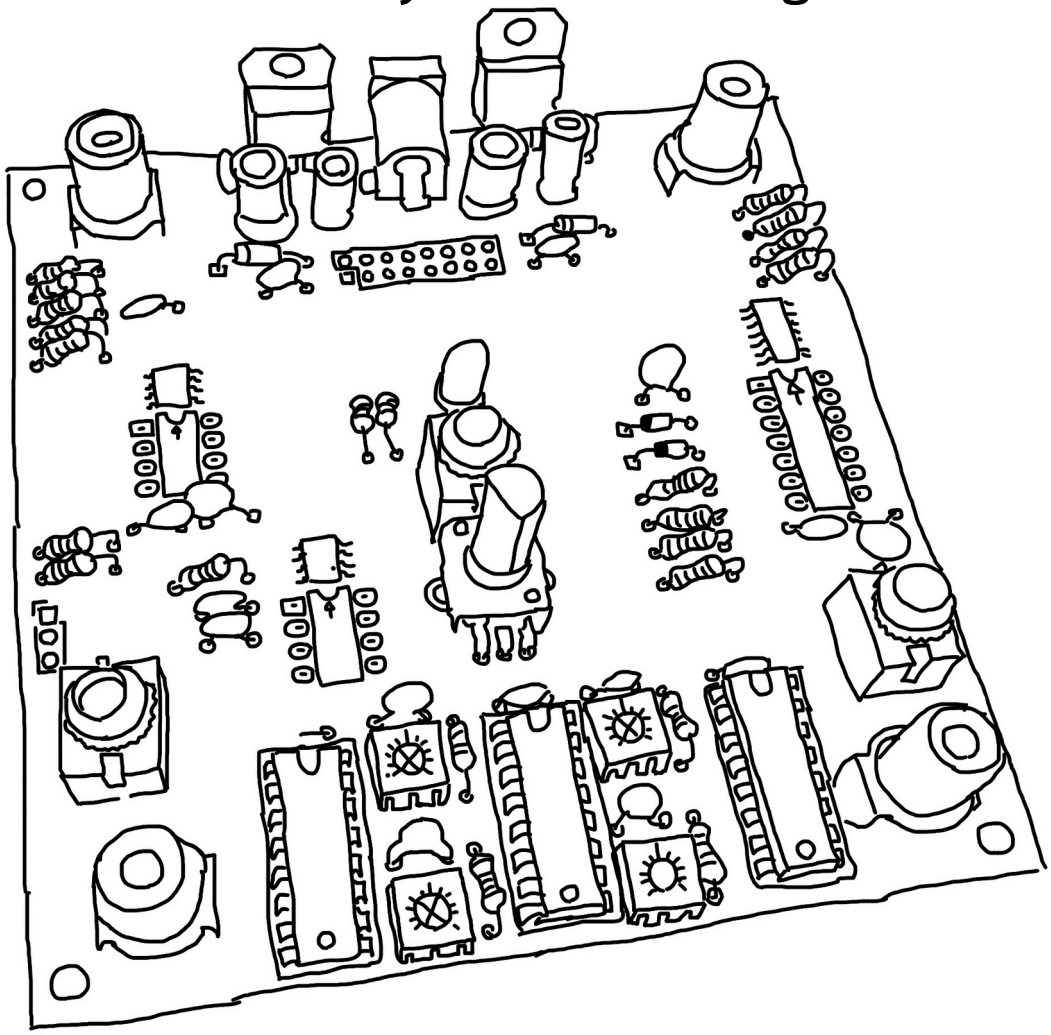
cyberboy666 & underscores.shop present
a circuit adapted from gael jaton design

sync_ope

effect send and sync restoring circuit



instruction manual and build guide
V0_5_1

View this project online at
underscores.shop/sync_ope

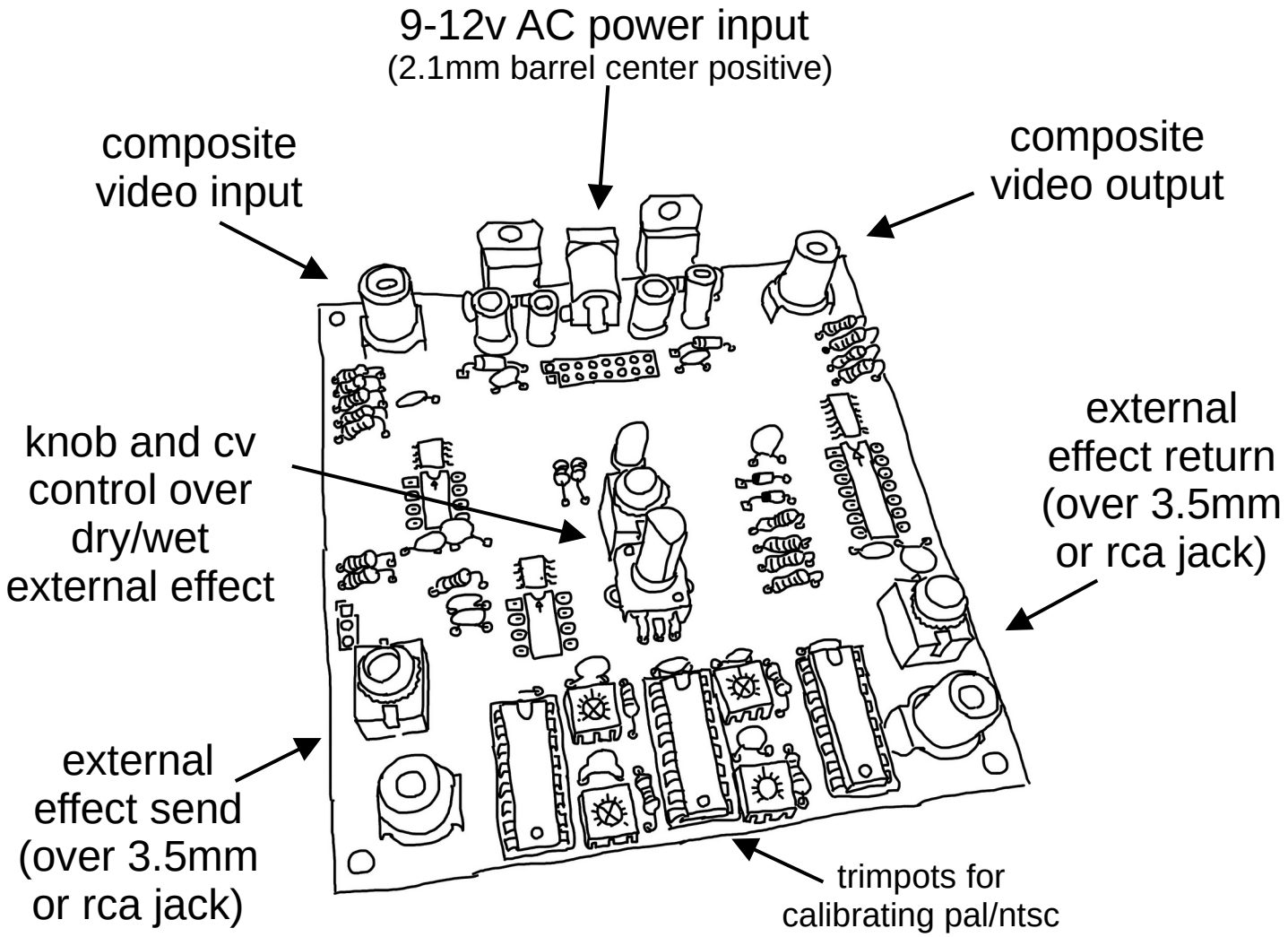
DESCRIPTION

sync_ope is a companion circuit for analog glitch & circuit bent video instruments. it preserves the sync pulses from the original signal and allows for smooth mixing between *clean* (dry) and *distorted* (wet) video.

preserving the sync pulses means the distorted video is less likely to drop out (blue screen) when sent to analog video decoders such as in projectors, capture cards and digital tvs

features

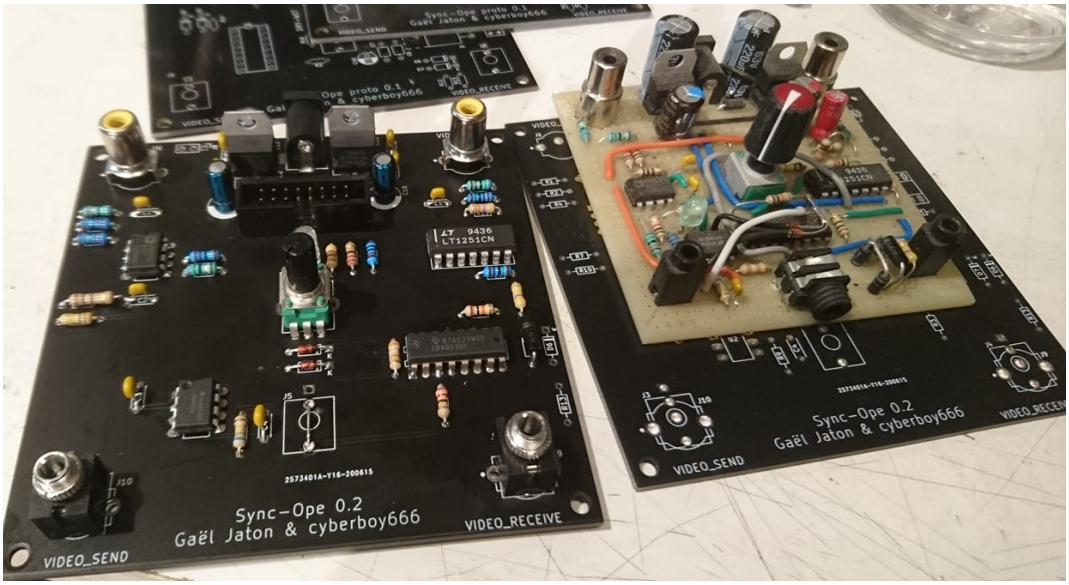
- knob for physical control over dry/wet external effect
- cv jack (0-1v) for sequenced control over dry/wet external effect
- external video send & return over rca or 3.5mm jacks



BACKGROUND

The original version was created by Gael Jaton on a breadboard and shared through the VIDEO CIRCUITS facebook group in 2019.

i collaborated with Gael and others through the scanlines community to layout a pcb and revise and improve the circuit design a number of times



The idea is similar to how an **effect send** feature works on an audio mixing board so that external effect units can be blended into the final mix out

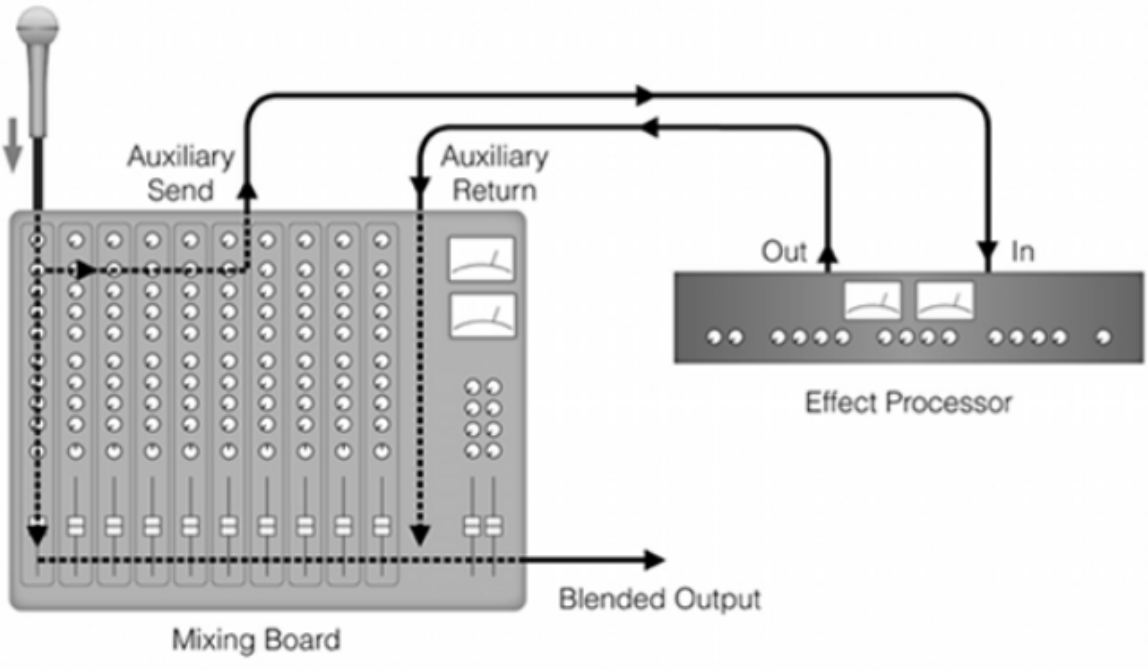


Figure 7: Connecting Effects to an Auxiliary Send

OPERATING INSTRUCTIONS

Power supply

This circuit needs +-5v to operate. There is circuitry on the board to convert a 9-12**VAC** power input from barrel jack to this format. (regular DC power bricks will not work)

Alternatively if you have +-12v already from a eurorack supply you can just provide this over a euroheader. Or send +-5v directly to the diy pins on the side of the board

Connecting ins, outs & the external effect

- plug your composite video source (eg output from a camcorder) into the top left **VIDEO_IN** jack -> the middle led should light up when a video source input is detected
- Connect your composite video display (eg an old tv or easycap capture card) into the top right **VIDEO_OUT** jack - now with mix knob rotated fully anti-clockwise your source video should be passing through to the display
- plug one of the **VIDEO_SEND** jacks into the *input* and one of the **VIDEO_RETURN** jacks from the *output* of your external processing device - now with the mix knob rotated fully clockwise your source video should pass through the external effect device - but with stable sync pulses !
- if you have the gear for it you can sequence this mix knob using the cv jack above it - 0-1v will cover full range - dont send it negative voltage.

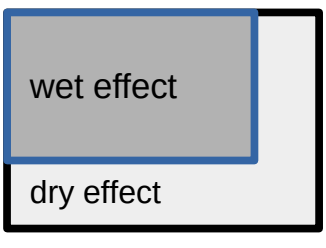
blanking calibration

There is a total of 4 trimpots on the sync_ope board to calibrate the vertical and horizontal *blanking pulses* – **start by rotating all of them fully clockwise**

If you have a two channel oscilloscope with edge trigger you can inspect the incoming video signal on one channel and the blanking pulse (**pin10** of *u6_hc4538* for v_blanking ***RV3*** & ***RV5***, **pin10** of *u5_hc4538* for c_blanking ***RV2*** & ***RV4***) on the other

Starting from top-left and working down first slowly turn the trim pots counterclockwise until the rising and falling edges align with blanking on the video signal

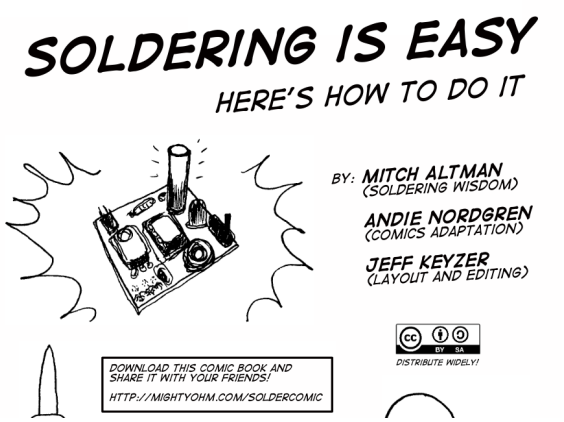
If you do not have a scope you can roughly calibrate
In same way by looking at the video output with effect knob fully on – for each pot align effect with an edge of screen: *RV3 – top, RV4 – bottom, RV2 left, RV4 right*



Find more info for calibration on project github page

BUILD INSTRUCTIONS

It is highly recommended to use the interactive BOM to help with placement on this build – type *kutt.it/ElOPGl* into a browser or find the links from the github page



note on soldering: remember to heat pad first (2-3seconds), then add solder, then continue to heat (1-2seconds)

Checkout the web-comic *soldering is easy* for more soldering advice

smd or dip ic option

for some of the rarer ic's both smd and dip footprints are on the board - if you are assembling yourself you can choose which of these to source (dont place both!)

for the smd parts i would place and solder these first before doing any of the throughhole parts - please make sure these parts are placed facing **downwards** as indicated on the silkscreen. you can test the continuity of your solder joints with a multimeter on the pin + one on the corresponding dip pad

assembling

- Start by soldering the smallest parts first: resistors, diodes, capacitors and regulators - take note of the direction on the diodes : black bar on component matching black bar on footprint – I place about 10 components in and then solder and clip them

- Next lets do the ic's/sockets - make sure the direction is correct! place in and fold two corner pins to hold in place, then solder all pins. you can place the ic in now too

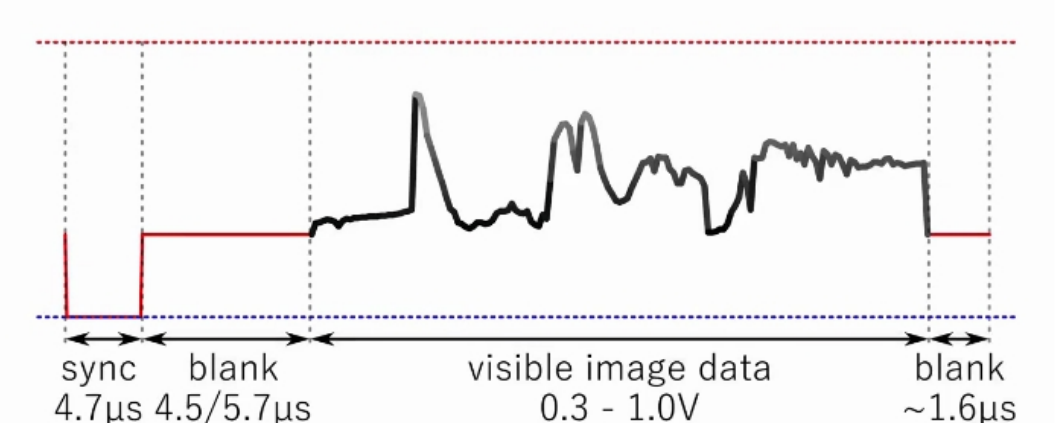
- Finally solder in the interface parts: trim_pots & pots, jacks, power barrel. If you are not using eurorack power supply there is no need to solder anything on j7 (or j3)

HOW THE CIRCUIT WORKS

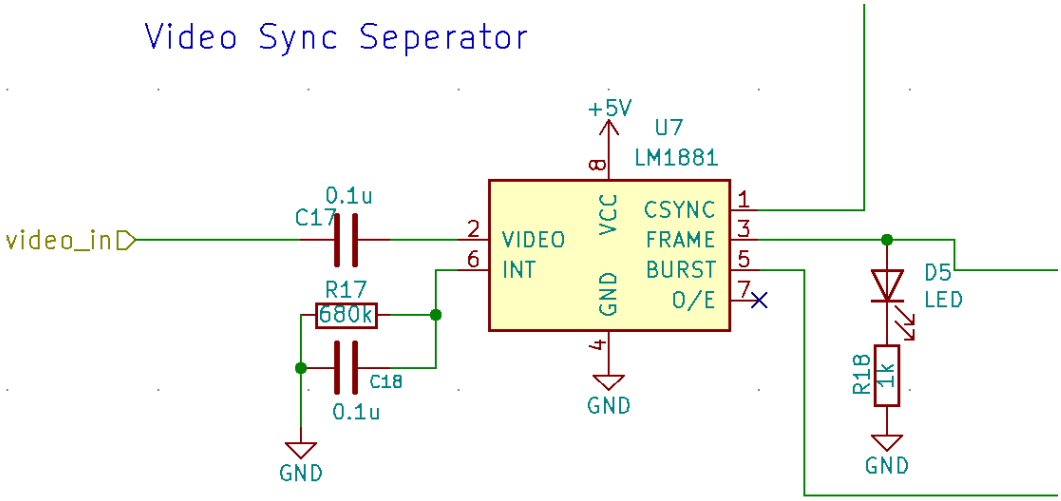
A composite video signal is made up of two parts:

visible image data - which tell the tv at any given point how bright the image should be

sync & blanking data – offscreen pulses which help the tv align new lines and frames so they are in sync with each other



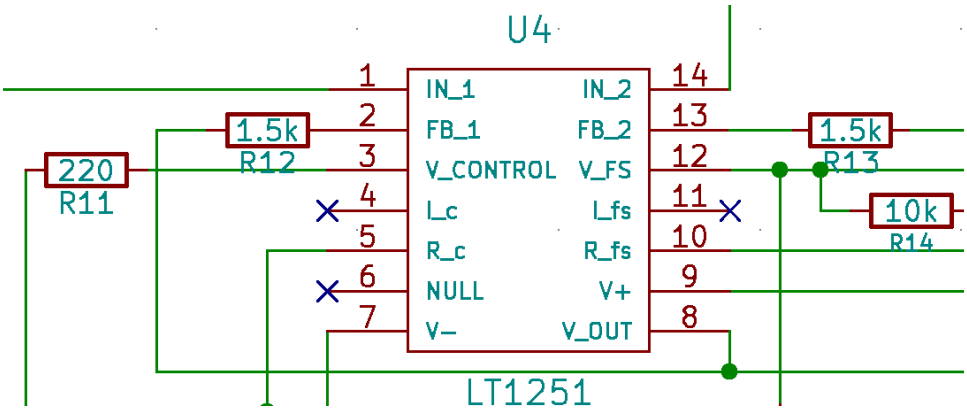
A digital video display will load this analog signal into its buffer – and needs the sync & blanking to do this correctly. If the sync & blanking pulse is corrupted then it will 'blue screen' and show nothing



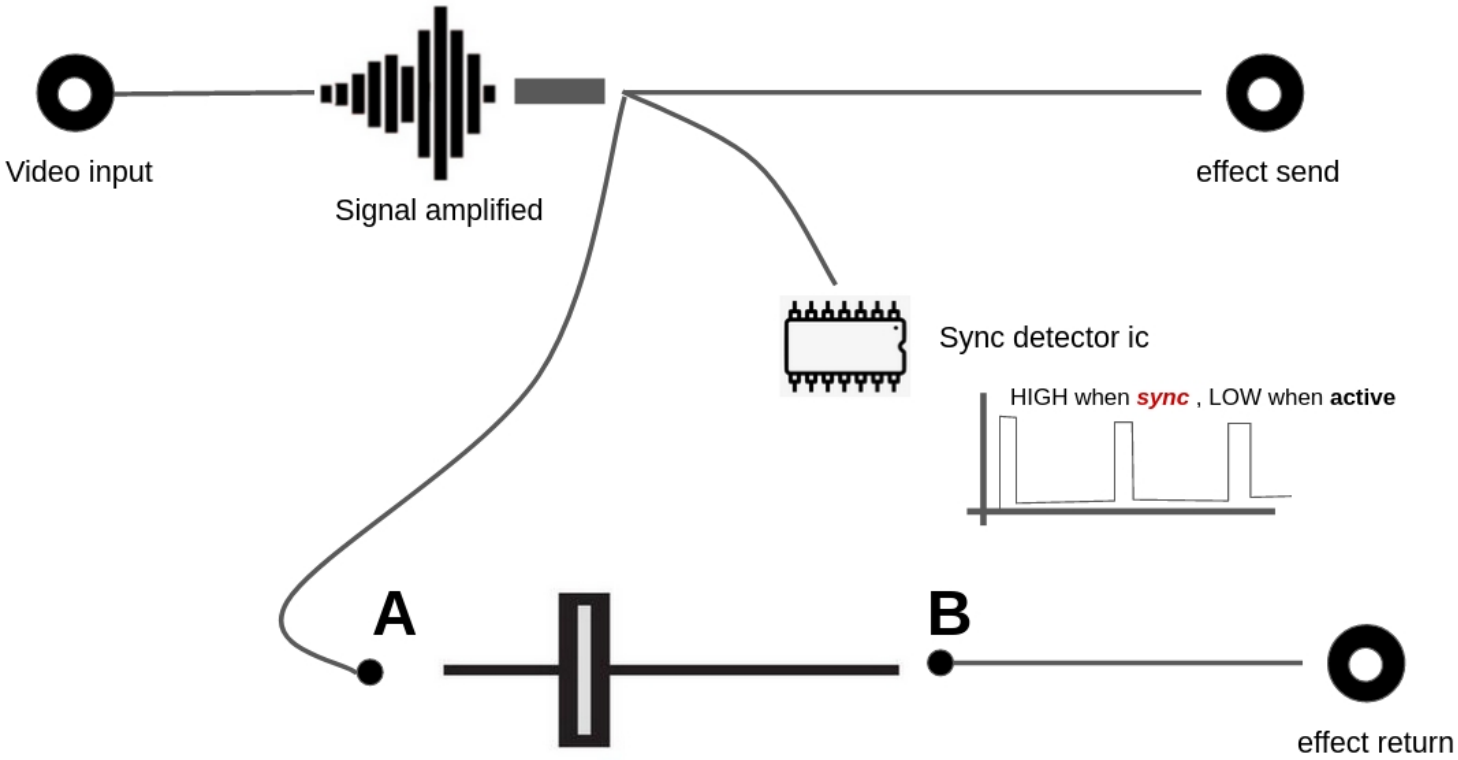
LM1881 is a video ic that can separate the **sync & blanking** part of the video signal

HOW THE CIRCUIT WORKS CONTINUED

LT1251 is a video crossfader ic that creates an output signal as a mix between two inputs (A & B).



Output from the sync detecting ic is used to set the 'crossfader' position of video output – when video signal is in **sync & blanking** range the output will use the clean signal (A) – this ensures that no matter how corrupted the **visible image data** becomes, the **sync & blanking data** of the output video signal will always be *clean*



Then when signal is in the *visible image range* the knob/cv jack will position the crossfader between A and B (ie decide how much of clean vs wet signal to show in visible image)

CREDITS AND MORE INFO

This circuit is distributed through UNDERSCORES – open video hardware label – visit underscores.shop for more info

The pcb was designed using KICAD , this booklet was created in LibreOffice Draw

Everything from gerbers, cad files, panels and documentation is freely available online and distributed under CC-BY-SA / open-source licenses – help us contribute to the commons !

Ask any questions or start discussions related to this project on the *scanlines.xyz* forum – an online community space dedicated to diy av / electronic media art

You can contact me directly at *tim (at) cyberboy666 (dot) com*
Please get in touch if you are interested in hosting a workshop !

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underscores.shop

KiCad
DESIGNED WITH

Thanks to Gael Jaton for sharing your design and knowledge. to Bastien Lavaud for circuit advice, always. To Guergana Tzatchkova for booklet design inspiration. To Ben Caldwell for project advice. To everyone who has or will contribute ♥♥♥