Visible Signals

Xorand

DIY Video Synthesizer module for Eurorack

Manual V0.1a

Xorand is a 4HP four-input logic gate performance control module for LZX-compatible eurorack video module systems.

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 – Xorand (page 1)

RESISTORS

	Part	Value		Part	Value
☐	R1	100K	☐	R34	180K
☐	R4	100K	☐	R2	1K
☐	R5	100K	☐	R3	1K
☐	R6	100K	☐	R7	1K
☐	R10	100K	☐	R8	1K
☐	R11	100K	☐	R17	1K
☐	R12	100K	☐	R18	1K
☐	R14	100K	☐	R24	1K
☐	R15	100K	☐	R25	1K
☐	R16	100K	☐	R31	1K
☐	R20	100K	☐	R32	1K
☐	R21	100K	☐	R33	20K
☐	R22	100K	☐	R30	3K
☐	R26	100K	☐	R9	499R
☐	R28	100K	☐	R13	499R
☐	R29	100K	☐	R19	499R
☐	R27	12K	☐	R23	499R

DIODES & FERRITES

Make sure the diodes are in the right way. Of the diodes, only D1 and D2 have a part number on the PCB silkscreen since all the rest are the same part (1N5711).

	Part	Value		Part	Value
☐	D1	1N400x	☐	D5	1N5711
☐	D2	1N400x	☐	D6	1N5711
☐	L1	Ferrite Bead	☐	D7	1N5711
☐	L2	Ferrite Bead	☐	D8	1N5711
☐	D3	1N5711	☐	D9	1N5711
☐	D4	1N5711	☐	D10	1N5711

INTEGRATED CIRCUITS

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. Put the legs of IC7 into the holes and then bend it over, flat against the PCB.

	Part	Value		Part	Value
☐	IC4	74HC32N	☐	IC1	LM6172
☐	IC5	74HC688N	☐	IC2	LM6172
☐	IC3	74HC86N	☐	IC6	LM6172
☐	IC7	7805T			

MLCC CAPACITORS

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

Part	Value	Part	Value
☐ C3	100n	☐ C8	100n
☐ C4	100n	☐ C9	100n
☐ C5	100n	☐ C10	100n
☐ C6	100n	☐ C11	100n
☐ C7	100n	☐ C13	100n

SOCKETS

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

Part	Value	Part	Value
☐ IN1	PJ302M	☐ IN4	PJ302M
☐ IN2	PJ302M	☐ OUT	PJ302M
☐ IN3	PJ302M		

ELECTROLYTIC CAPACITORS

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

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

POWER HEADER

Make sure the notch on the shrouded power header is on the outside edge of the PCB.

Part	Value
☐ POWER	5x2 Pin Header

SWITCH SHIM PCBs

Insert the switch shims into the main PCB but do not solder them yet. The input 1-4 shims should be inserted with the 'Top' side facing away from the panel, and the Out shim with the 'Bottom' side facing away from the panel. Attach the switches to the front panel and fit their legs into the shims. The four Input switches are SP3T (centre off) and the Output switch is SPDT.

Solder the two easily accessible legs of each switch to the shim first, then remove the front panel and the shim from the main PCB to make it easier to solder the last leg if you need to. Fit everything back together correctly then solder the shims to the main PCB from the bottom side of the main PCB.

Note: sometimes the shims are a little too big and might be hard to fit into the main PCB. If this happens use a nail file to make the shim a little less wide.

Circuit Details

Xorand is a four-input logic gate module designed for live manipulation of up to four separate image or pattern sources via front panel performance control switches.

Xorand works by first converting each of its inputs into a digital (fully on or off) signal and then combining them all together, each in one of three different ways. An input set to AND acts as a filter, only allowing other inputs signals to show through where it is "lit" (+0.5V or greater). Inputs in XOR/OR mode are either layered over each other like overhead transparencies (OR mode) or combined so that an even number of input images that are "lit" at the same spot cancel each other and result in an "unlit" pixel (XOR mode). XOR mode is particularly useful for producing complex, interrelated patterns that are directly related to the inputs in a way that brings balance and "negative space" to otherwise simple visual compositions.

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
MLCC Capacitor	100n	10	Mouser	594-K104K15X7RF53K2	*	
Diode	1N400x	2	Mouser	750-1N4001-G	*	Any part like 1N4001, 1N4004, etc is fine
Diode	1N5711	8	Mouser	511-1N5711	*	
Electrolytic Capacitor	10uF	2	Mouser	80-ESL106M050AC3AA	*	
Ferrite bead	Ferrite bead	2	Mouser	623-2743001111	*	
IC	74HC86	1	Mouser	595-SN74HC86N		
IC	74HC32	1	Mouser	595-SN74HC32N		
IC	74HC688	1	Mouser	595-SN74HC688N		
IC	LM6172	3	Mouser	926-LM6172IN/NOPB	*	
PCB	Xorand PCB set	1	Visible Signals	XRND		
Panel	Xorand PCB set	1	Visible Signals	XRND		
Switch Shim PCB	Xorand PCB set	5	Visible Signals	SHIM_1PDT		
Pin Header	Pin header 5x2	1	Mouser	710-61201021621	*	Shrouded
Resistor	100K	16	Mouser	603-MFR-25FBF52-100K	*	
Resistor	12K	1	Mouser	603-MFR-25FBF52-12K		
Resistor	180K	1	Mouser	603-MFR-25FBF52-180K		
Resistor	1K	10	Mouser	603-MFR-25FBF52-1K	*	
Resistor	20K	1	Mouser	603-MFR-25FBF52-20K		
Resistor	3K	1	Mouser	603-MFR-25FBF52-3K		
Resistor	499R	4	Mouser	594-5063JD499R0F	*	
Socket	PJ302M	5	Thonk	PJ302M	*	
Switch	1PDT ON-OFF-ON	4	Mouser	118-1MS3T1B1M1QES	*	
Switch	1PDT ON-ON	1	Mouser	118-1MS1T1B1M1QES	*	
Voltage Regulator	7805	1	Mouser	511-L7805CV		