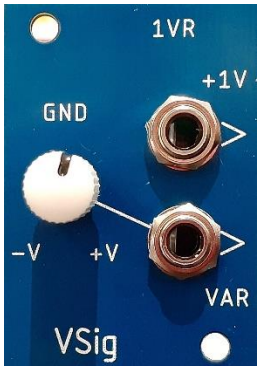
Visible Signals

1VR Voltage Reference

DIY Video Synthesizer module for eurorack

Manual V0.1b



1VR Voltage Rererence is a 6HP 1U tile which provides two stable voltage references suitable for video use: +1V (fixed) and -1V to +1V (adjustable).

All Visible Signals manuals include a version number, which corresponds to the version number printed on the PCBs, plus a revision letter. Please make sure the manual you use has the same version number as your PCBs! Contact info@visiblesignals.net if you can't find the right manual.

Recommended Build Order

First, one quick fix. In the middle of the rear board, next to IC1 there are three solder pads in a row. One pad is next to the 'R5' silkscreen, and that one should be left untouched. The other two pads need to be connected together, either with a small piece of wire soldered between them or a careful dob of solder connecting ('bridging') the two pads.

Start with the rear board: solder in IC1, then the smaller (unlabelled) capacitors, then the inner-most resistors.

	Part	Value		Part	Value
☐	IC1	LM6172	☐	R1	1K
☐	C3	100n	☐	R4	4.99K
☐	C4	100n	☐	R6	4.99K

The rest of the resistors and the voltage reference Q1.

	Part	Value		Part	Value
☐	R3	1.5K	☐	R2	1K
☐	R5	4.99K	☐	Q1	TL431

Diodes (unlabelled) and ferrite beads. Make sure the diodes are the right way around – the arrow points towards the end of the diode which has the line on it.

	Part	Value		Part	Value
☐	D1	1N400x	☐	L1	Ferrite bead
☐	D2	1N400x	☐	L2	Ferrite bead

Solder the power header. See below for a note about the Pulp power connector.

	Part	Value
☐	J1	5x2

Electrolytic capacitors. Make sure they are orientated correctly, with the longer leg in the hole marked with a "+".

	Part	Value		Part	Value
☐	C1	10uF	☐	C2	10uF

Leave the interconnect pin headers for now and move to the front board instead.

	Part	Value		Part	Value
☐	R8	499R	☐	R9	499R

Sockets and the tall trimmer pot. Insert them into the front panel before soldering, to make sure they are properly lined up – especially the shaft of the pot which ideally should not rub against the sides of the hole in the front panel.

	Part	Value		Part	Value
☐	S1	PJ301M	☐	VR1	B5K
☐	S2	PJ301M			

Recommended Build Order (continued)

Resistor R7 should be 0 ohms, which can just be a piece of conducting wire like the trimmed off leg of another resistor. If you use a piece of wire then be careful not to let it touch the side of the tall trimmer pot!

	Part	Value
☐	R7	0 ohms (a piece of wire)

Finally, plug the three interconnect header/socket pairs together and fit them into the boards as you solder them (I usually use a small rubber band to hold the boards and interconnects together until I have soldered a couple of pins on each board). The headers/sockets are soldered on the opposite sides of the PCBs to all of the other components, so when the boards are done the 'solder' sides of the boards are on the inside, facing towards each other.

	Part	Value
☐	J1	4x1
☐	J2	4x1
☐	J3	4x1

	Part	Value
☐	H1	4x1
☐	H2	4x1
☐	H3	4x1

Module Use

The 1VR's top socket outputs a fixed voltage (usually +1V) and the bottom socket outputs a variable voltage that can be adjusted from -1V to +1V using the knob on the front panel.

The +1V voltage output is handy as a 'full brightness' source, and the variable output is useful for patching into a control voltage input where you want direct manual control. I often patch the 1VR's +1V output into a 1SW A/B Switch module so that I can manually control a module with digital inputs (like Xorand or One Of Four), or use the variable voltage reference as a solid colour input to a video output encoder module.

Different Voltage Mods

The voltage output from this module is set by a voltage divider across the +2.5V output of the TL431 (Q1). The formula is:

$$V_{out} = 2.5V \times \frac{R2}{R2 + R3}$$

The default +1V is set by R2=1K, R3=1.5K. If you make R3 = 0K (for V_{out} = +2.5V) then omit R2 altogether as it won't be required.

If you want a value of V_{out} greater than +2.5V then you can kludge in a resistor (R_{boost}) from pin 6 of IC1 to ground (e.g. the nearby "-" pin of C1, or the grounded pin of R2 that you can omit altogether). This will give you:

$$V_{out} = 2.5V \times \frac{R2}{R2 + R3} \times \left(1 + \frac{1K}{Rboost}\right)$$

I just couldn't find enough space to fit R_{boost} on the PCB sorry ☹

Pulp Power Connector

Oops… the three power pins for the Pulp power connector (a "Futaba J" type) are in the wrong order on the 1VR version 0.1 PCB. Sorry about that – I didn't have access to a Pulp case for testing ☹ Please use the standard eurorack 5x2 power connector and cable instead. This will be fixed on a future board revision.

Bill of Materials

Parts marked with an asterisk are frequently used in Visible Signals modules, so consider stocking up if there's a quantity discount available.

Type	Value/Description	Qty	Vendor	Part Number	*	Notes
Capacitor	100n	2	Mouser	594-K104K15X7RF53H5	*	
Diode	1N400x	2	Mouser	750-1N4001-G	*	Any part like 1N4001, 1N4004, etc is fine
Electro Capacitor	10uF	2	Mouser	80-ESL106M050AC3AA	*	
Ferrite bead	Ferrite bead	2	Mouser	623-2743001111	*	
IC	LM6172	1	Mouser	926-LM6172IN/NOPB	*	
PCBs	1VR PCB set	1	Visible Signals	1VR		
Pin Header	Pin header 5x2	1	Mouser	855-M22-2020546	*	Not Shrouded (won't fit!)
Pin Header	Pin header 4x1	3	Mouser	523-G800W304018EU		Or get a single 40x1 and snap off just what you need
Pin Socket	Pin socket 4x1	3	Mouser	200-SSQ10404TS		These are much, much cheaper from Tayda!
Resistor	1K	2	Mouser	603-MFR-25FBF52-1K	*	
Resistor	1.5K	1	Mouser	603-MFR-25FBF52-1K5		
Resistor	0 ohms	1	Mouser	594-SFR25-0		Or just use a piece of wire and save 20c
Resistor	499R	2	Mouser	603-MFR50SFTE52-499R	*	
Resistor	4.99K	3	Mouser	603-MFR50SFTE52-4K99		
3.5mm socket	PJ301M	2	Thonk	PJ398SM / PJ301M	*	Thonkiconn Vertical mount. With washers and nuts!
Variable Resistor	B5K	1	Thonk	Tall Trimmer 9mm Pot		Note: 5K not 10K!
Knob	Tall Trimmer Topper	1	Thonk	Tall Trimmer Topper		Choose your own colour
Voltage Ref	TL431	1	Mouser	511-TL431CZ-AP	*	