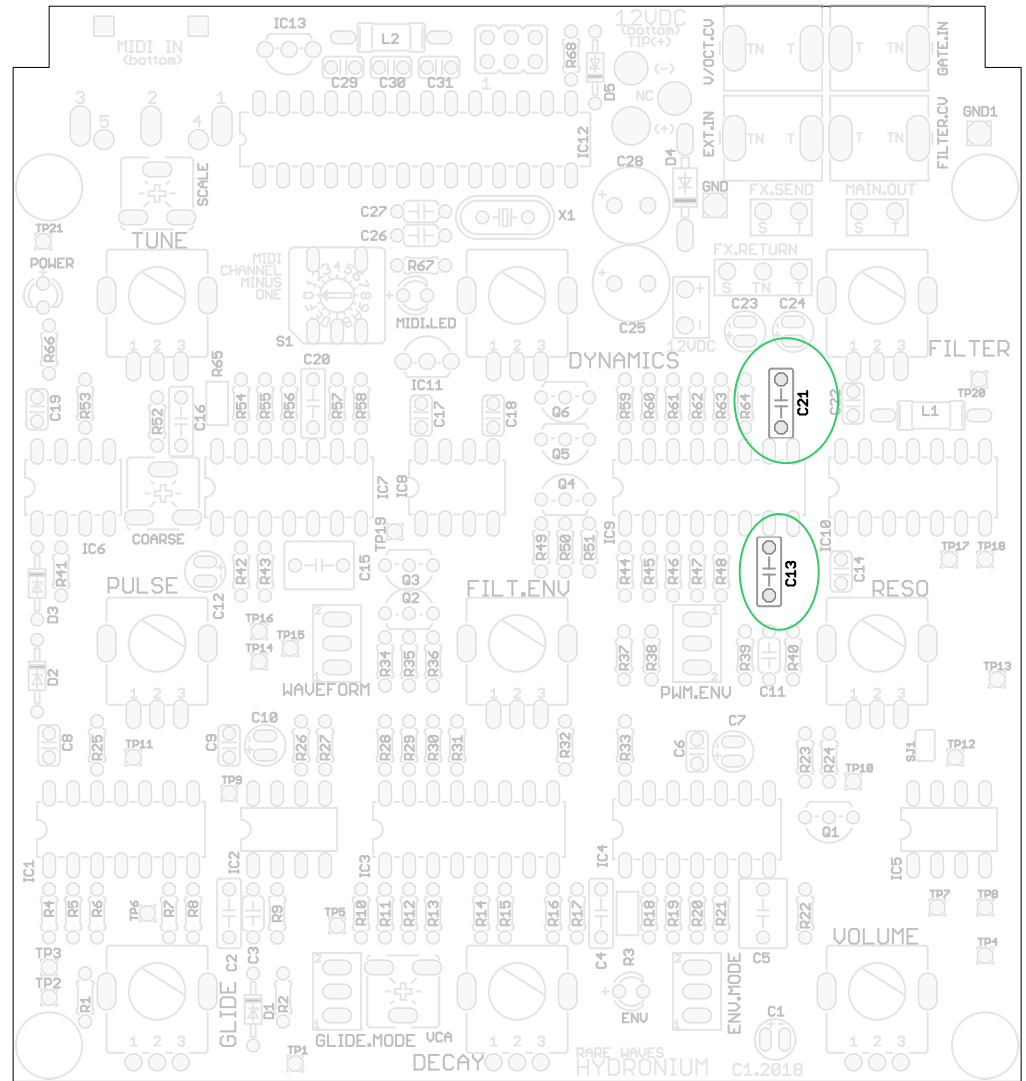
Reference _____ C13,C21

Value _____ 220 pF



Type _____ Ceramic disc capacitor 5%

Assembly Note _____
These parts are marked "221"...
Don't confuse them with the 22pF capacitors.



Step 22



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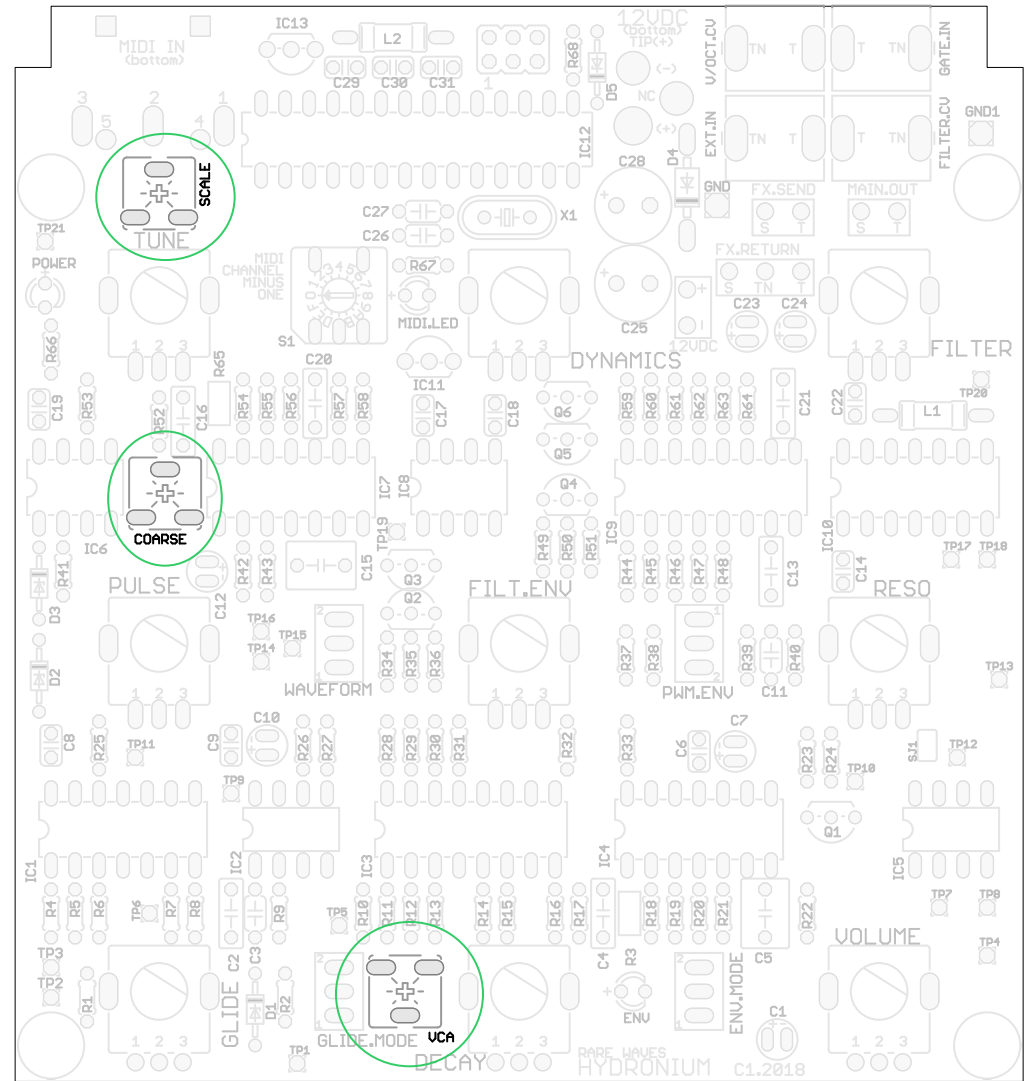
Count 3

Reference COARSE,SCALE,VCA

Value 2 k Ω

Type Variable resistor, trim potentiometer

Assembly Note The part should be sitting flat and straight on the PCB



Step 23



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Count _____ 2

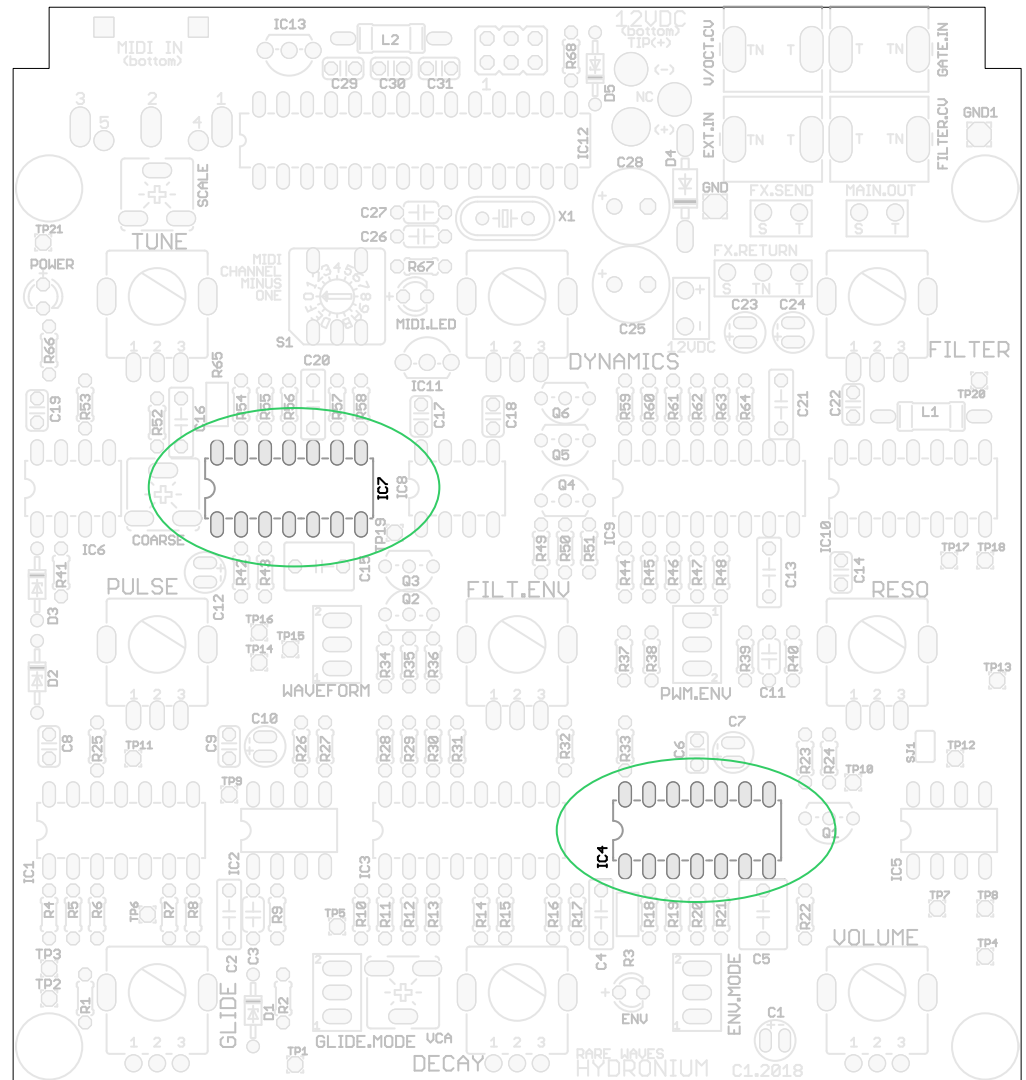
Reference _____ IC4,IC7

Value _____ MCP6004-I/P

Type _____ Quad op amp, DIP-14

Assembly Note

- Bend the leads straight to the body before inserting.
- Insert the IC into the holes on the PCB.
- Make sure all of the leads are passing through the holes.
- Wait! Double-check the orientation of the IC.
- Be sure its not installed backwards.
- Finally, solder all the leads.



Step 24



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Count _____ 2

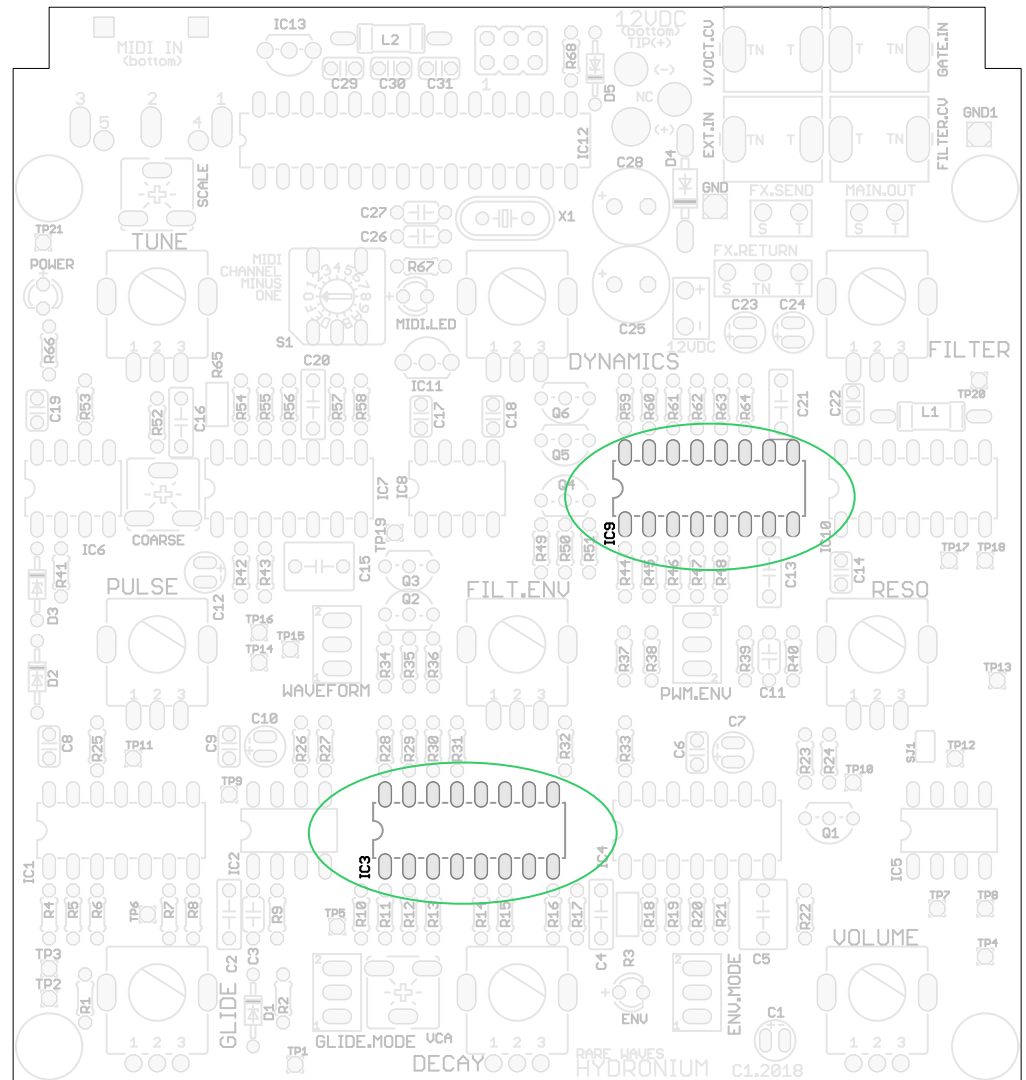
Reference _____ IC3,IC9

Value _____ NJM13700D

Type _____ Dual OTA, DIP-16

Assembly Note _____

- Bend the leads straight to the body before inserting.
- Insert the IC into the holes on the PCB.
- Make sure all of the leads are passing through the holes.
- Wait! Double-check the orientation of the IC.
- Be sure its not installed backwards.
- Finally, solder all the leads.



Step 25



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Count _____ 2

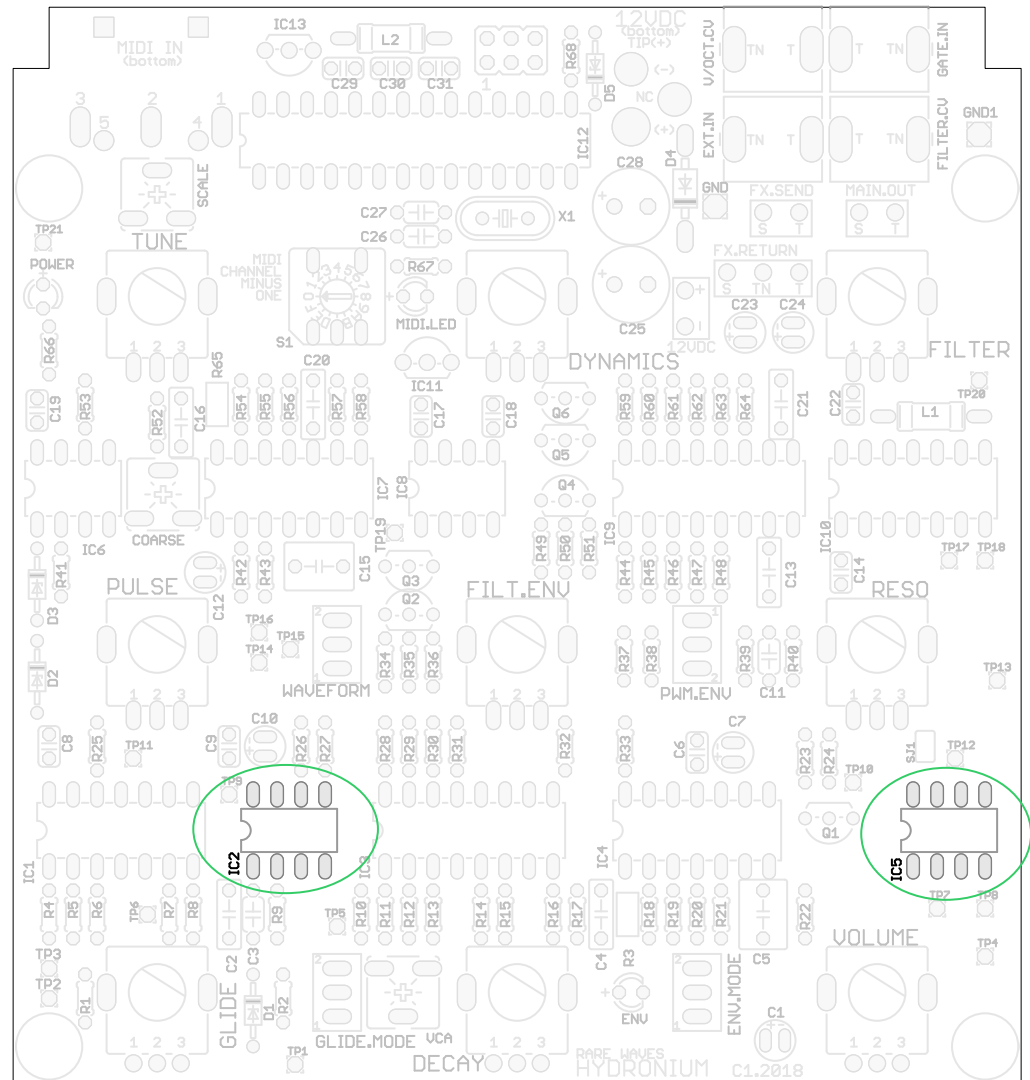
Reference _____ IC2,IC5

Value _____ TL 062

Type _____ Dual op amp, DIP-8

Assembly Note

- Bend the leads straight to the body before inserting.
- Insert the IC into the holes on the PCB.
- Make sure all of the leads are passing through the holes.
- Wait! Double-check the orientation of the IC.
- Be sure its not installed backwards.
- Finally, solder all the leads.



Step 26

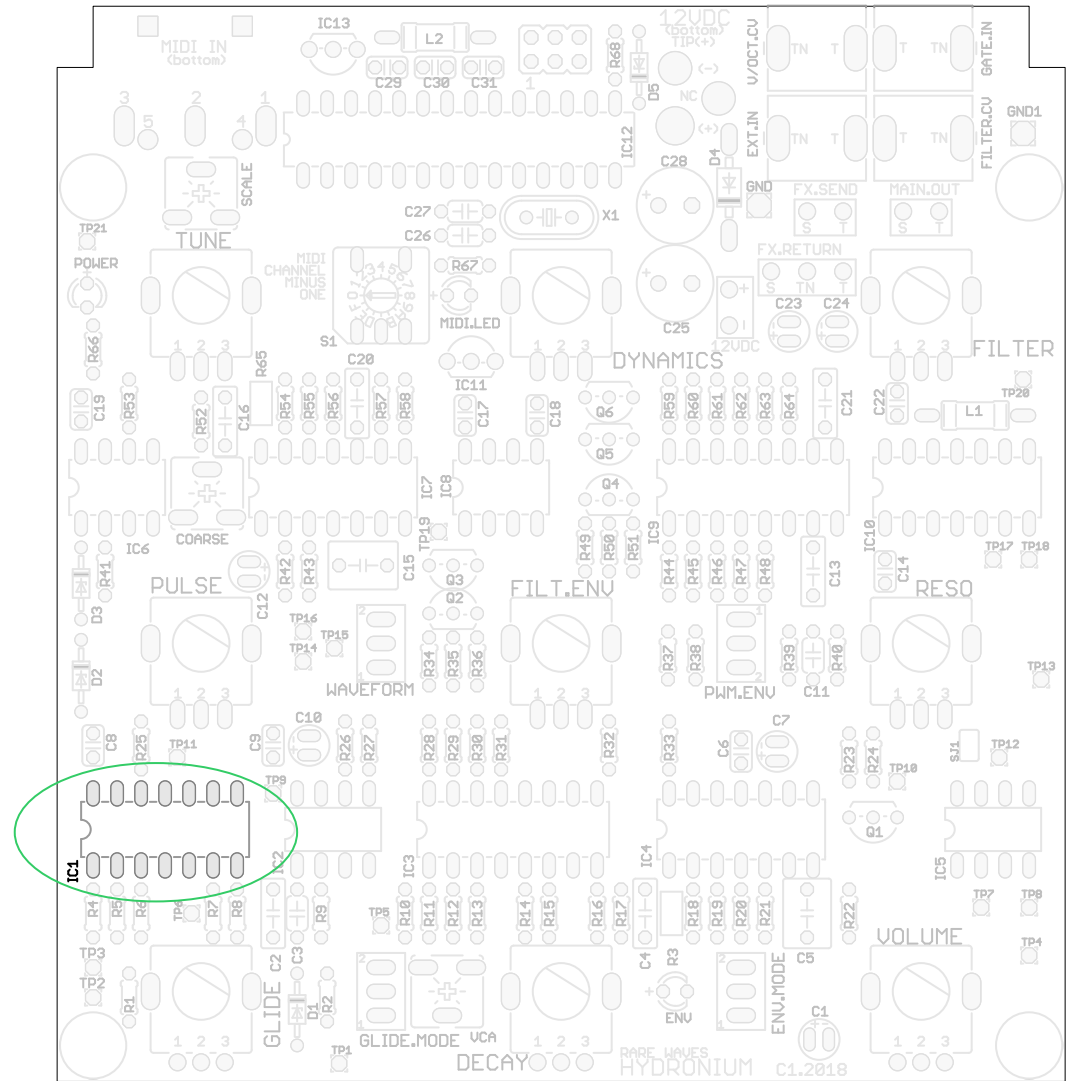
Count _____

Reference _____ IC 1

Value _____
CD74HC4066

Type _____
Quad analog switch, DIP-14

Assembly Note _____
Bend the leads straight to the body before inserting.
Insert the IC into the holes on the PCB.
Make sure all of the leads are passing through the holes.
Wait! Double-check the orientation of the IC.
Be sure its not installed backwards.
Finally, solder all the leads.



Step 29



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Count _____ |

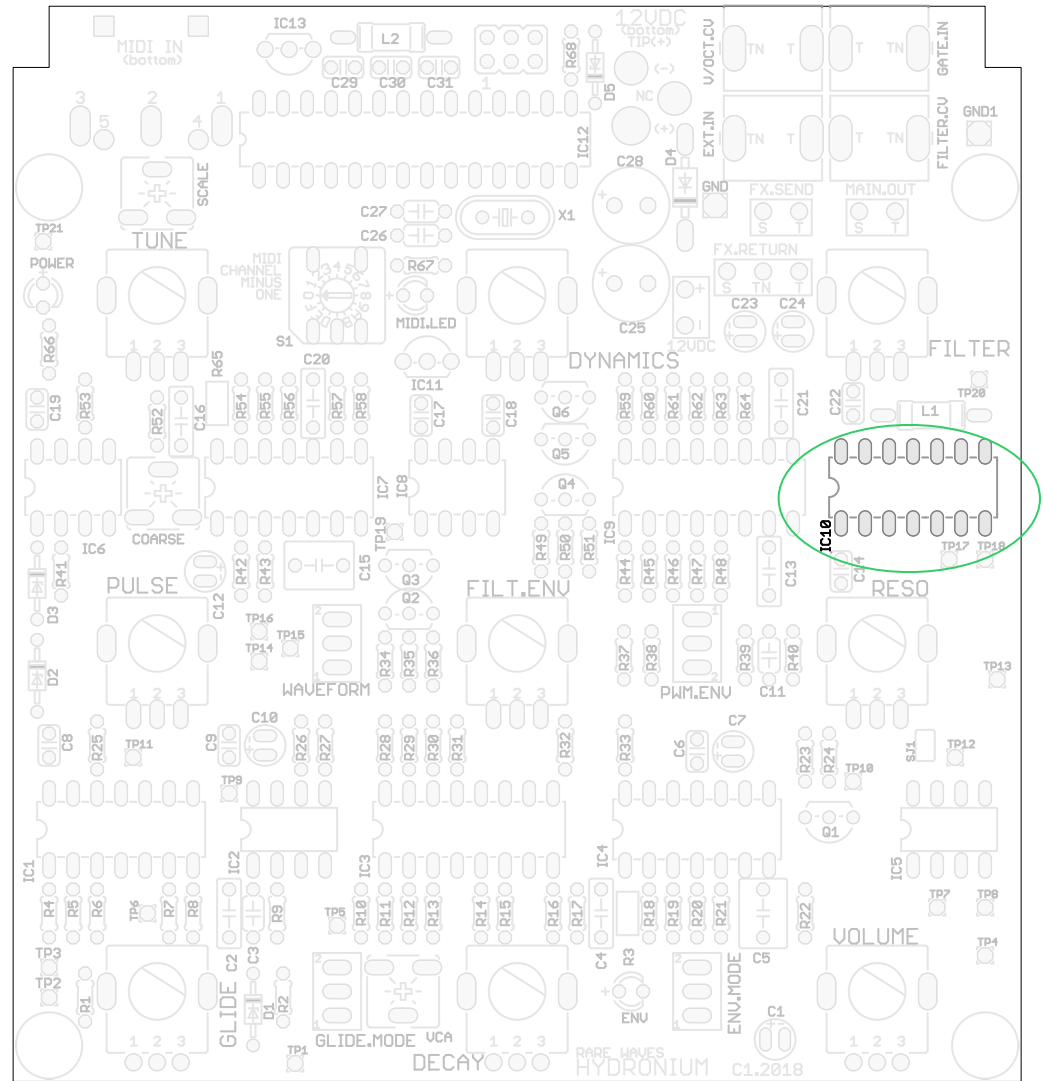
Reference _____
IC 10

Value _____
MCP4902-E/P

Type _____
Dual 8-bit DAC, DIP-14

Assembly Note

- Bend the leads straight to the body before inserting.
- Insert the IC into the holes on the PCB.
- Make sure all of the leads are passing through the holes.
- Wait! Double-check the orientation of the IC.
- Be sure its not installed backwards.
- Finally, solder all the leads.



Step 30



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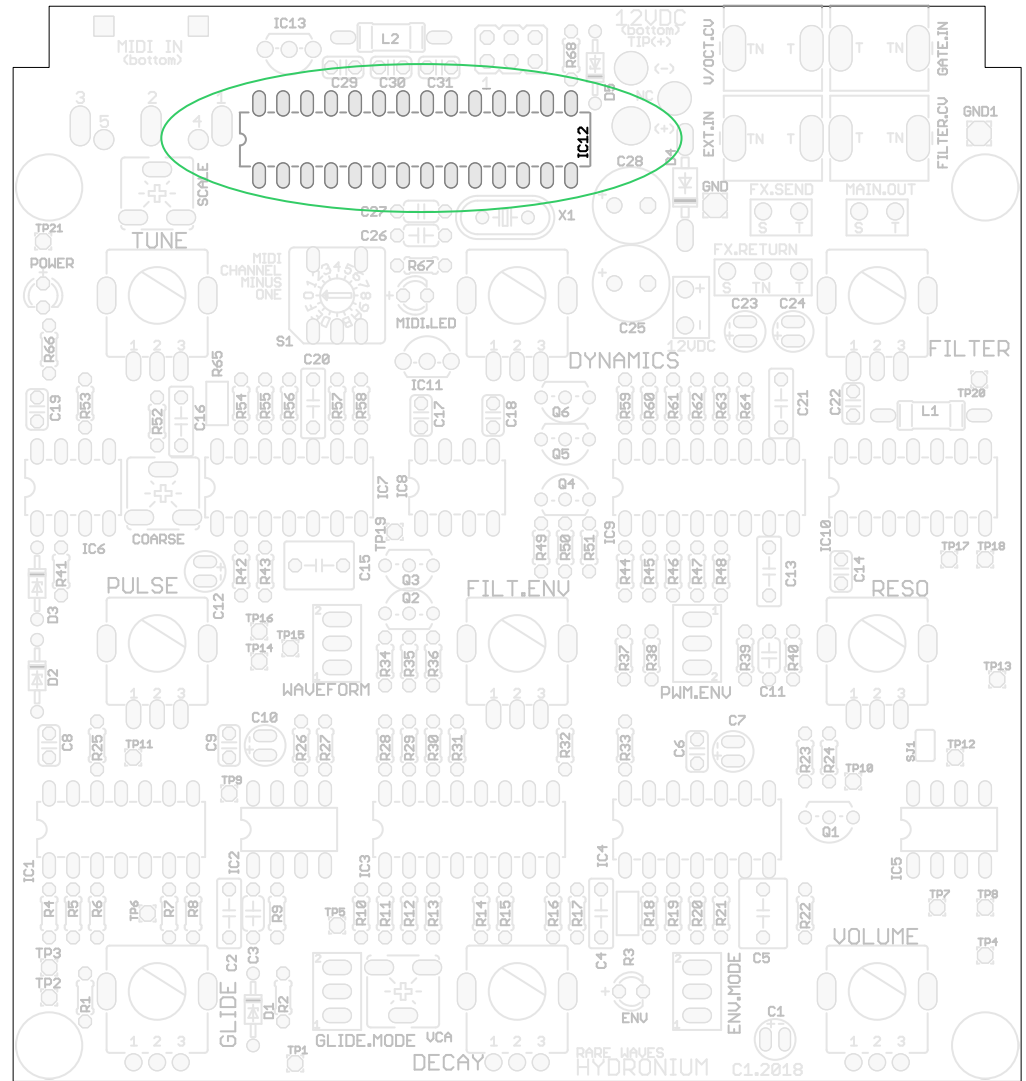
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Count _____

Reference _____
socket for IC 12

Value _____
IC socket, 28-pin

Assembly Note
This socket allows replacing the microcontroller “just in case”
Make sure the socket is installed in the correct orientation.



Step 31



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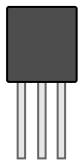
rev.C

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Count _____ 2

Reference _____ IC11, IC13

Value _____ 78L05



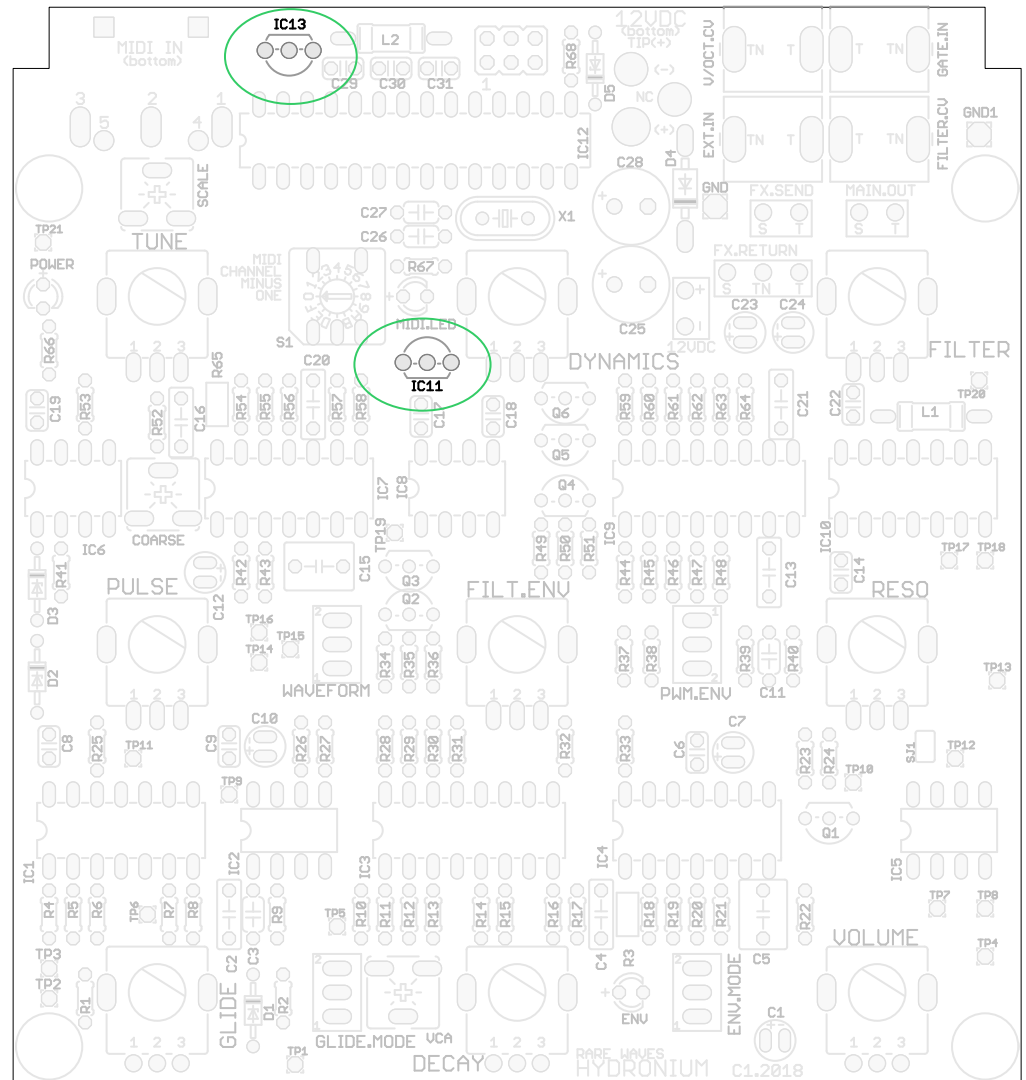
Type _____ 5-volt linear regulator, TO-92

Assembly Note

Use a magnifying lens to read the print on the part
Be sure you don't confuse it with the transistors.

Don't install it backwards.. The part must be oriented so it
matches the outline printed on the PCB.

This part must sit low on the board. It must be less than 9mm
high or it will interfere with the enclosure.



Step 32



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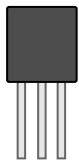
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Count _____ 4

Reference _____
Q1,Q3,Q5,Q6

Value _____
BC559B

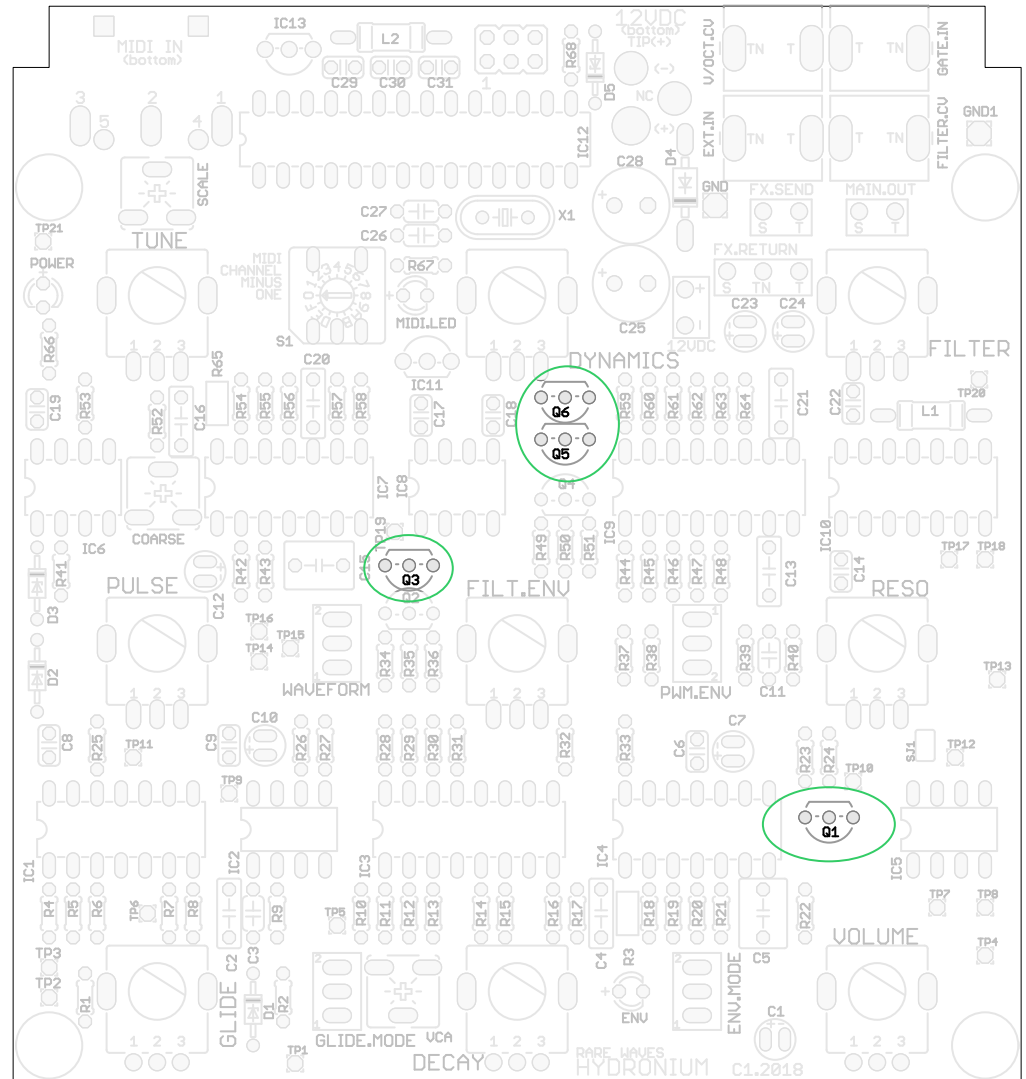


Type _____
PNP bipolar junction transistor, TO-92

Assembly Note _____
Use a magnifying lens to read the print on the part

Don't install it backwards... The part must be oriented so it matches the outline printed on the PCB.

These parts must sit low on the board. They must be less than 9mm high, or they will interfere with the enclosure.

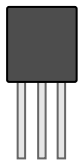


Step 33

Count _____ 2

Reference _____ Q2,Q4

Value _____ BC549B



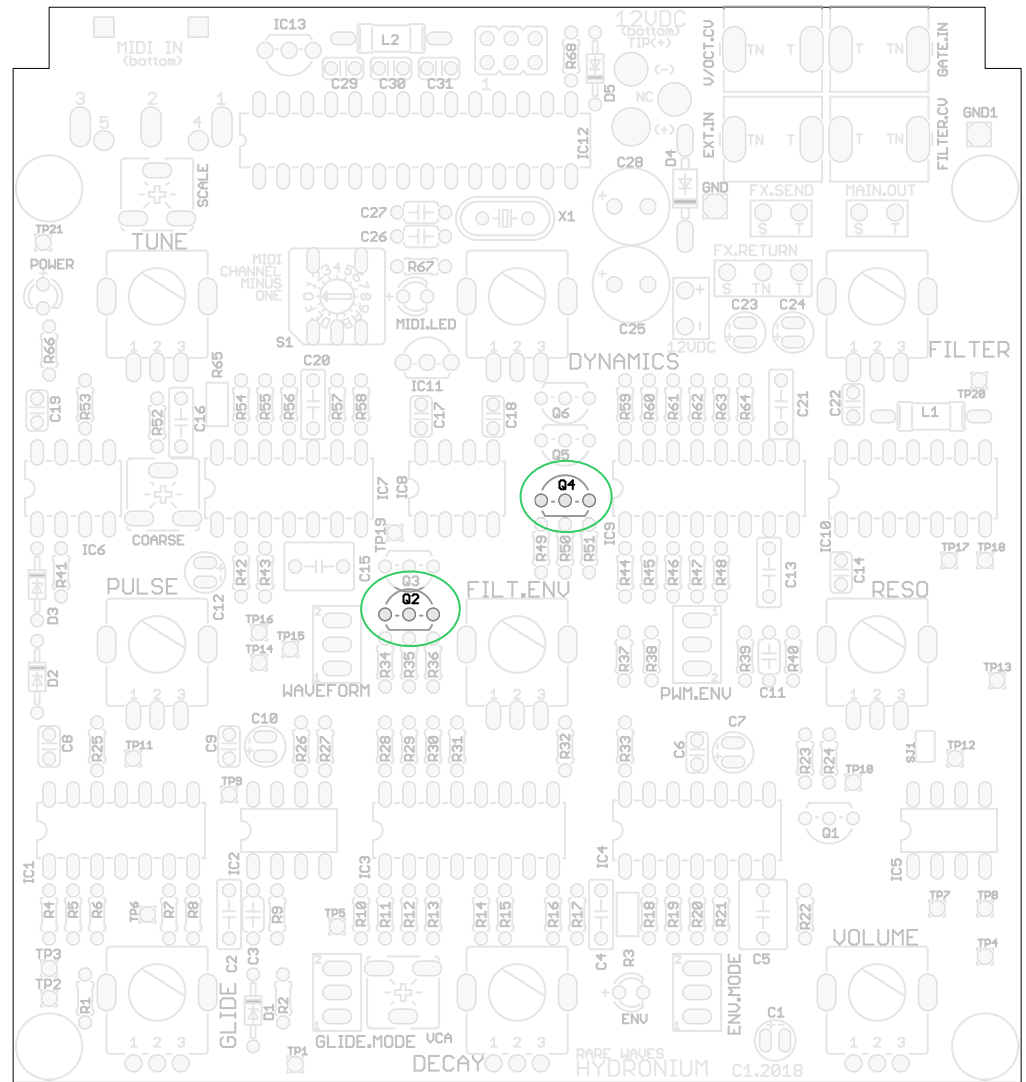
Type _____ NPN bipolar junction transistor, TO-92

Assembly Note _____

Use a magnifying lens to read the print on the part

Don't install it backwards... The part must be oriented so it matches the outline printed on the PCB.

These parts must sit low on the board. They must be less than 9mm high, or they will interfere with the enclosure.



Step 34



: Main PCB Assembly Guide

rev.C

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Count _____ 2

Reference _____ C25,C28

Value _____ 220 μ F



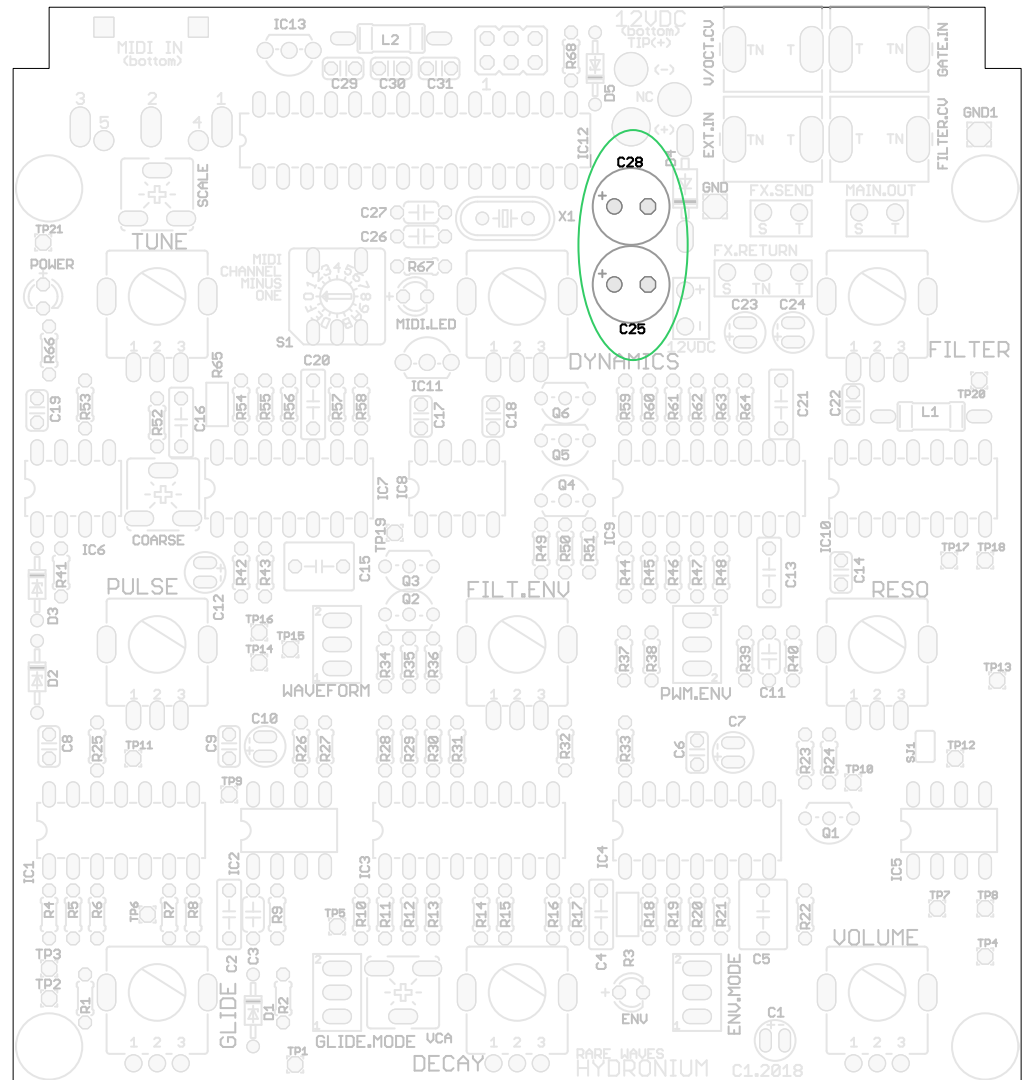
Type _____ Electrolytic capacitor, 8mm (d) x 9mm (h)

Assembly Note _____

The long lead must go in the hole marked (+).

**** IMPORTANT NOTE ****

The base of this part must be pressed tight against the PCB.
Otherwise it will be too tall, and it will interfere with the enclosure later when you go to assemble the case.



Step 35



HYDRONIUM : Main PCB Assembly Guide

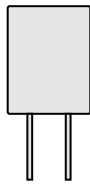
rev.C

rarewaves.net

Count _____ 2

Reference _____ C5,C15

Value _____ 2.2 μ F

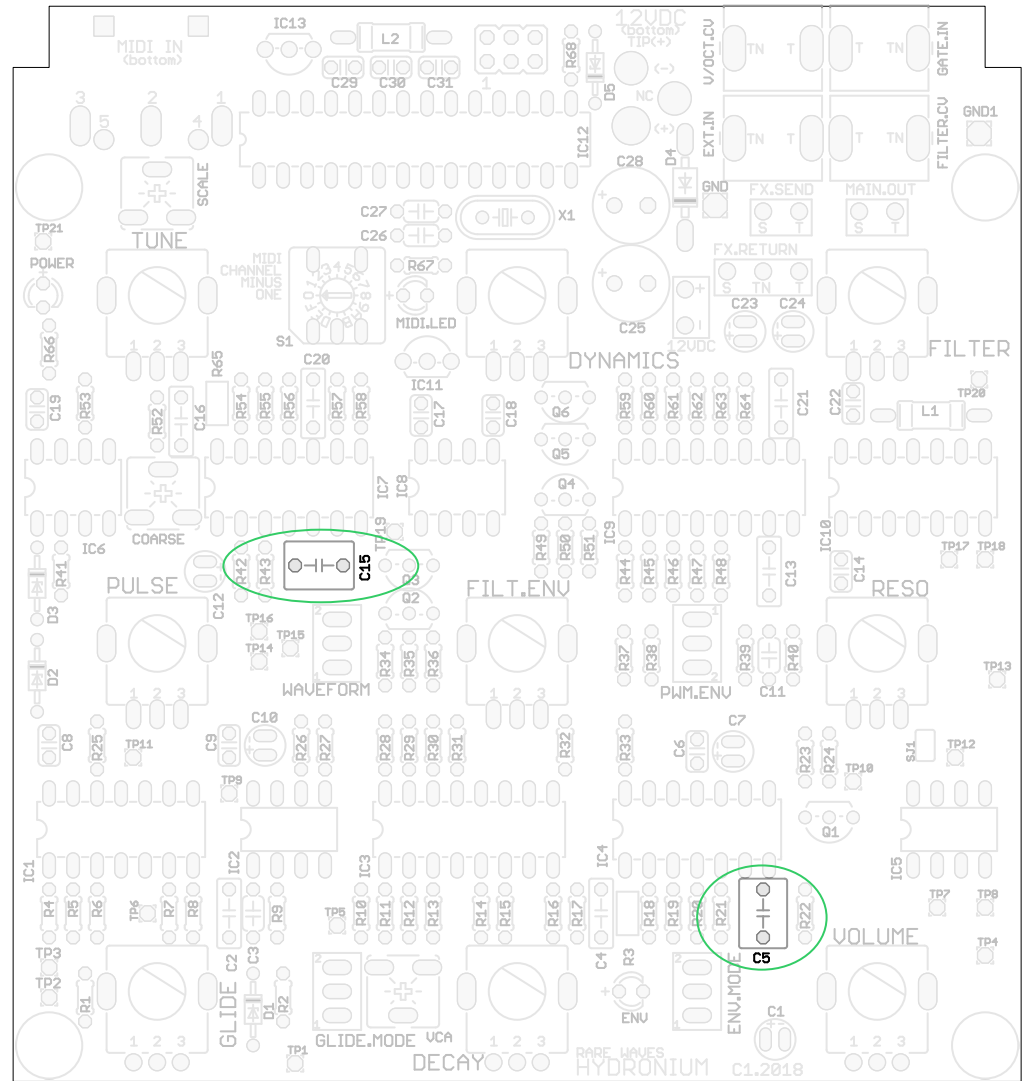


Type _____ PET film box capacitor 5%

Assembly Note _____

**** IMPORTANT NOTE ****

The base of this part must be pressed tight against the PCB.
Otherwise it will be too tall, and it will interfere with the enclosure later when you go to assemble the case.



Step 36



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HYDRONIUM : Main PCB Assembly Guide

rev.C

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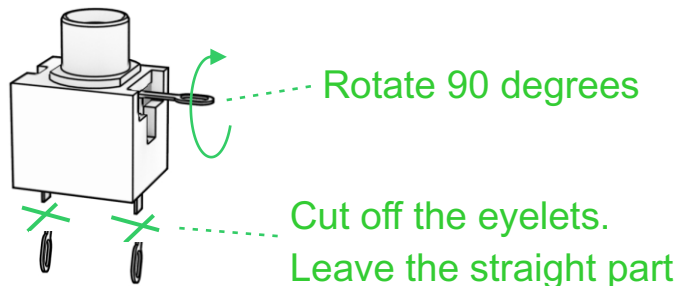
Count _____ 4

Reference _____
V/OCT.CV, EXT.IN, GATE.IN, FILTER.CV

Type _____
3.5 mm phone jack

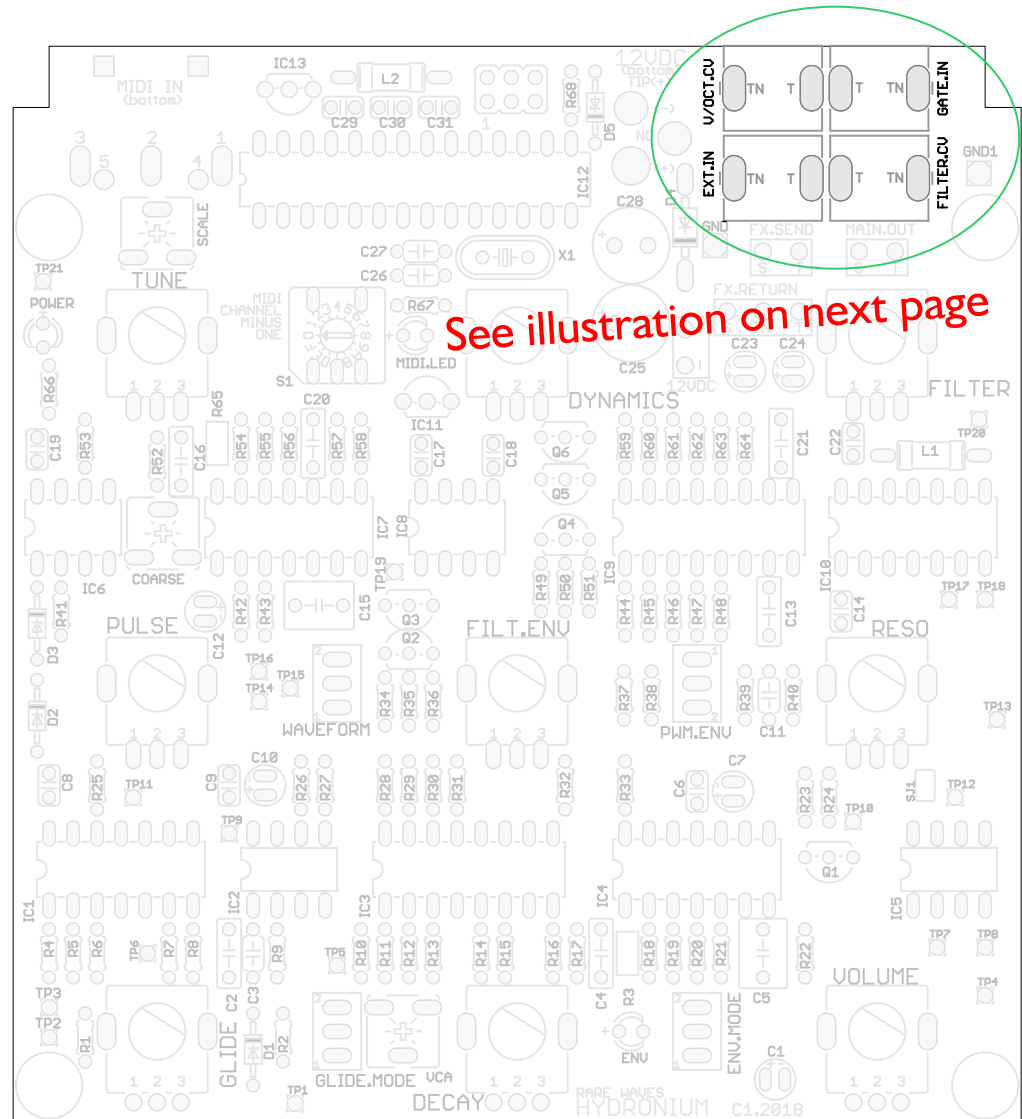
Assembly Note _____
Cut off the eyelets from the two leads on the bottom of the jack.
** Let the straight portion of the lead remain.
** Don't cut the lead on the side of the jack

Twist the lead on the side of the jack so it is rotated by 90 degrees.



Place the jacks on the PCB with the side lead facing toward the TN mark printed on the PCB.

Solder only one lead, then inspect carefully to be sure the part is sitting flat and straight on the PCB. Re-heat the solder and correct the alignment until it is perfect. Then solder its other lead.



Step 37



: Main PCB Assembly Guide

rev.C

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Reference

V/OCT.CV, EXT.IN, GATE.IN, FILTER.CV

Type

3.5 mm phone jack

Assembly Note (continued)

The side terminals of the jacks must be connected to the GND1 pad on the PCB. The GND1 pad is located next to the FILTER.CV jack.

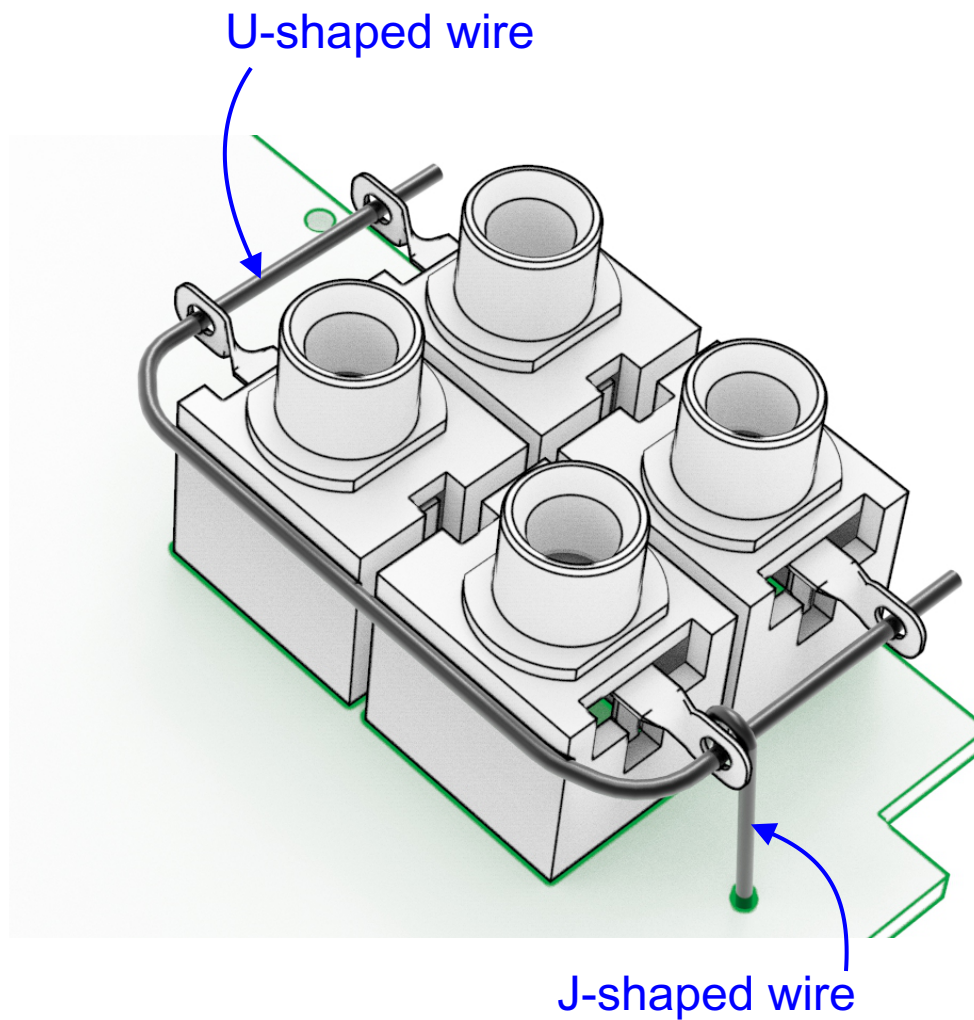
A short length of tinned copper bus wire is provided for this purpose.

Refer to the illustration on this page when forming the wire and installing it.

First, make a U-shaped piece of wire that will fit through all four of the solder eyelets. Solder it in place, then trim off the excess length.

Use the cut off piece to make a short jumper with a J-bend in its end. Install it so it connects the U-shaped piece to the GND1 pad on the PCB.

Solder the pieces in place so they make a secure electrical connection.



Step 37 (continued)



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HYDRONIUM

: Main PCB Assembly Guide

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Count _____ 3

Reference _____
POWER, ENV, MIDI. LED

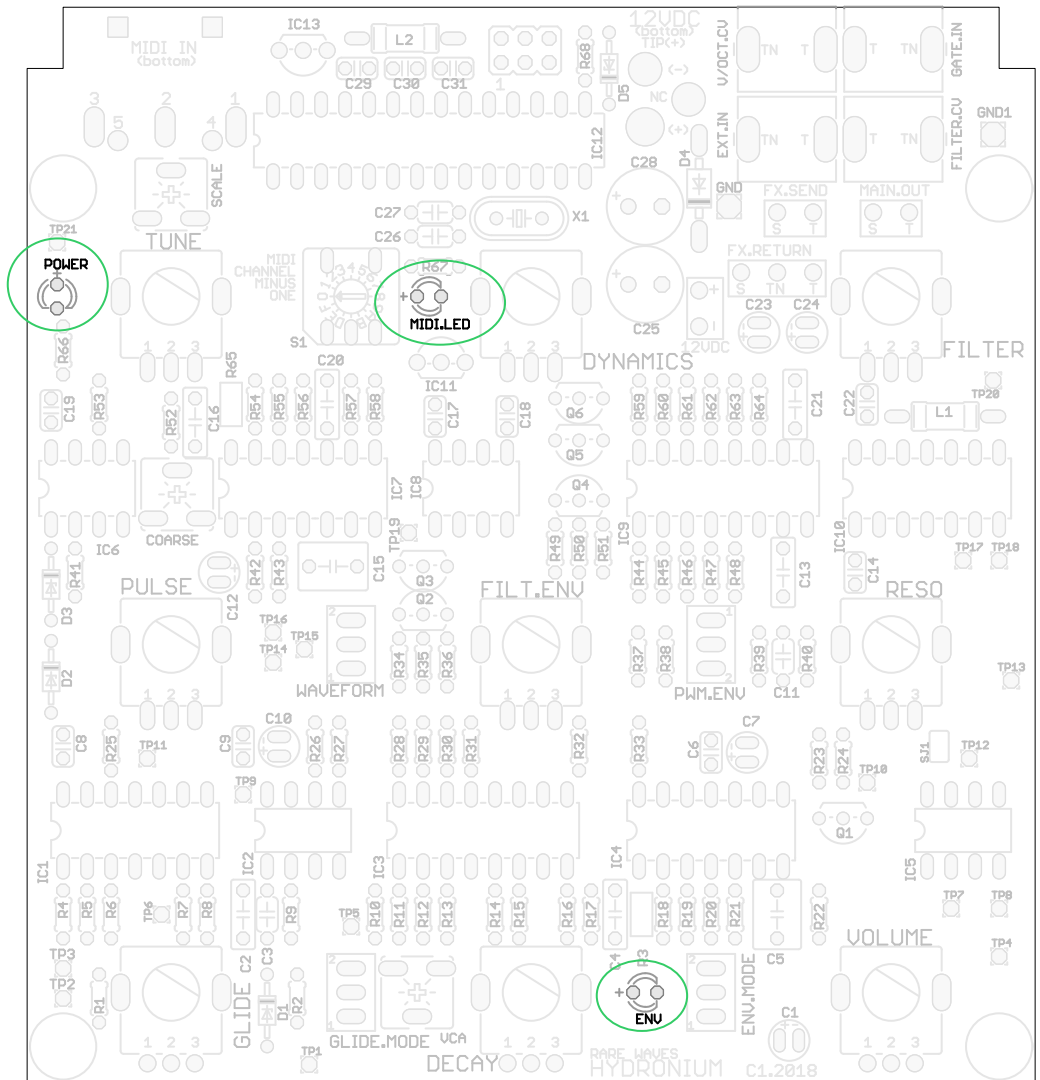
Type _____
3mm LED, with standoff

Assembly Note _____
Slide the LED into its plastic standoff before mounting it on the PCB. The standoff holds the LED in position so it matches the hole in the enclosure.

The long leg of the LED goes into the hole marked (+)

Solder one of the LED leads. Then, inspect its alignment. Correct the LED's alignment so it is perfectly straight and flat. If it needs re-alignment, heat up the solder and move the LED into position.

After the LED is aligned straight and flat against the PCB, finish it by soldering its other lead.



Step 38

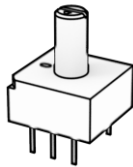
Count

Reference

S1

Type

Rotary switch, 16-position binary coded



Assembly Note

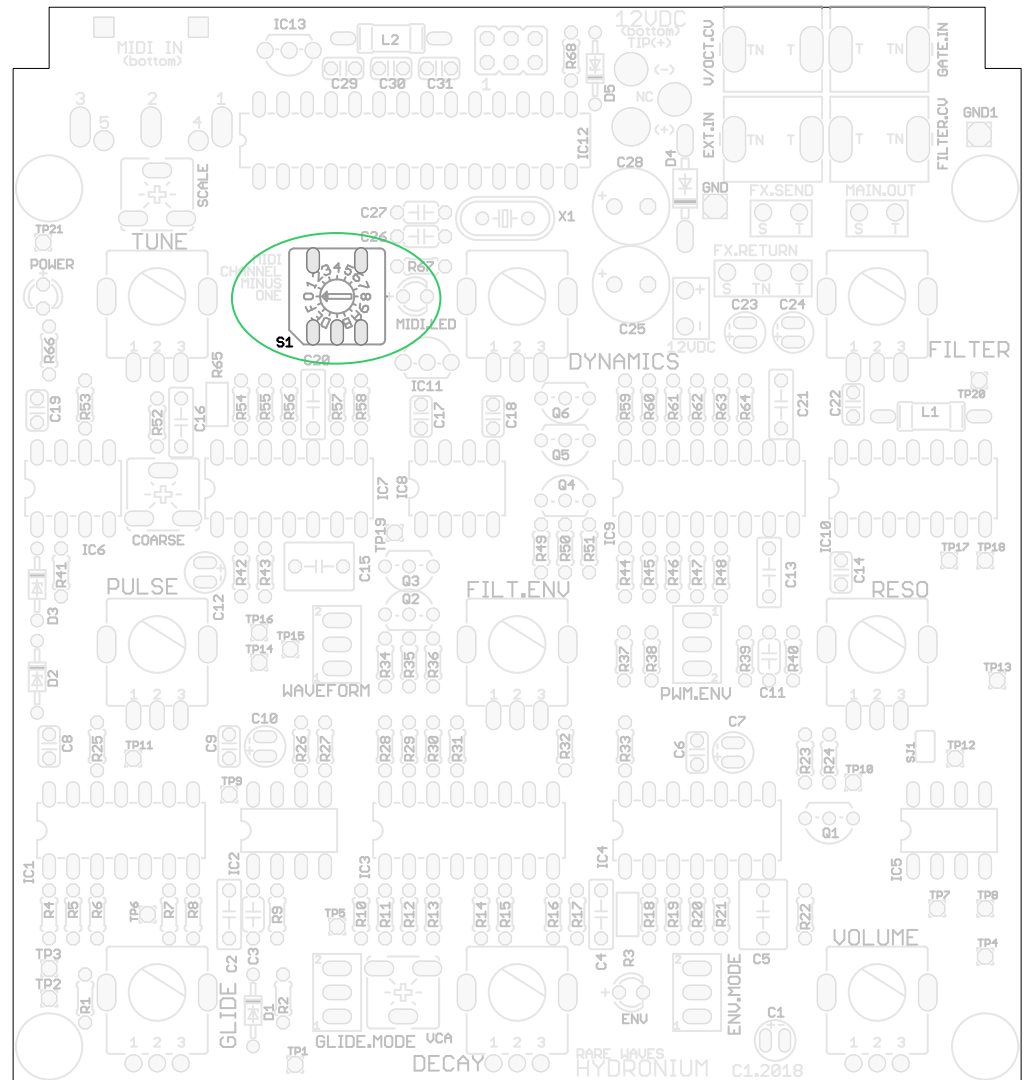
The switch has 6 leads, but there are only 5 holes on the PCB!

You must bend one of the switch's leads out of the way before mounting it on the PCB.

Identify the lead that is underneath the digit "4" printed on the switch. Then bend that lead outward so it is flat against the side of the switch.

First, solder only one lead in place. Then inspect the alignment.

Make sure the switch is sitting flat and tight against the PCB before soldering the remaining leads.



Step 39



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HYDRONIUM : Main PCB Assembly Guide

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Count _____

Reference _____
IC 12

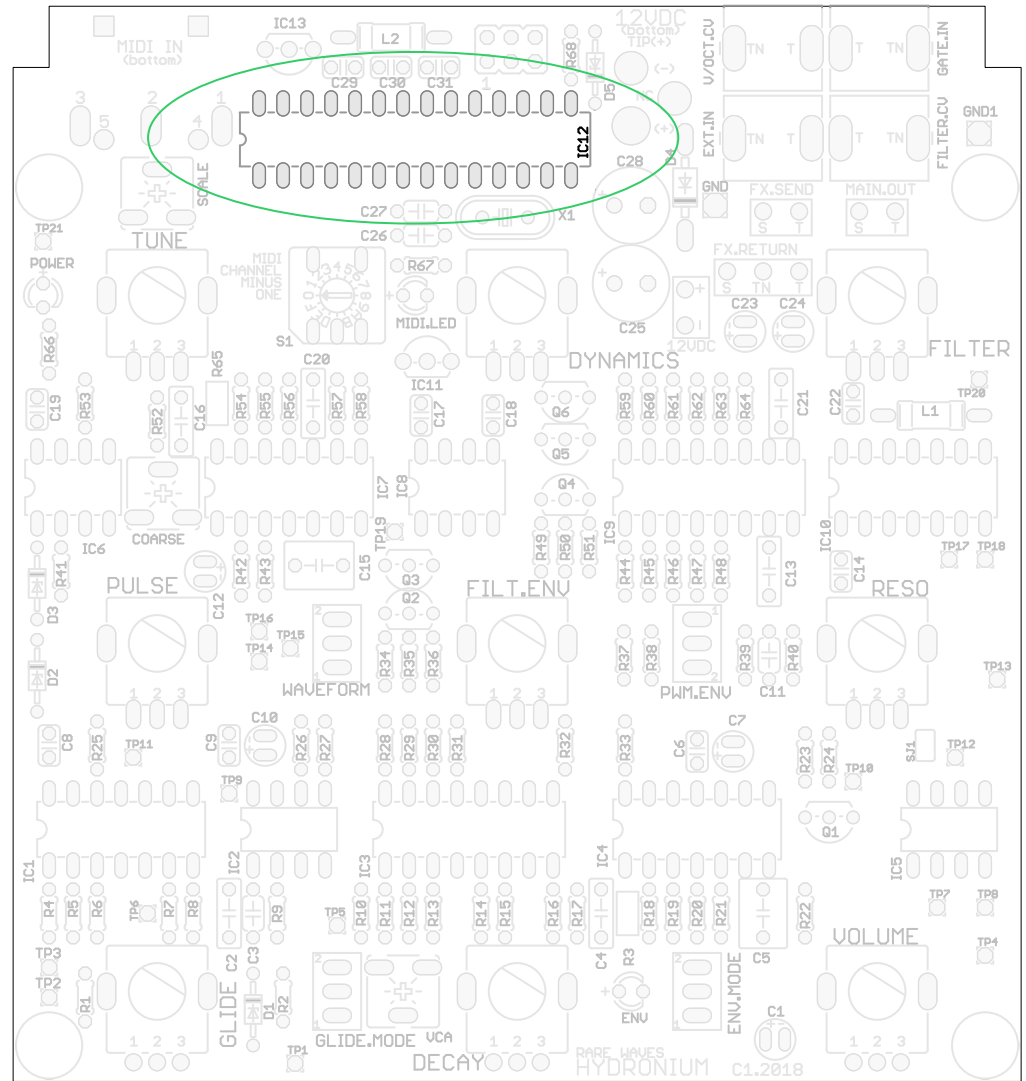
Type _____
ATmega328P microcontroller, DIP-28

Assembly Note _____

The part must be installed in the correct orientation.

Press the IC firmly into its socket.

Be careful that none of its pins deflects sideways out of the socket.



Step 40



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Count

Reference

DC.IN

Type

DC power input jack, 2.1 mm center pin

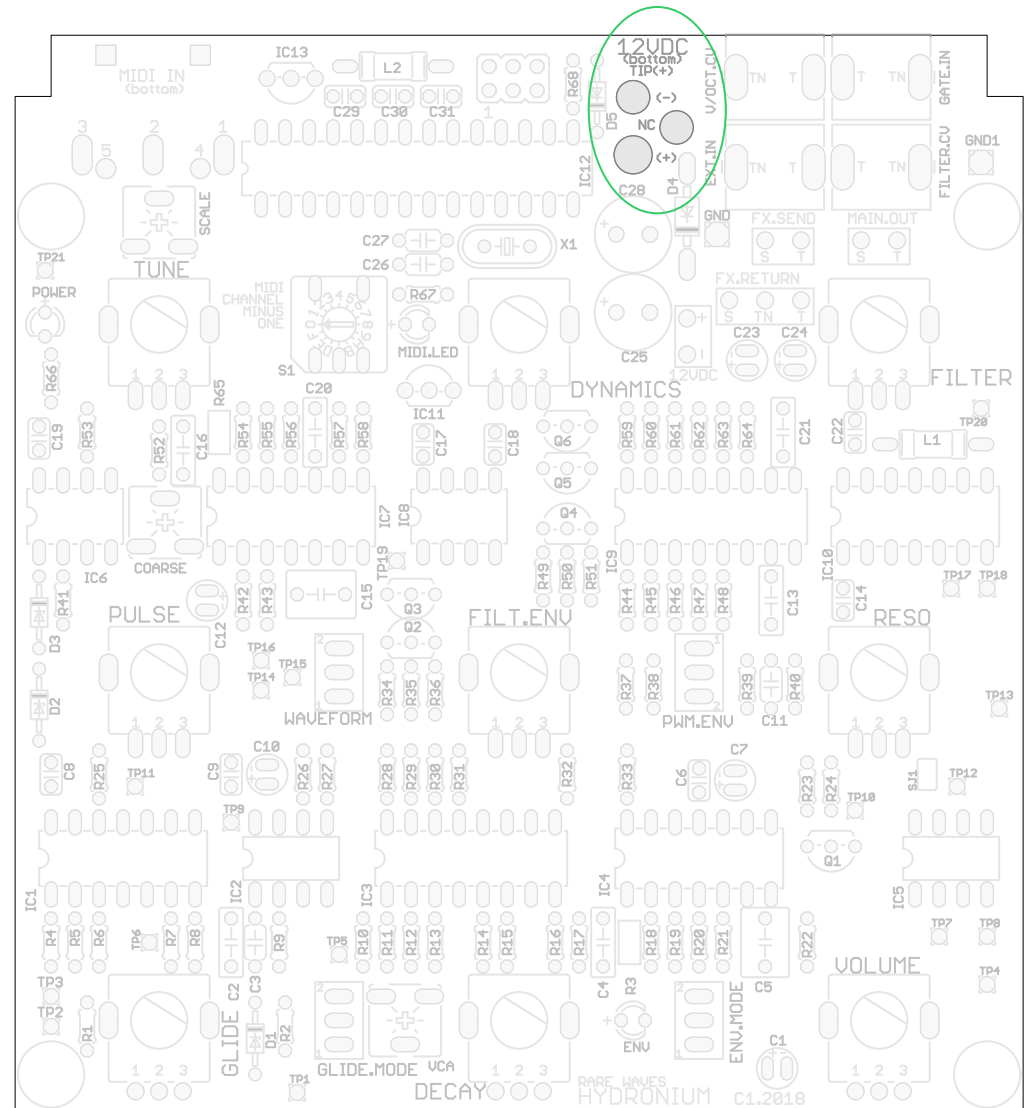
Assembly Note

Skip this step if you are building the Eurorack version

**** This part mounts on the bottom of the PCB ****

Before mounting this part, carefully trim the leads of D5 so they are flat with the surface of the PCB. Otherwise, the leads from D5 will interfere with this part and prevent it from sitting flat against the PCB.

It is important for this part to sit flat and straight on the PCB, because it must match the location of the hole in the chassis.



Step 41



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HYDRONIUM : Main PCB Assembly Guide

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Count

Reference

MIDI.IN

Type

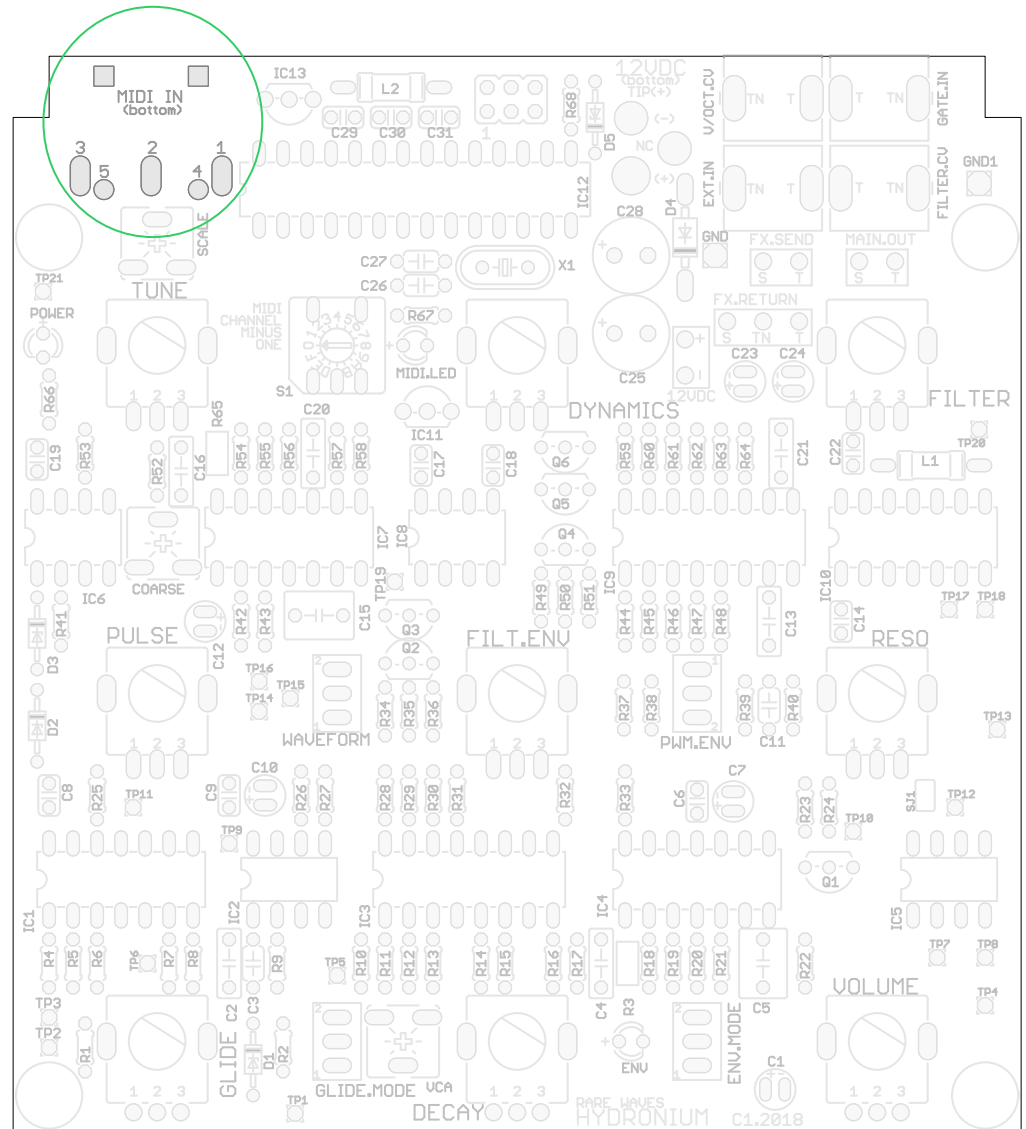
DIN-5 jack, right angle

Assembly Note

Skip this step if you are building the Eurorack version

**** This part mounts on the bottom of the PCB ****

It is important for this part to sit flat and straight on the PCB, because it must match the location of the hole in the chassis.



Step 42

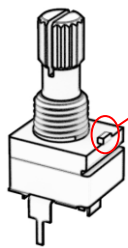
Count _____ 9

Reference _____
(various names)

Type _____
Potentiometer, 5k Ω linear

Assembly Note

First, remove the anti-rotation tab feature from the metal surface of the part. Use needle-nose pliers to break it off. Afterward, the top surface of the potentiometer will be flat.

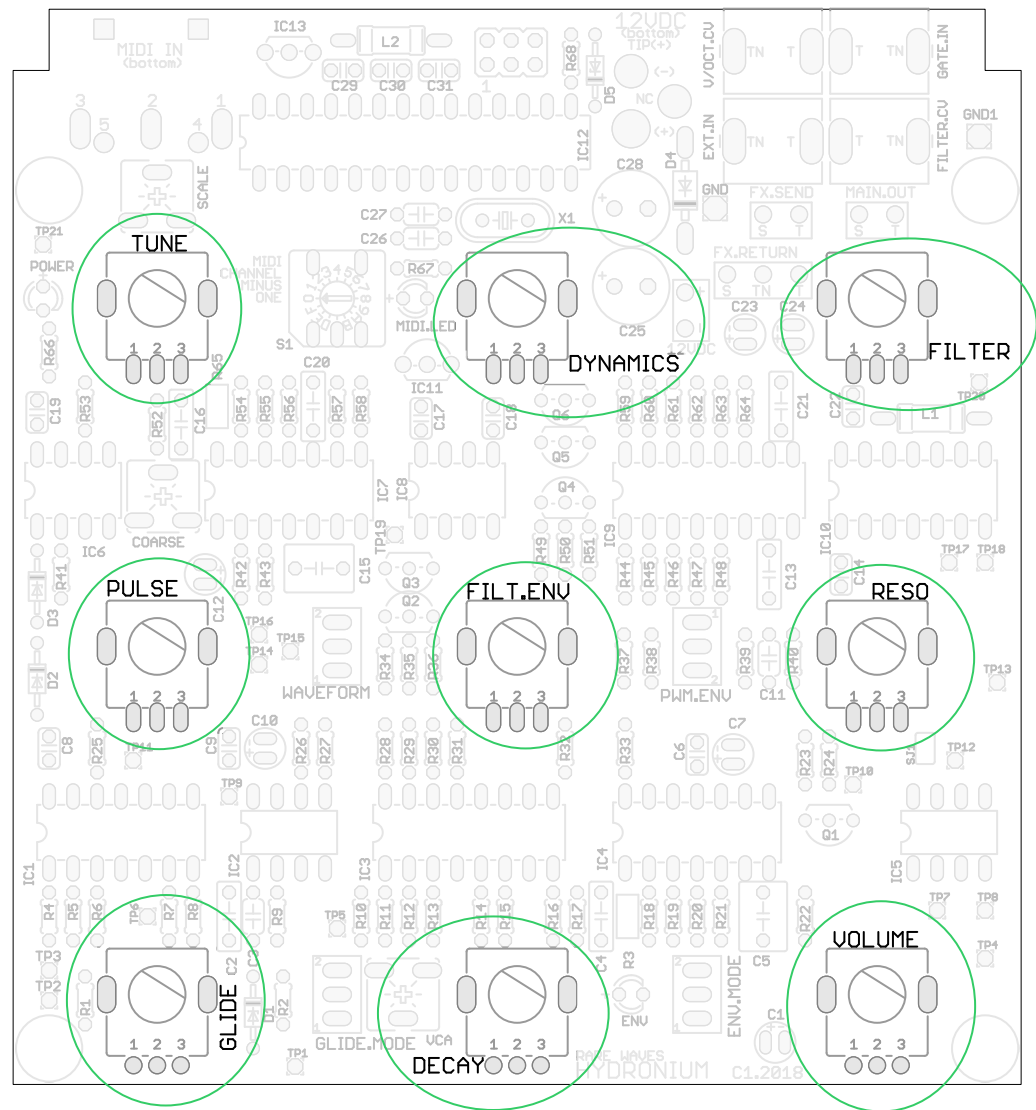


Break off this tab

Snap the potentiometers into their holes on the PCB. Be very careful that none of the pins deflects sideways and misses its hole.

After the pots are snapped in place, inspect them carefully to be certain they are flat and straight against the PCB.

Don't solder any of the pins on the potentiometers. This will be done later, after the PCB is mounted to the enclosure.



Step 43



rare waves

HYDRONIUM : Main PCB Assembly Guide

rev.C

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Count _____ 4

Reference _____
(various names)

Type _____
Toggle switch, SPDT

Assembly Note _____
First, solder only the center pin of the switch. Then inspect it to be sure it is sitting flat and straight on the PCB.

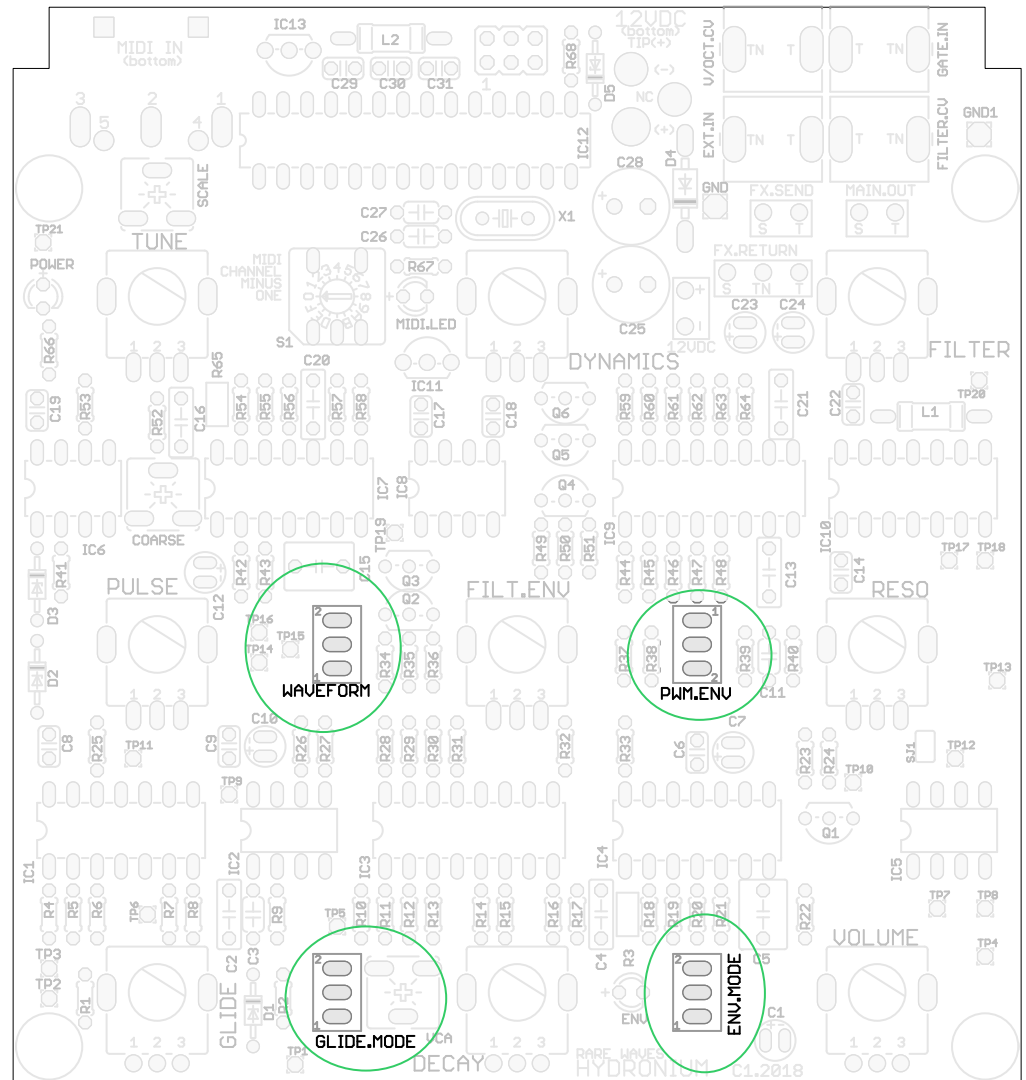
If its position needs adjustment, heat up the solder joint and move the switch into proper alignment.

Then, solder the remaining pins.

You are finished building the Main PCB!

Before you proceed to connect the Expander PCB, test the fit of the Main PCB to the control panel. All of the controls should pass through the holes in the panel. If any parts are not aligned correctly, re-heat the solder joints while applying pressure to align them straight so they fit through the panel.

Keep all of the hardware that came with the parts kit. You will use it later in the final steps of assembling the chassis.



Step 44



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HYDRONIUM : Main PCB Assembly Guide

rev.C

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Count _____
5

Reference _____
R1,R2,R7,R8,R12

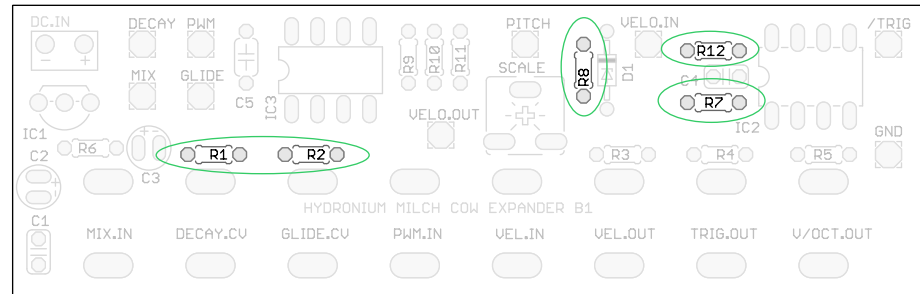
Value _____
20 k Ω



Type _____
Metal film resistor 1% 1/8W

Assembly Note

Bend leads at right angle to body, then insert through holes, solder, then clip off excess length.



Step 1



: Tabletop Expander PCB Assembly Guide

rev.B

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Count _____
2

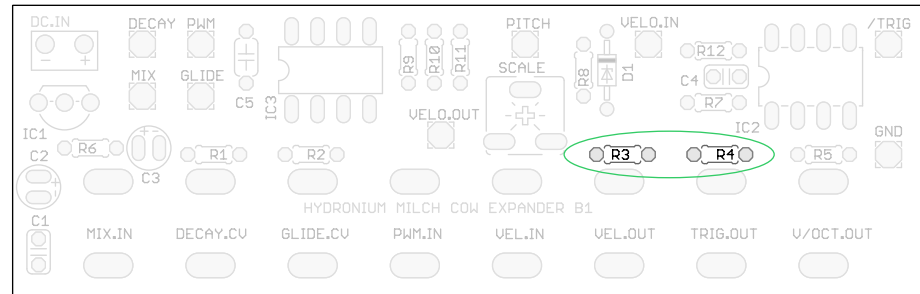
Reference _____
R3,R4

Value _____
1 k Ω



Type _____
Metal film resistor 1% 1/8W

Assembly Note
Bend leads at right angle to body, then insert through holes,
solder, then clip off excess length.



Step 2



HYDRONIUM : Tabletop Expander PCB Assembly Guide

rev.B

rarewaves.net

Count _____
|

Reference _____
R6

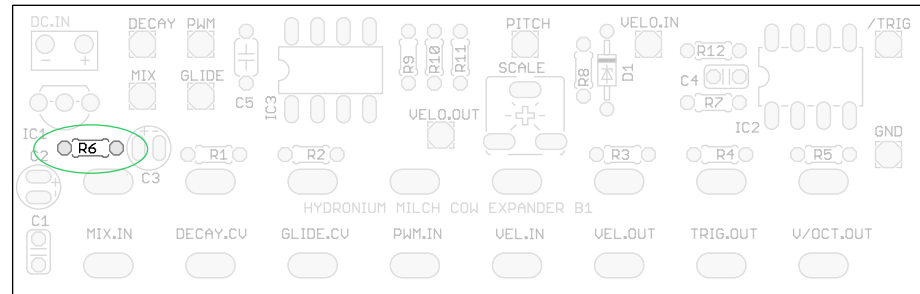
Value _____
200 k Ω



Type _____
Carbon film resistor 5% 1/8W

Assembly Note

Bend leads at right angle to body, then insert through holes, solder, then clip off excess length.



Step 3



HYDRONIUM : Tabletop Expander PCB Assembly Guide

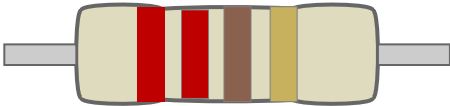
rev.B

rarewaves.net

Count _____ |

Reference _____ R5

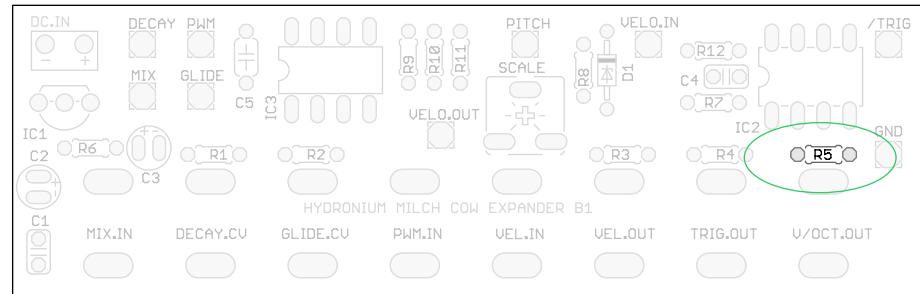
Value _____ 220 Ω



Type _____ Carbon film resistor 5% 1/8W

Assembly Note

Bend leads at right angle to body, then insert through holes, solder, then clip off excess length.



Step 4



HYDRONIUM : Tabletop Expander PCB Assembly Guide

rev.B

rarewaves.net

Count _____
|

Reference _____
R9

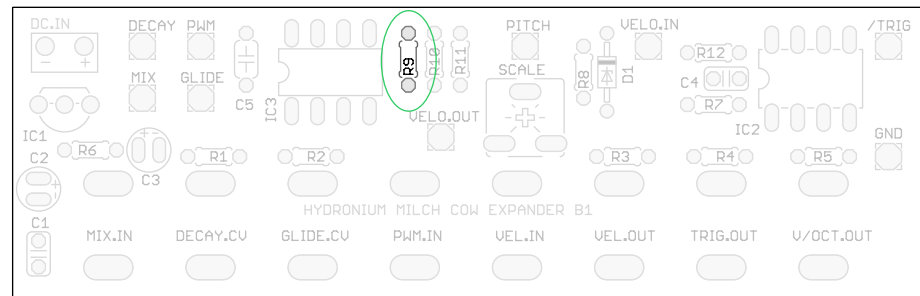
Value _____
33.2 kΩ



Type _____
Metal film resistor 1% 1/8W

Assembly Note

Bend leads at right angle to body, then insert through holes, solder, then clip off excess length.



Step 5



: Tabletop Expander PCB Assembly Guide

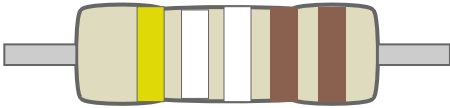
rev.B

rarewaves.net

Count _____
|

Reference _____
R10

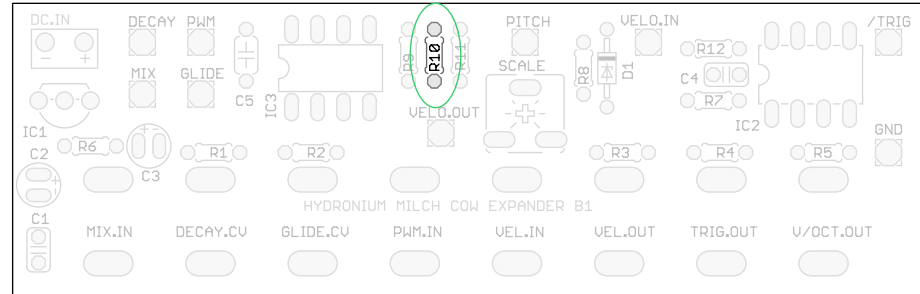
Value _____
4.99 k Ω



Type _____
Metal film resistor 1% 1/8W

Assembly Note

Bend leads at right angle to body, then insert through holes, solder, then clip off excess length.



Step 6



HYDRONIUM : Tabletop Expander PCB Assembly Guide

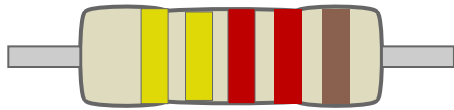
rev.B

rarewaves.net

Count _____
|

Reference _____
R11

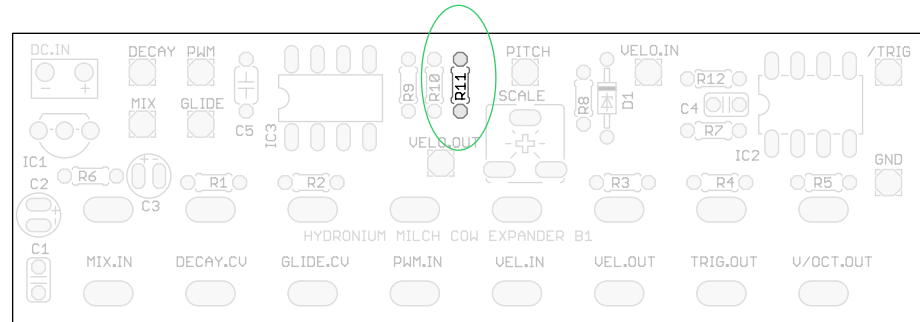
Value _____
44.2 k Ω



Type _____
Metal film resistor 1% 1/4W

Assembly Note

Bend leads at right angle to body, then insert through holes, solder, then clip off excess length.



Step 7



: Tabletop Expander PCB Assembly Guide

rev.B

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Count _____ |

Reference _____ DI

Value _____ IN5233B

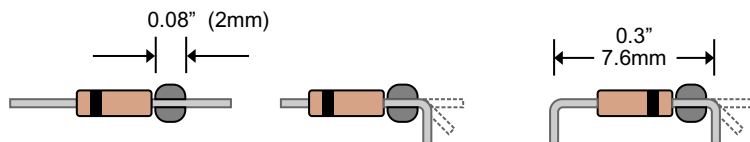
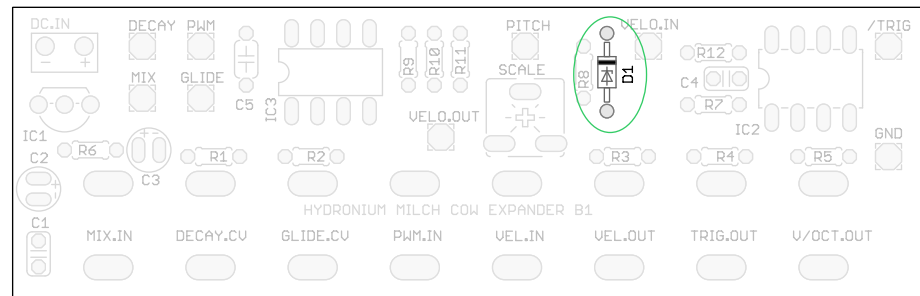


Type _____ Zener diode 6.0V, 5%, DO-35

Assembly Note

Orient the part so its striped end matches the stripe printed on the PCB.

The part is made of glass. To prevent damage, grip the leads with tweezers or needle nose pliers close to the body while making the bends.



Step 8



HYDRONIUM : Tabletop Expander PCB Assembly Guide

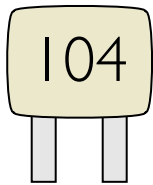
rev.B

rarewaves.net

Count _____
2

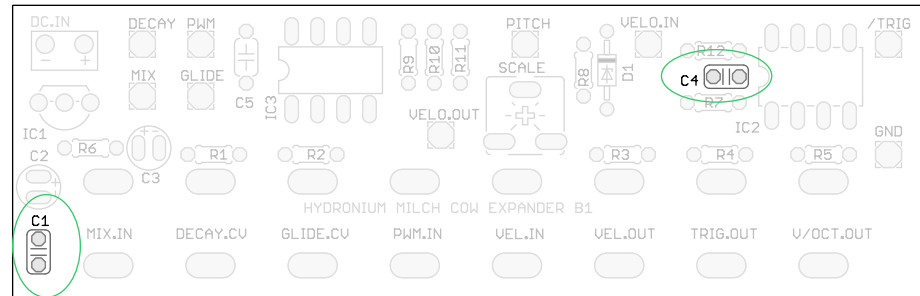
Reference _____
C1,C4

Value _____
0.1 μ F



Type _____
Ceramic capacitor, MLCC, 20%

Assembly Note _____
Non-polar



Step 9



HYDRONIUM : Tabletop Expander PCB Assembly Guide

rev.B

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Count _____
2

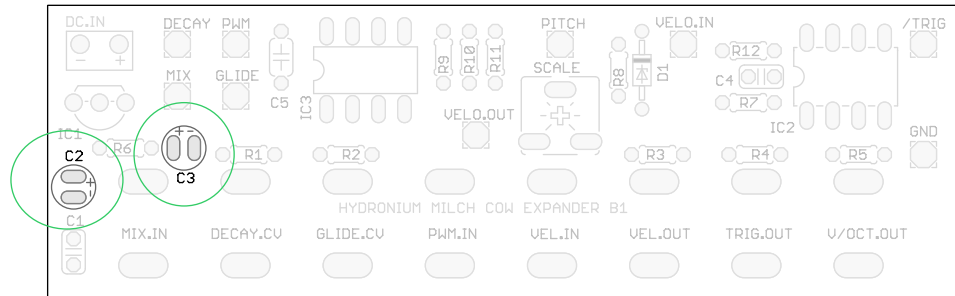
Reference _____
C2,C3

Value _____
22 μ F



Type _____
Electrolytic capacitor, 4 mm(d) x 7 mm(h)

Assembly Note _____
The long lead must go in the hole marked (+)



Step 10



HYDRONIUM : Tabletop Expander PCB Assembly Guide

rev.B

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Count

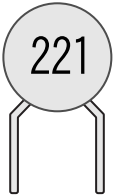
1

Reference

C5

Value

220 pF

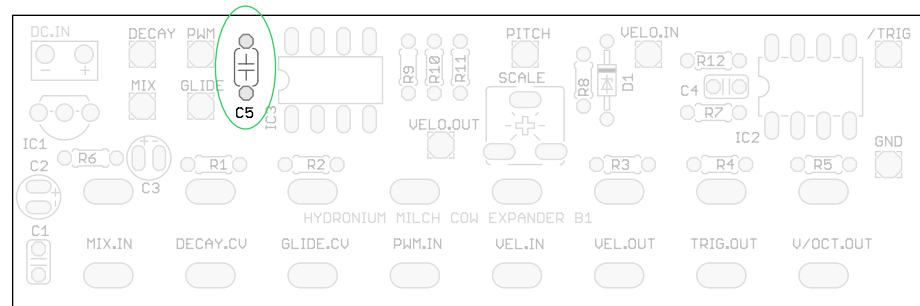


Type

Ceramic disc capacitor, 5%

Assembly Note

Non-polar



Step 11



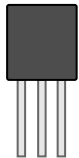
HYDRONIUM : Tabletop Expander PCB Assembly Guide

rev.B

rarewaves.net

Count _____ |

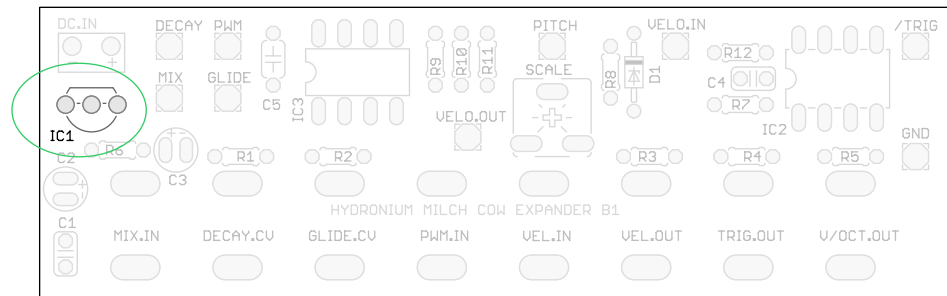
Reference _____ IC 1

Value _____
 78L05

Type _____
5V linear voltage regulator, TO-92

Assembly Note

Don't install it backwards.. The part must be oriented so it matches the outline printed on the PCB



Step 12



HYDRONIUM : Tabletop Expander PCB Assembly Guide

rev.B

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Count _____ |

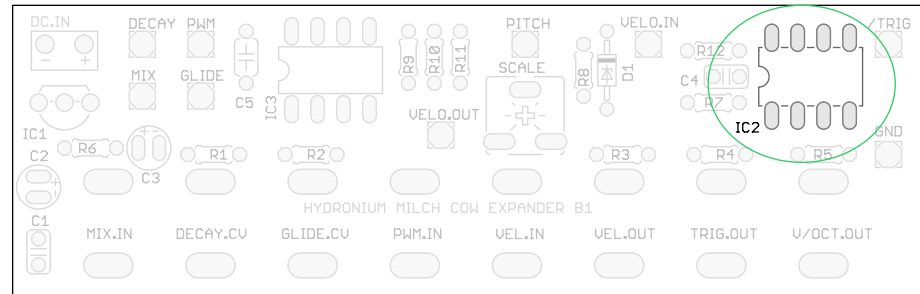
Reference _____ IC 2

Value _____ MCP6542-I/P

Type _____ Dual analog comparator, DIP-8

Assembly Note

Bend the leads straight to the body before inserting.
Insert the IC into the holes on the PCB.
Make sure all of the leads are passing through the holes.
Wait! Double-check the orientation of the IC.
Be sure its not installed backwards.
Finally, solder all the leads.



Step 13



HYDRONIUM : Tabletop Expander PCB Assembly Guide

rev.B

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Count _____ |

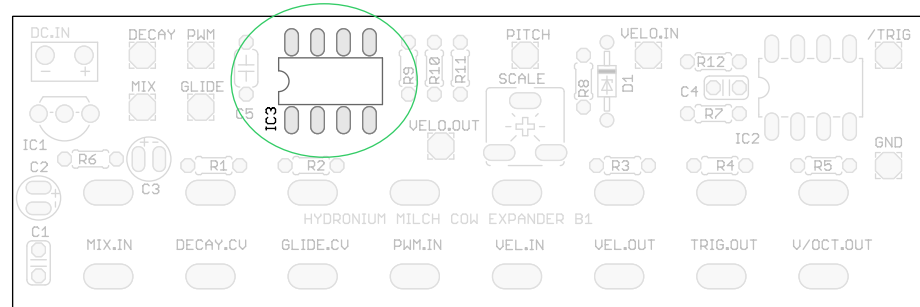
Reference _____
IC 3

Value _____
TLC2262 or TLC272

Type _____
Dual op amp, DIP-8

Assembly Note

Bend the leads straight to the body before inserting.
Insert the IC into the holes on the PCB.
Make sure all of the leads are passing through the holes.
Wait! Double-check the orientation of the IC.
Be sure its not installed backwards.
Finally, solder all the leads.



Step 14



HYDRONIUM : Tabletop Expander PCB Assembly Guide

rev.B

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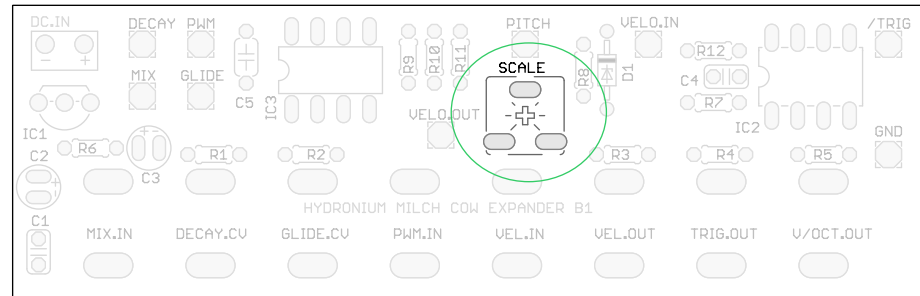
Count _____ |

Reference _____
SCALE

Value _____
2 k Ω

Type _____
Variable resistor, trimmer potentiometer

Assembly Note _____



Step 15



HYDRONIUM : Tabletop Expander PCB Assembly Guide

rev.B

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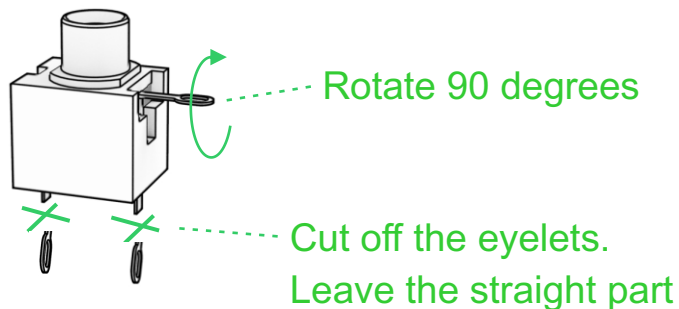
Count _____
8

Reference _____
MIX.IN, DECAY.CV, GLIDE.CV, PWM.IN,
VEL.IN, VEL.OUT, TRIG.OUT, V/OCT.OUT

Type _____
3.5mm phone jack

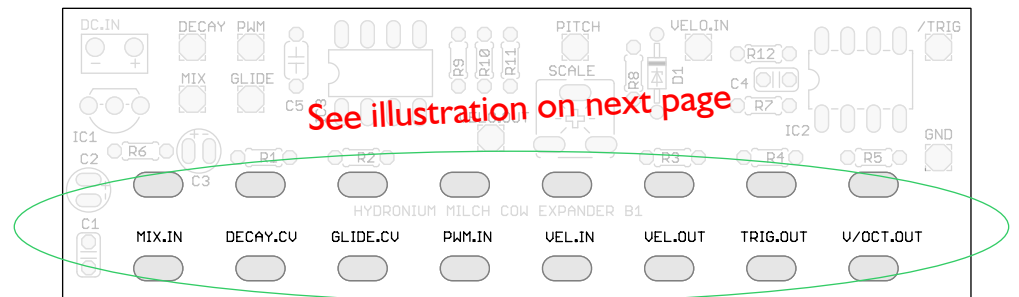
Assembly Note _____
Cut off the eyelets from the two leads on the bottom of the jack.
** Let the straight portion of the lead remain.
** Don't cut the lead on the side of the jack

Twist the lead on the side of the jack so it is rotated by 90 degrees.



**** IMPORTANT NOTE ****

These parts mount on the bottom side of the PCB, opposite all the other components.



Reference

MIX.IN, DECAY.CV, GLIDE.CV, PWM.IN,
VEL.IN, VEL.OUT, TRIG.OUT, V/OCT.OUT

Type

3.5 mm phone jack

Assembly Note (continued)

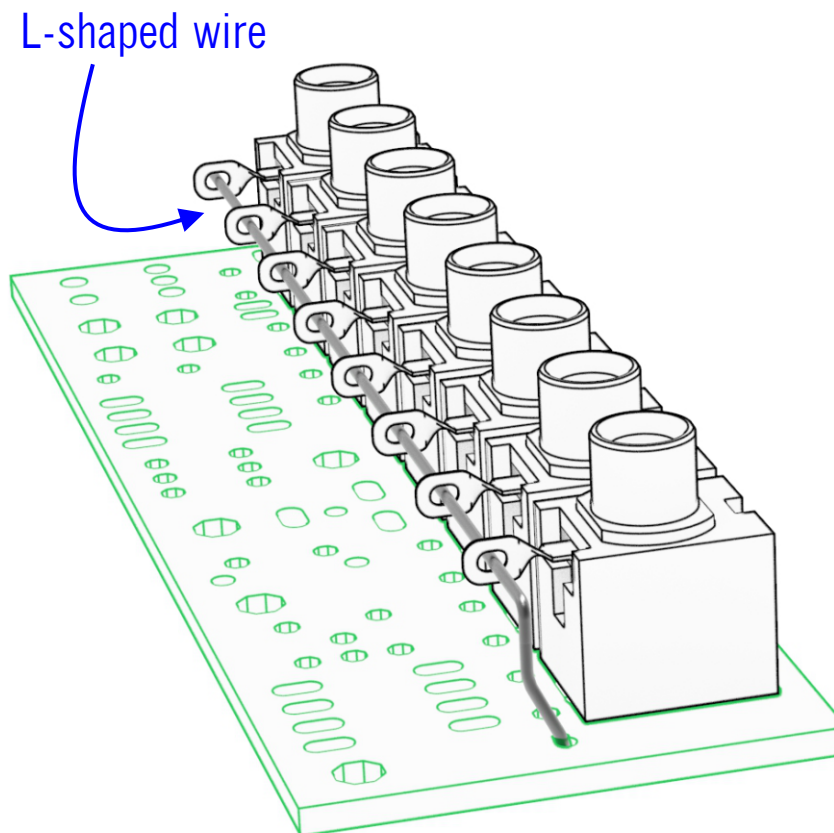
** IMPORTANT NOTE **

The jacks mount on the “bottom” of the PCB, opposite the other components.

First, solder only one terminal of each jack. Then inspect them to be sure they are sitting flat and in straight rows on the PCB. If they need adjustment, re-heat the solder and apply pressure to shift the jack into correct alignment. Test-fit it with the chassis to be sure all the jacks line up with the holes. After you have the jacks aligned well, solder the remaining terminals.

The side terminals of the jacks must be connected to the GND pad on the PCB. The GND pad is located next to IC 2.
A short length of tinned copper bus wire is provided.

Thread the wire it through all 8 jacks’ side terminals. Bend the end into an “L” so it can reach the GND pad. Solder the wire in place so it makes a secure electrical connection with all of the jacks and the GND pad.



Step 16



HYDRONIUM : Tabletop Expander PCB Assembly Guide

rev.B

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Operation

Inter-board connections

Assembly Note

In this step you will connect the Expander PCB to the Main PCB.

The kit includes pre-cut 26-gauge PVC insulated stranded hookup wire for this purpose.

Refer to the figure on this page as a guide while you make the connections.

DECAY, GLIDE, /TRIG ... etc refer to the solder pads on the Expander PCB, where you will solder the other end of the wire.

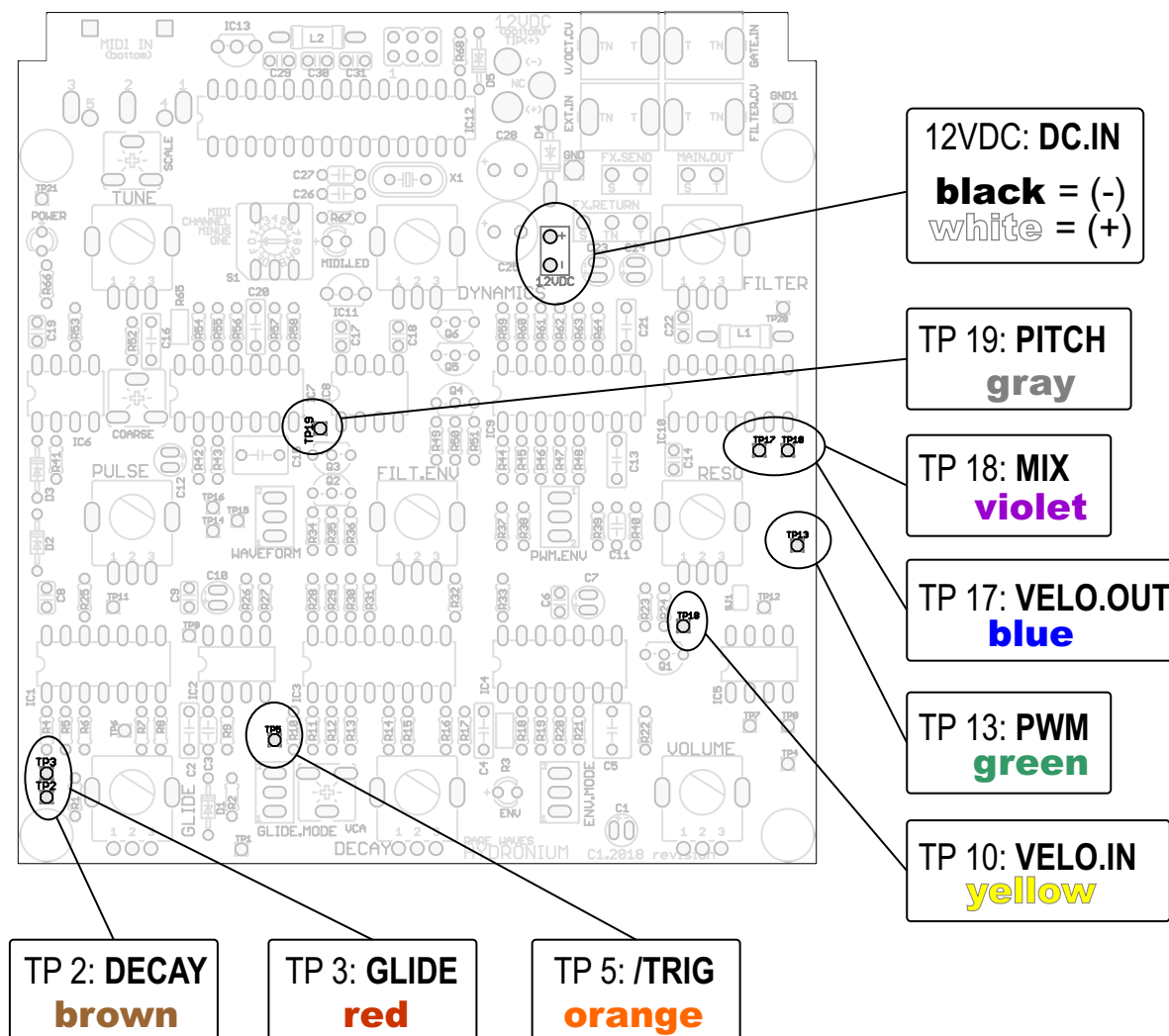
Follow the color code that is shown.

Strip 1/8" (3mm) of insulation from both ends of the wire, then tin the stripped ends with solder.

First, solder one end of each wire to the top side (component side) of the Expander PCB.

Then, poke the free ends of the wires through the back side (solder side) of the Main PCB.

Make sure you put each wire in the correctly numbered TP # location. Solder the wires from the top side of the Main PCB, being careful not to melt the other components



Step 1



HYDRONIUM : Tabletop Chassis Assembly Guide

rev.C

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Operation

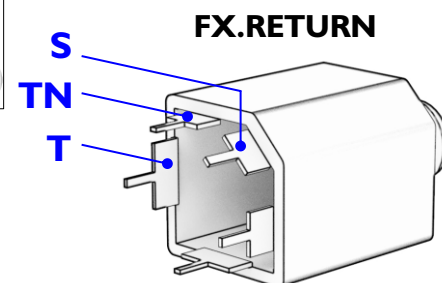
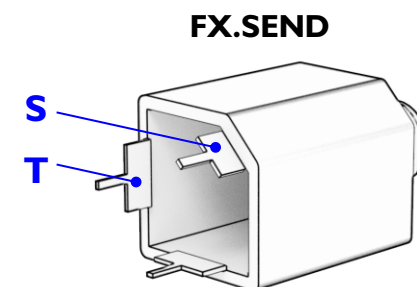
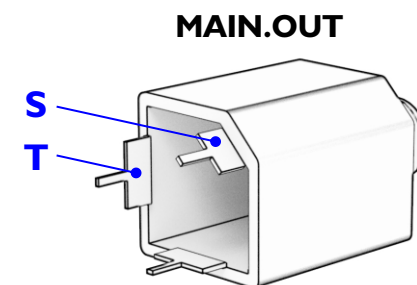
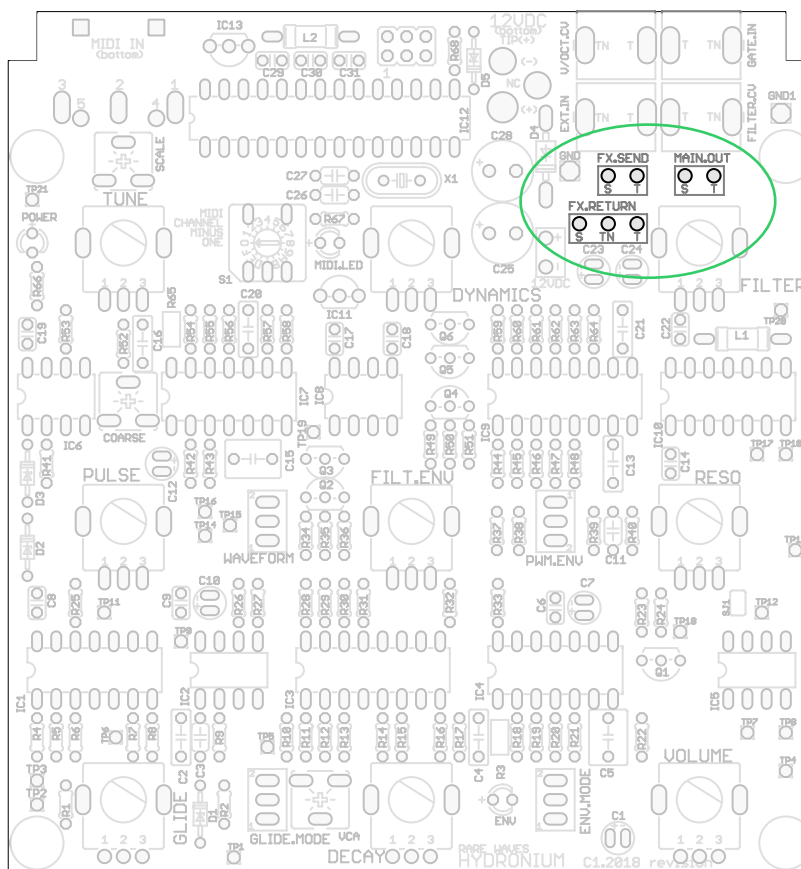
Off-board jacks hookup

Assembly Note

In this step, connect three 1/4" phone jacks to the PCB using 4" lengths of hookup wire.

1. Strip 1/8" of insulation from both ends of the wire.
2. Tin both ends of the wire.
3. Tin the terminals on the jack.
4. Touch the wire to the terminal on the jack while heating both with the soldering iron. This will re-melt the solder and form a bond.
5. Poke the other end of the wire through the appropriate PCB pad from the back side (solder side).
6. Turn the PCB over and solder the connection from the top side.

S = SLEEVE (GND)
T = TIP
TN = TIP NORMAL



Operation

Mate PCB with chassis

Assembly Note

First, verify that the anti-rotation tabs have been removed from all 9 potentiometers.

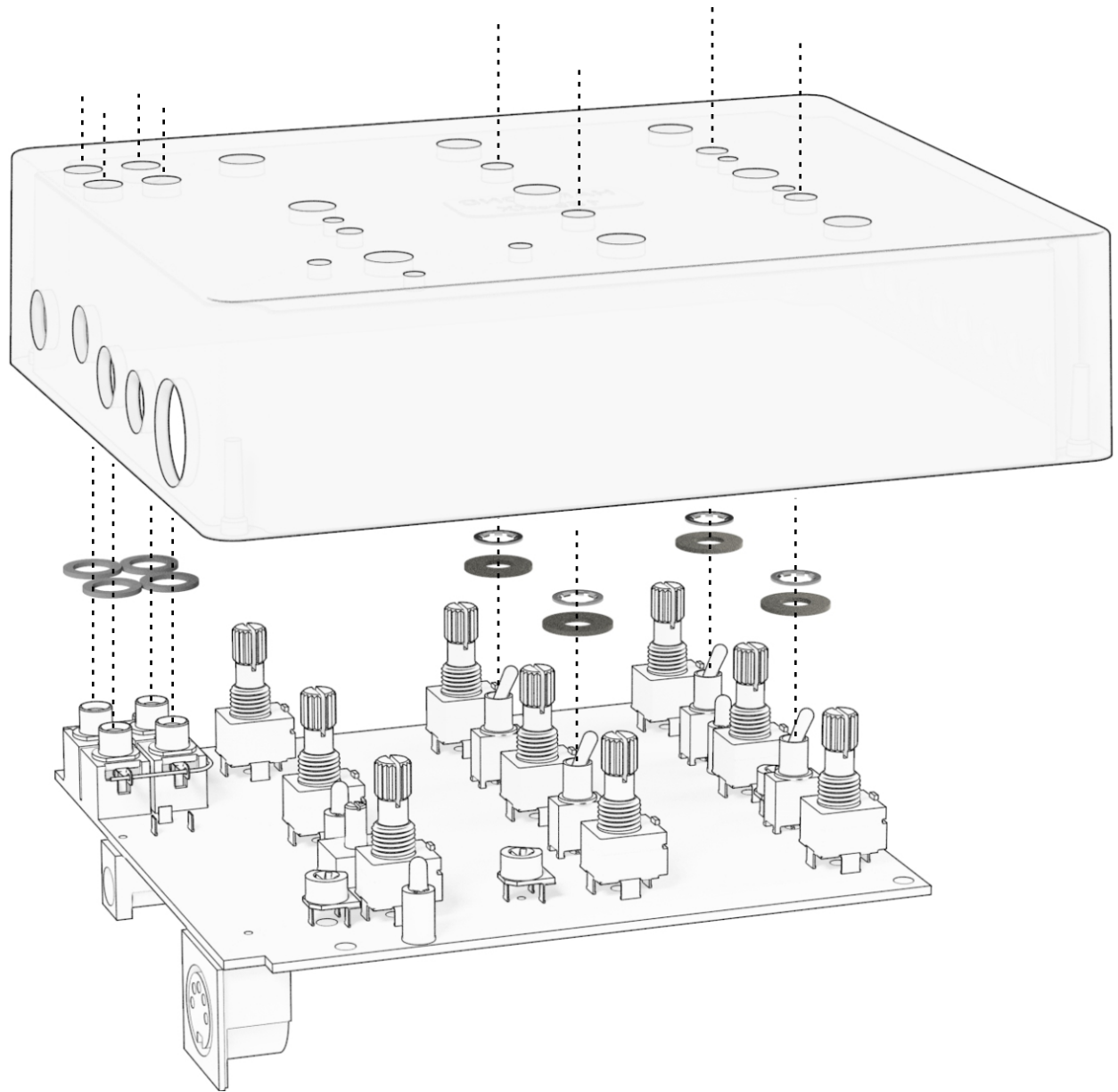
Before mating the PCB with the chassis, install washers on the switches and 3.5mm jacks as shown. This hardware is necessary to prevent stress on the assembly when the panel nuts are tightened.

The jacks require 0.25" ID plastic washers (black).

The switches require 0.19" ID plastic washers (white) and metal lock nuts.

When mating the PCB with the chassis, it will help to set all four toggle switches in the down position as shown.

Be careful to make a smooth motion when mating the PCB with the chassis. Otherwise the washers will jump off of the jacks. Make sure all the hardware stays in place as the assembly is brought together.



Step 3



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HYDRONIUM : Tabletop Chassis Assembly Guide

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Operation

Install hardware

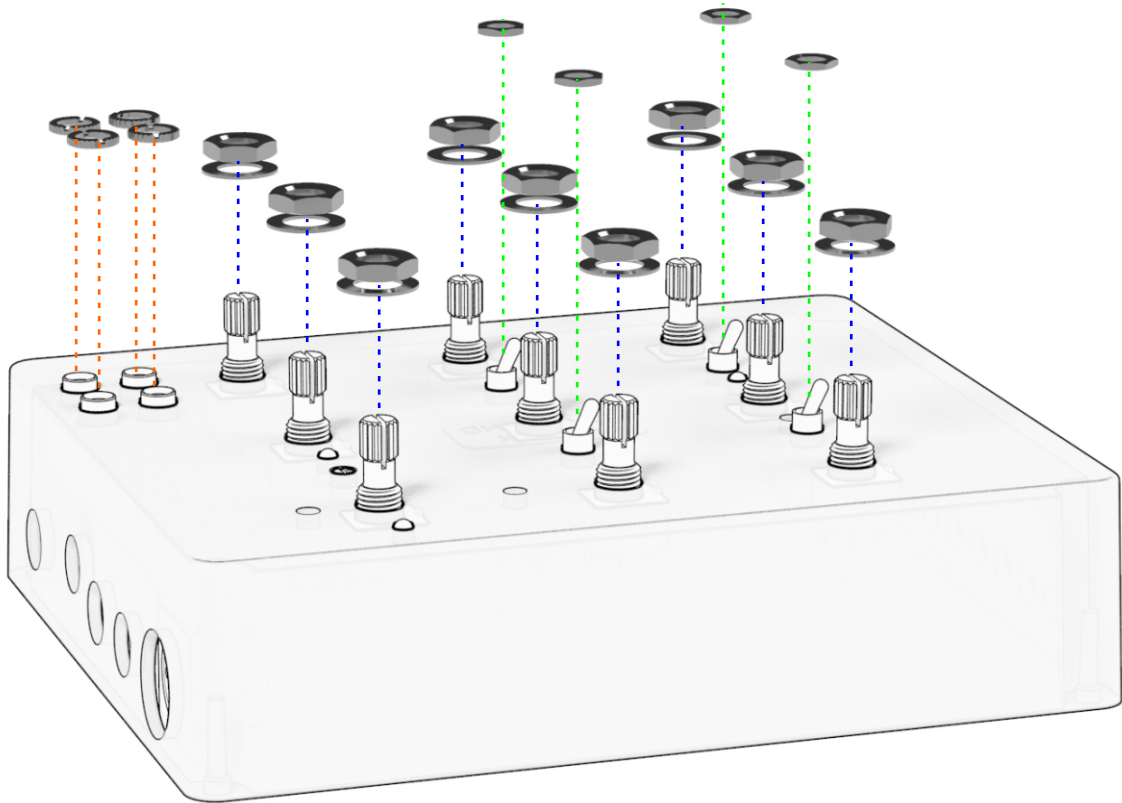
Assembly Note

Refer to the illustration.

Place flat washers on the potentiometers, then firmly tighten the potentiometer nuts. A 10mm socket can be used. The potentiometer nuts are holding the PCB tight against the inside of the chassis.

Place four hex nuts on the switches. A 9/32" socket can be used.

Place four round knurled nuts on the 3.5mm jacks. You can use pliers to tighten the nuts, but be careful not to scratch the finish.



Operation

Mount Expander PCB

Assembly Note

Attach the Expander PCB to the chassis, using the eight nuts on its jacks to hold it in place.

Tighten the nuts carefully with pliers to avoid scratching the finish.



Operation

Solder potentiometers

Assembly Note

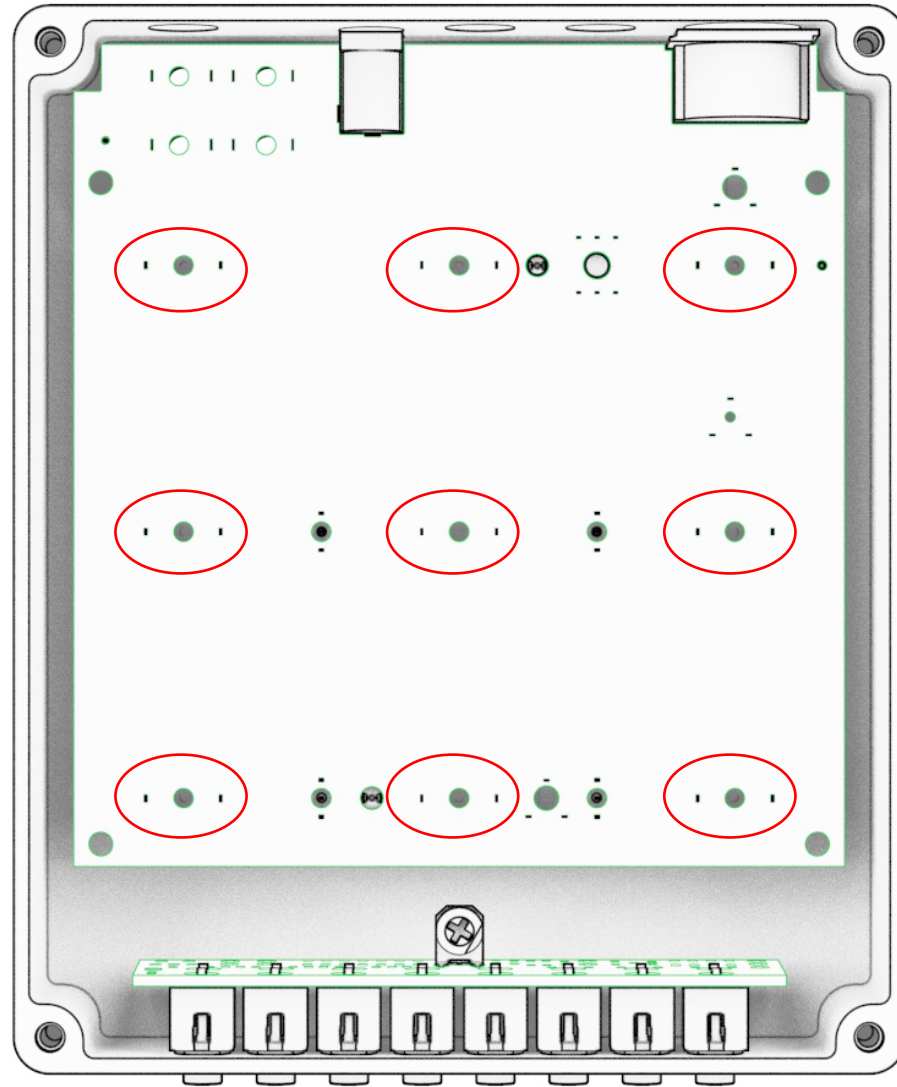
Now you may solder all nine of the potentiometers to the PCB.

We delayed doing this until now, to prevent residual tension from being trapped in the assembly.

At this point, the potentiometers have been firmly mounted to the chassis in their final positions, so they can be locked in place with solder.

Each potentiometer has 5 solder joints.

Be careful not to melt the insulation on the wires that connect to the Expander PCB!



Operation

Mount jacks

Assembly Note

Attach the three 1/4" phone jacks to the holes in the rear panel of the chassis.

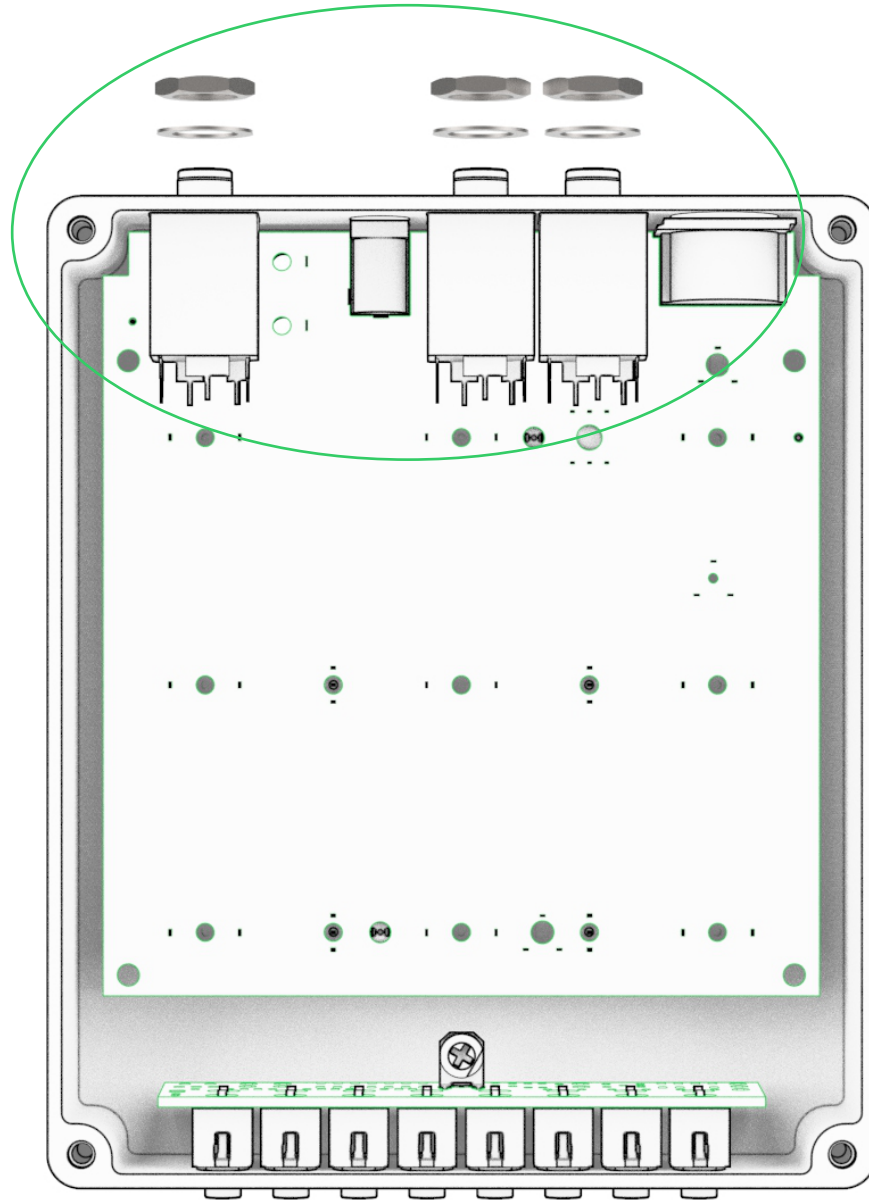
Each jack has a flat washer and a hex nut.
A 13mm socket can be used.

Be sure that the jacks are in the correct positions, referring to the labels on the front panel of the unit.

To help you mount the jacks in the correct holes, use this information:

The Effect Return jack has 3 wires.

That the Main Out jack's wires connect to the PCB directly beneath it.



Operation

Install knobs, bumpers, and cover

Assembly Note

Attach the nine control knobs to the potentiometers.

First, rotate the shaft fully counterclockwise. Position its knob with its indicator pointing to the 8 o'clock position. Then press the knob firmly onto the potentiometer shaft. If you encounter excessive resistance, try rotating the knob slightly, so its internal teeth line up with the grooves in the shaft.

Next, stick the 4 adhesive bumpers to the bottom cover of the case. Press very hard to achieve a good bond.

Finally, attach the cover with four machine screws included.

That's all, folks

The Hydronium is ready to be powered up for a listening test!

Before it is playable, the trimmers must be calibrated.
Refer to the User Guide for details.

