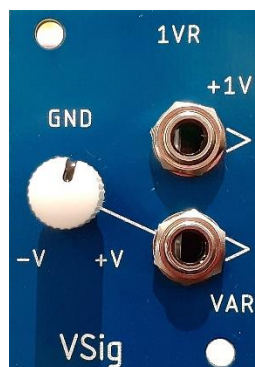


Visible Signals

1VR Voltage Reference

DIY Video Synthesizer module for eurorack

Manual V0.1a



1VR Voltage Reference 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.

	<u>Part</u>	<u>Value</u>		<u>Part</u>	<u>Value</u>
<input type="checkbox"/>	IC1	LM6172	<input type="checkbox"/>	R1	1K
<input type="checkbox"/>	C3	100n	<input type="checkbox"/>	R4	4.99K
<input type="checkbox"/>	C4	100n	<input type="checkbox"/>	R6	4.99K

The rest of the resistors and the voltage reference Q1.

	<u>Part</u>	<u>Value</u>		<u>Part</u>	<u>Value</u>
<input type="checkbox"/>	R3	1.5K	<input type="checkbox"/>	R2	1K
<input type="checkbox"/>	R5	4.99K	<input type="checkbox"/>	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.

	<u>Part</u>	<u>Value</u>		<u>Part</u>	<u>Value</u>
<input type="checkbox"/>	D1	1N400x	<input type="checkbox"/>	L1	Ferrite bead
<input type="checkbox"/>	D2	1N400x	<input type="checkbox"/>	L2	Ferrite bead

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

	<u>Part</u>	<u>Value</u>
<input type="checkbox"/>	J1	5x2

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

	<u>Part</u>	<u>Value</u>		<u>Part</u>	<u>Value</u>
<input type="checkbox"/>	C1	10uF	<input type="checkbox"/>	C2	10uF

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

	<u>Part</u>	<u>Value</u>		<u>Part</u>	<u>Value</u>
<input type="checkbox"/>	R7	2.49K	<input type="checkbox"/>	R9	499R
<input type="checkbox"/>	R8	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.

	<u>Part</u>	<u>Value</u>		<u>Part</u>	<u>Value</u>
<input type="checkbox"/>	S1	PJ301M	<input type="checkbox"/>	VR1	B5K
<input type="checkbox"/>	S2	PJ301M			

Recommended Build Order (continued)

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.

	<u>Part</u>	<u>Value</u>		<u>Part</u>	<u>Value</u>
<input type="checkbox"/>	J1	4x1	<input type="checkbox"/>	H1	4x1
<input type="checkbox"/>	J2	4x1	<input type="checkbox"/>	H2	4x1
<input type="checkbox"/>	J3	4x1	<input type="checkbox"/>	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 (usually 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 an 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:

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

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 version 0.1 1VR rear 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.

<u>Type</u>	<u>Value/Description</u>	<u>Qty</u>	<u>Vendor</u>	<u>Part Number</u>	<u>*</u>	<u>Notes</u>
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	2.49K	1	Mouser	603-MFR50SFTE52-2K49		
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