

Visible Signals

RGB Matrix – Output

DIY Video Synthesizer module for eurorack

Manual V0.4b



The RGB Matrix is an expandable three channel, dual-bus video-rate matrix mixer for colourising and mixing pattern and video sources in full colour RGB, allowing manipulations previously only possible through the combination of a large number of other separate modules. It also includes three-channel RGB crossfader/keying functionality, for complex image compositing and effects.

The RGB Matrix Output module provides summed outputs for each of the Red, Green and Blue colour mixes on the A and B busses.

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.

Suggested Build Order

RESISTORS

<input type="checkbox"/>	<u>Part</u>	<u>Value</u>	<input type="checkbox"/>	<u>Part</u>	<u>Value</u>
<input type="checkbox"/>	R7	1K	<input type="checkbox"/>	R4	20K
<input type="checkbox"/>	R8	1K	<input type="checkbox"/>	R5	20K
<input type="checkbox"/>	R9	1K	<input type="checkbox"/>	R6	20K
<input type="checkbox"/>	R10	1K	<input type="checkbox"/>	R13	499R
<input type="checkbox"/>	R11	1K	<input type="checkbox"/>	R14	499R
<input type="checkbox"/>	R12	1K	<input type="checkbox"/>	R15	499R
<input type="checkbox"/>	R1	20K	<input type="checkbox"/>	R16	499R
<input type="checkbox"/>	R2	20K	<input type="checkbox"/>	R17	499R
<input type="checkbox"/>	R3	20K	<input type="checkbox"/>	R18	499R

DIODES & FERRITES

Make sure the diodes are in the right way.

<input type="checkbox"/>	<u>Part</u>	<u>Value</u>	<input type="checkbox"/>	<u>Part</u>	<u>Value</u>
<input type="checkbox"/>	L1	Ferrite Bead	<input type="checkbox"/>	D1	IN400x
<input type="checkbox"/>	L2	Ferrite Bead	<input type="checkbox"/>	D2	IN400x

ICs

Make sure the ICs are in the right way, with the notch (or the left side relative to the writing on top of the chip) lined up with the silkscreen.

<input type="checkbox"/>	<u>Part</u>	<u>Value</u>	<input type="checkbox"/>	<u>Part</u>	<u>Value</u>
<input type="checkbox"/>	IC1	LM6172	<input type="checkbox"/>	IC4	LM6172
<input type="checkbox"/>	IC2	LM6172	<input type="checkbox"/>	IC5	LM6172
<input type="checkbox"/>	IC3	LM6172	<input type="checkbox"/>	IC6	LM6172

MLCC CAPACITORS

All unlabelled capacitors on the PCB silkscreen are 100nF MLCC types.

<input type="checkbox"/>	<u>Part</u>	<u>Value</u>	<input type="checkbox"/>	<u>Part</u>	<u>Value</u>
<input type="checkbox"/>	C3	100n	<input type="checkbox"/>	C9	100n
<input type="checkbox"/>	C4	100n	<input type="checkbox"/>	C10	100n
<input type="checkbox"/>	C5	100n	<input type="checkbox"/>	C11	100n
<input type="checkbox"/>	C6	100n	<input type="checkbox"/>	C12	100n
<input type="checkbox"/>	C7	100n	<input type="checkbox"/>	C13	100n
<input type="checkbox"/>	C8	100n	<input type="checkbox"/>	C14	100n

SOCKETS

Make sure the sockets fit into the front panel as you solder them.

<input type="checkbox"/>	<u>Part</u>	<u>Value</u>	<input type="checkbox"/>	<u>Part</u>	<u>Value</u>
<input type="checkbox"/>	A_BLUE	PJ302M	<input type="checkbox"/>	B_BLUE	PJ302M
<input type="checkbox"/>	A_GREEN	PJ302M	<input type="checkbox"/>	B_GREEN	PJ302M
<input type="checkbox"/>	A_RED	PJ302M	<input type="checkbox"/>	B_RED	PJ302M

ELECTROLYTIC CAPACITORS

Make sure the long legs go in the hole marked with a '+'.

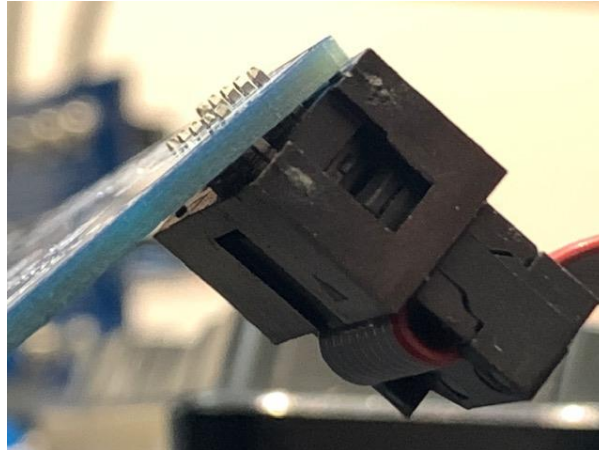
<input type="checkbox"/>	<u>Part</u>	<u>Value</u>	<input type="checkbox"/>	<u>Part</u>	<u>Value</u>
	C1	10uF		C2	10uF

HEADERS

Before you solder the KEYER and PWR headers in place it's best if you build the Keyer PCB and then come back to do the headers and sockets that connect the two PCBs at the same time. If you have the Combo panel then attach the PCBs to it in order to line up the Output and Keyer PCBs with each other perfectly. Otherwise screw the panels into your Eurorack frame backwards (i.e. with the component PCBs protruding), or else clamp the two panels together somehow to make sure they're correctly lined up.

<input type="checkbox"/>	<u>Part</u>	<u>Value</u>	<input type="checkbox"/>	<u>Part</u>	<u>Value</u>
	POWER	Pin Header 2x5 Shrouded		INPUTS	Pin Header 2x7 Right angle
	KEYER	Pin Header 6x1		PWR	Pin Header 4x1

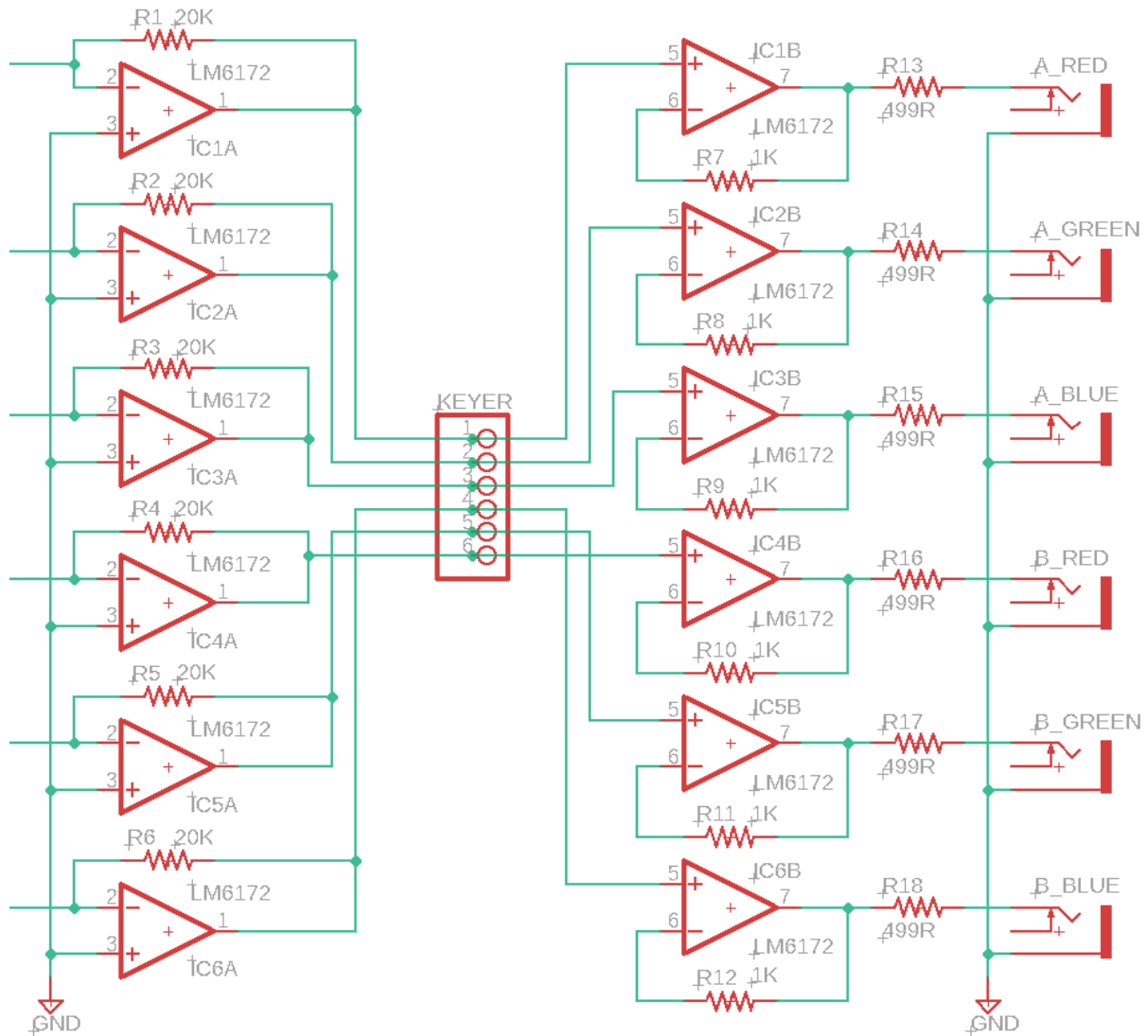
Once the whole RGB Matrix Mixer is assembled it's difficult to fit the power connector on the top of the Output board because the Keyer board is deep and gets in the way. Originally, I used a right-angled power connector – which is fine since although it's not keyed the module has diode protection to make sure it won't be harmed if the power is plugged in backwards. But a better approach is to solder the power connector on the bottom of the board, like this. Make sure it's aligned as shown, so that the stripe on the power cable aligns with the -12V stripe on the PCB.



Circuit Details

The RGB Matrix Output module mixes the six colour signals (Red, Green and Blue for each of bus A and B) together using inverting summing op-amps, and then buffers them for the output sockets. It also feeds the mixed signals to the Keyer module.

The summing op-amps use 20K resistors in their feedback path, which are twice the value of the 10K resistors used by the Input and Direct In modules, so the effective outcome is that all input signals are doubled when unattenuated (i.e. control pots set to fully clockwise), or at unity gain when set to the 12 o'clock position.



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>
Resistor	1K	6	Mouser	603-MFR-25F52-1K	*	
Resistor	20K	6	Mouser	603-MFR-25F52-20K	*	
Resistor	499R	6	Mouser	603-MFR-25F52-499R	*	
Ferrite bead	Ferrite bead	2	Mouser	623-2743001111	*	
Diode	IN400x	2	Mouser	750-1N4001-G	*	
IC	LM6172	6	Mouser	926-LM6172IN/NOPB	*	
Capacitor	100n	12	Mouser	594-K104K15X7RF53K2	*	
Pin Header	Pin Header 2x5	1	Mouser	710-61201021621	*	Shrouded
Pin Header	Pin Header 2x7 right angle	1	Mouser	649-1012938291402BLF	*	Or get a 40x2 and snap off what you need
Pin Header	Pin Headers 4x1	1	Mouser	649-1012937890401BLF	*	Or get a 40x1 and snap off what you need
Pin Header	Pin Headers 6x1	1	Mouser	649-1012937890601BLF	*	Or get a 40x1 and snap off what you need
Socket	PJ302M	6	Thonk	PJ302M	*	
Electro Capacitor	10uF	2	Mouser	80-ESL106M050AC3AA	*	
PCB	RGB Matrix Starter Pack PCB set	1	Visible Signals	MM-SP		
Panel	RGB Matrix Starter Pack PCB set	1	Visible Signals	MM-SP		
IDC Connector	14 pin (2x7) 0.1"	1	Mouser	653-XG4M-1430		For the RGB Matrix bus ribbon cable