

DE-3: BUNKER ARCHEOLOGY



23 March 1942 - The order to build the atlantic wall is given

10th of December 1975 - the first edition of Bunker Archeology is published

Fall of 1998 - A copy of Speed & politics is handed to me by a friend. Virilio becomes a lifelong companion

2020- Amidst global pandemic, Virilios work inspires me to start to create a eurorack bunker simulator as well as an album.



In the 1960's Virilio starts documenting the abandoned structures of the atlantic wall with his camera.

13th October 1976 - I was born

December 1999 - Grindcoreband Asterisk (a*) records "Death of a dromologist" inspired by Virilios work.

1.1. Overall description

Bunker Archeology is the world's first "bunker simulator" composed by two different sections: an overdriven digital reverb "tank" as well as frequency driven tremolo/VCA¹. The module is normalized so the incoming signal is first sent to the reverb tank and then to the static (tremolo) circuit. The latter could also be used as a crude (albeit backwards) VCA. However one can easily patch it the other way around by inserting an incoming signal to the "Static in" and patching "Output" to "Bunker In".

1.2 The Reverb

Using "Bunker Input" you can attenuate the incoming signal, this is helpful since the reverb tank is pushed to its very limits². Depending on how you attenuate the incoming signal (also of course depending on how "hot" the incoming signal is, digital oscillators for instance tend to be a lot hotter) the module will behave differently, not just in regards of distortion³. You can regard the whole circuit as a bastardized envelope follower of sorts (that being said placing a VCA before the input is usually a fun idea, or any modulation of frequency really). When the modulation switch is switched on (ie. Downwards) it causes the reverb tank to gradually shut down (or attacking itself), shorting out the tank using a LDR and a LED. This creates interference and noise which is sent to the static circuit. It can be used for drones (shaped with the acoustics knob) or percussive sounds. The modulation knob lets you dial in the amount and character of that sound and how much of the tank that should be shorted. This knob also has CV control (expecting 0 to 5V and ignoring negative voltages). "Acoustics" knob lets you change the overall acoustics of the bunker which in turn effects how static behaves (since the static circuit is frequency driven, altering the frequency changes overall behavior of the static circuits speed and/or stuttering). Feedback is the amount of signal being fed back into the reverb tank⁴. "Reverb Out" is a dedicated output for the reverb section and can be used for mixing downstream in your rack for those times you don't want the static interference, just a grainy lo-fi reverb). You can also use an external mixer to combine the two outputs. Plugging in a cable into the "Reverb Out" will not stop sending the reverb signal to the static circuit.

¹ A concept introduced to me by Wraalabs (now known as Glowfly): <https://imgur.com/G7UXNUE> and <https://wraalabs.wixsite.com/pedals>

² I have a small graveyard of BTDR's that didn't make it through the testing stages.

³ Although of course you can pretty much distort the devil out of it.

⁴ duh



1.3 Static

“Static in” is a dedicated input for the static circuit. Plugging in a cable here will remove the reverb from the static circuit completely (but still present at the reverb out, as described above). “Divisions” switch determines the overall speed of the static circuit. There are three different options⁵. The CV input on the static side of the module lets you replace the frequency driven tremolo with a positive CV. Remember that this works as a backwards VCA, ie shutting the signal up when voltage goes high and makes it audible when voltage is low. It expects a 0-5V incoming signal and might not track your incoming envelope perfectly but it does its job⁶⁷. The CV knob lets you either dial in the tremolo amount (when no cable is inserted into “CV”) or attenuates the incoming CV signal. At about 11-12 a clock using the tremolo it should chop the sound up in and makes it grainy⁸. Feeding this CV input an audiorate signal creates bell like tones (similar to a ring modulator) or bitcrushing sounds depending on the division setting and the modulating waveform. This is made possible by using a lighting fast⁹ transistor based optocoupler rather than the much more sluggish, standard LDR/LED or vactrol configuration. The “Output” is the end station of the module, when nothing is plugged into “Static In” it contains the reverb and the static circuit in series, when the input to the static circuit is used it just contains the static out. Which means you can use either half of this module if you want, or

⁵ A high pitched signal will always create a faster response though and a low note a slower response no matter what setting the switch is in.

⁶ It's quite picky with incoming CV signals though, try different sources (YMMV)

⁷ Since it works backwards to a normal VCA it might also be good for side-chaining?

⁸ Similar to your run of the mill granular module in linear operation mode.

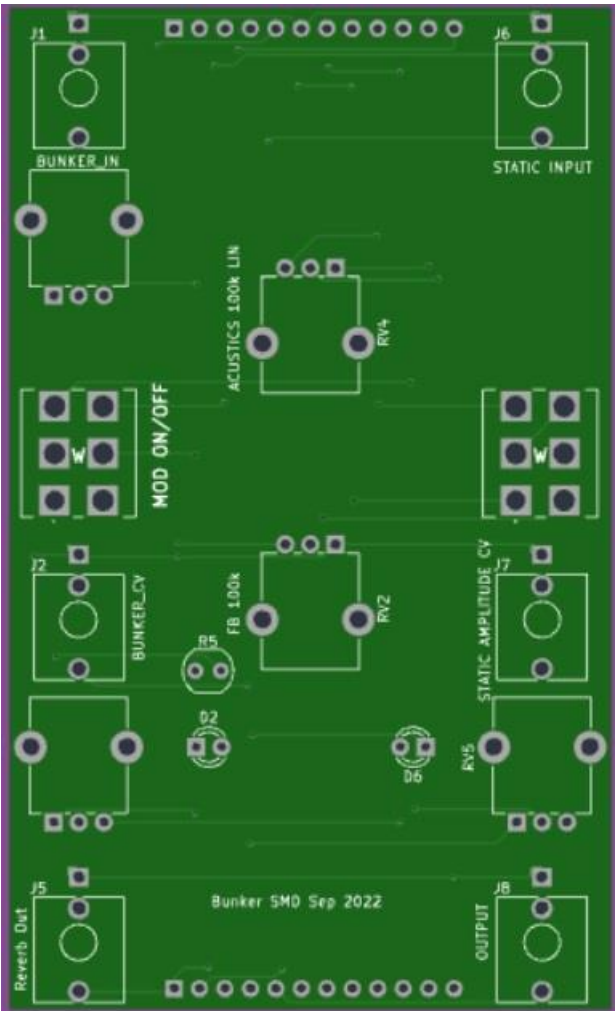
⁹ Infrared even

both, or use the reverb to effect one sound and the static a different sound in patch. Also try it the other way around.

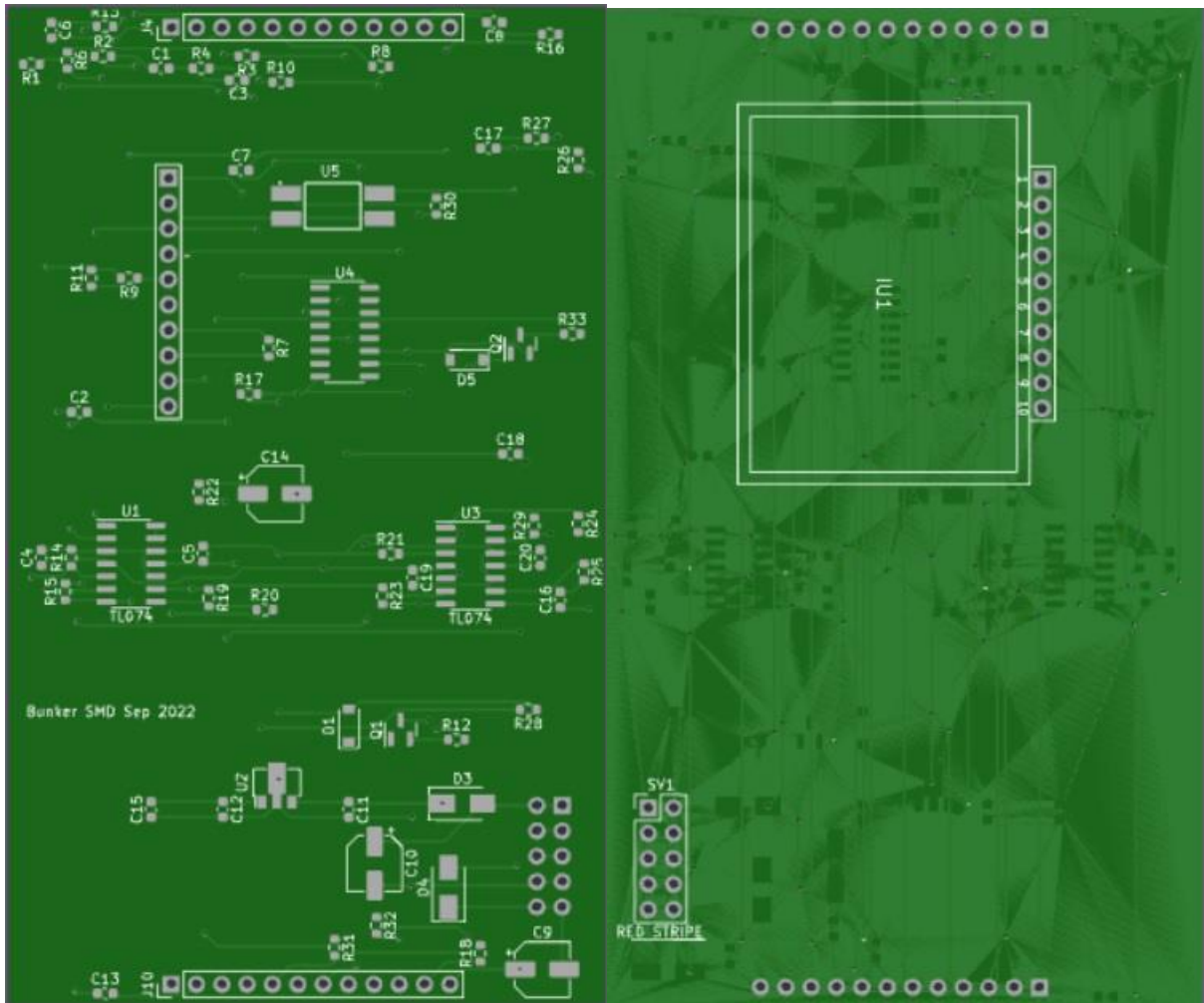
1.4 Conclusion

The input attenuator, the acoustic knob, feedback, modulation and static CV amount are all meant to play around with, there are usually several sweet spots here, but remember it is also affected by your incoming signal. Try different incoming signals, and see what you like (VCA's and filters are usually a good idea too to alter the signal before it hits the bunker). It is also encouraged to use this module without any incoming signal, just turn the modulation switch and introduce noise/drones to the static circuit. Use acoustics and feedback to shape it. Use a 0-5v incoming CV signal to effect the LED/LDR and making different sounds and volume (usually a lower setting on the CV pot here causes bigger changes when using incoming CV). Plug in a steady, or polyrhythmic clock into the static CV in. What do you hear?

2.1 Building the module



Jack Board

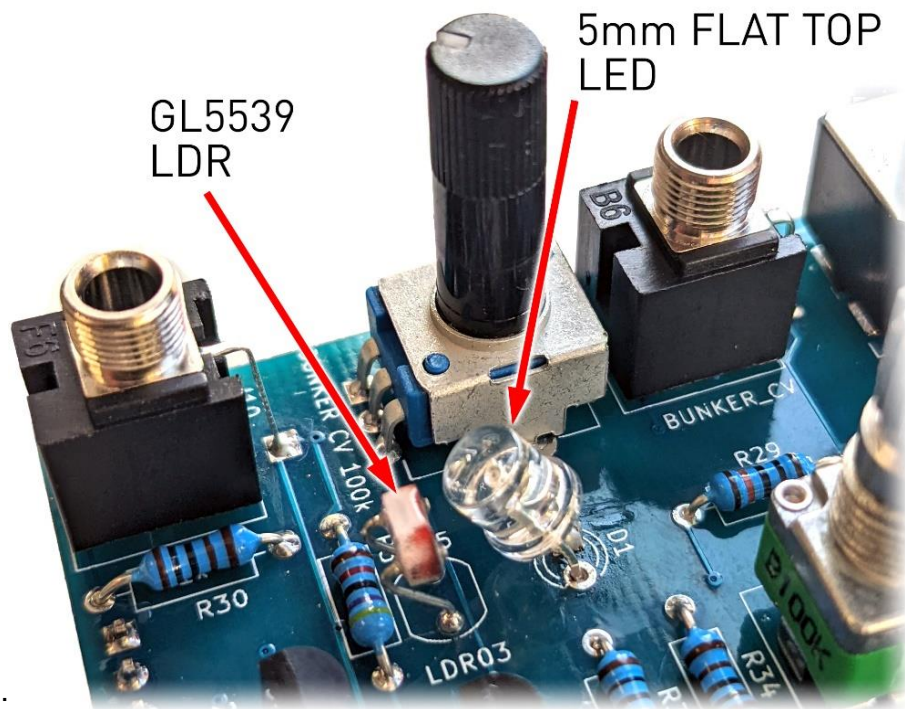


Component board front and backside

Build Guide

Building the SMD version of Bunker Archeology is as straight as it gets. I usually start with all the headers, female ones for the component board and for the reverb tank, male ones on the jack board. Follow the silkscreens. Then the power connector is soldered in. This completes all the soldering that is done for the component board.

Then I do the jack board but starting with the 5mm led and LDR. The SMD version has a slightly improved CV response here. This means the LDR and LED should not be touching but rather like



in the picture here:

I usually prefer to add some more distance between the LED and LDR, about 6-8mm and the LED does not have to be pointed towards the LDR, it can point straight up if you prefer, or have the LDR point towards the led like a satellite dish with a space of 6-8mm between them. The CV response is usually greater this way. Your miles may vary so feel free to experiment. S

The jack board contains jacks, pots and switches too, as well as a panel LED. I usually solder one pad of all pots and jacks before placing the switches (pay attention which switch goes where, MOD ON/OFF is the two way switch, the other switch (unlabeled on the PCB) is the three way switch). Don't solder the switches at all, place the led (square is the short leg on the LED) then attach the panel, align everything and check from the front side of the panel that everything looks good. LED is peeping out from beneath the panel and that the pots and jacks are straight. If not, reheat the one pad you soldered from above and re-align.

Check the headers again, make sure there are not any solder joints touching each other creating a short¹⁰. Grab the BTDR-3 and insert it in its header.

Inspect your pads before turning the pcb's on for the first time. Look for solder bridges etc. Turn it on: no magic smoke? Good. We can move on.

Then attach the panel with all nuts etc, knobs and you are done.

Modwiggler build thread will be available here:

¹⁰ This is one of the first things I check when a module is malfunctioning

<https://modwiggler.com/forum/viewtopic.php?t=251984>

3.1 Acknowledgments

Thank you:

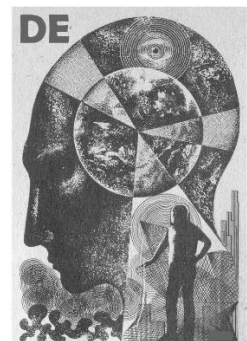
Wraalabs for getting the ball rolling.

Jon Nensén: For answering literary hundreds of questions on circuit design etc.

Ezhi & Aka: for introducing this style of Lo-Fi reverbs to me also helping me push the BTDR to its very limits.

Tom Withwell: For early in my career introducing the Music Thing Modular reverb which was my first reverb diy build. Unbeknownst to him it became my "Integral Accident"¹¹ which made my Bunker module possible to begin with.

Zeon Light: For releasing the album "Bunker Archeology"¹². Available at bandcamp for you to listen to while you are soldering or going through life.



¹¹ http://www.artandpopularculture.com/Integral_accident

¹² Senza Testa 2022

BOM

Part	Designator	QTY	INFO	Product link
5mm LED Flat top RED (or orange)	D2	1	Short leg goes to square	https://www.ebay.com/itm/254834860808?var=554725598366
3mm clear White LED	D6	1	Short leg goes to square	https://www.taydaelectronics.com/led-3mm-white-water-clear-ultra-bright.html
BTDR-3H	U1	1	fits back of the second board	https://www.musikding.de/Accu-Bell-BTDR-3H-Reverb_1
Thonkiconns	J1, J2, J5, J6, J7, J8	6		thonk, tayda, aliexpress: https://www.thonk.co.uk/shop/thonkiconn/
Header 1x12 Female	J4, J10	2		https://www.taydaelectronics.com/25-pin-2-54-mm-single-row-female-pin-header.html
Header 1x12 Male	J3, J9	2		https://www.taydaelectronics.com/40-pin-2-54-mm-single-row-pin-header-strip.html
Header 1 X10	IU1 for reverb tank	1		https://www.taydaelectronics.com/10-pin-2-54-mm-single-row-female-pin-header.html
GL5539	R5	1		https://www.ebay.com/itm/181056419055?mkcid=16&mkevt=1&mkrid=711-127632-2357-0&ssspo=zS0M_3S9Qu2&sssrc=2047675&ssuid=CwDmw60BR6-&widget_ver=artemis&media=COPY
Alpha 9mm potentiometer T18 100k Lin	RV1-RV5	5		https://www.taydaelectronics.com/tayda-100k-ohm-linear-taper-potentiometer-spline-shaft-pcb-mount-9mm.html
Eurack power pins 2x5	SV1	1		https://www.taydaelectronics.com/2x40-pin-2-54-mm-double-row-pin-header-strip.html
DPDT On-On-On	SW2	1	POLARITY: must be type A/1	https://www.taydaelectronics.com/mini-toggle-switch-dpdt-on-on-on-mts2033.html
DPDT ON-OFF	SW1	1		https://www.taydaelectronics.com/mini-toggle-switch-dpdt-on-on.html
3 mini knobs	for RV1, RV3, RV5	3	Must be Black	https://www.thonk.co.uk/shop/micro-knobs/
Black - Small (T18 Shaft) - Synth Pointer Plastic Knob	for RV2, RV4	2	Must be Black	https://www.thonk.co.uk/shop/synth-pointer-knobs/