

# 2X-PRO

## User Manual

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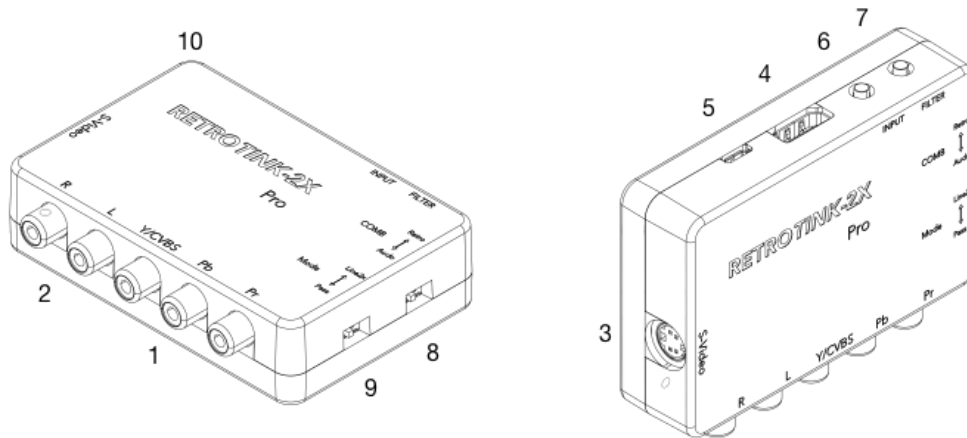
## **Introduction**

The RetroTINK-2X Pro is the next evolution of the original 2X for converting component, S-video and composite signals from retro consoles to a modern digital display. The 2X-Pro is specifically designed to handle 240p off-spec signals and output 480p with low latency and minimal artifacts to preserve the original gaming experience.

The Pro version adds a scanline generator, selectable comb filtering modes, automatic format detection (NTSC/NTSC-443/PAL/PAL-60/PAL-M/SECAM), USB firmware upgrade support and is housed in an injection molded enclosure. In addition, the 2X-Pro is fabricated on a 4-layer PCB with improved routing, power supply and filtering for lower video noise.



## Description



1. YPbPr/CVBS input. For composite sources, connect the Yellow video line to the Green jack.
2. Audio input.
3. S-Video input.
4. Digital Video output.
5. microUSB power input. Connect to any microUSB power source capable of supplying 500 mA or more.
6. INPUT button. Cycles between component, S-video and composite inputs.
7. FILTER button. Cycles between normal, smoothed and scanline filters.
8. COMB switch. Toggles between notch and automatic comb filtering for composite video.
9. MODE switch. Toggles between line doubling and pass-thru modes.
10. Indicator LED.



## Quick Start

First insert a microUSB power cable to the device. You may use any source capable of supplying at least 500 mA.

Second, connect your console to the device. You should only connect one type of video input at a time. Connecting multiple video inputs (e.g., S-video and component) will result in an incorrect or no video output.

Third, press the 'INPUT' button until the correct video input type is selected. The 'Indicator LED' shows the current input:

- GREEN - Component
- WHITE - S-video
- YELLOW - Composite

Fourth, make sure that the 'MODE' switch is set to 'Line2x' and that the 'COMB' switch is set to 'Retro'.

Fifth, connect the device to your display via a Digital Video cable. You should now see the output from your console on your display.

Finally, press the 'FILT' button until your desired effect is shown. The filters cycle between normal blocky, smoothed, scanline, low-resolution YPbPr and low-resolution YPbPr smoothed.

The RetroTINK-2X Pro remembers the input and filter settings between power cycles.



## Advanced Features

The 'COMB' switch controls how the video decoder performs chroma/luma separation for composite video sources. For retro-consoles such as the NES that use off-spec encoding and contain sharp edges, it is recommended that the switch be left in the 'Retro' position. This forces a notch based filter that minimizes ringing and other artifacts. The notch filter has lower horizontal resolution but is free from vertical comb filter distortions and emulates an older color CRT.\*

For cleaner video sources, such as LaserDisc and newer generation consoles, the 'Auto' position allows the video decoder to analyze the video signal and automatically adjust the comb/notch filtering and bandwidth settings.

The 'MODE' switch allows the line doubler to be turned on or off. For normal gaming on 240p/288p sources, this should be set to 'Line2x' to output 480p/576p.

Setting the 'MODE' switch to 'Pass' turns off the line doubler and the device simply digitizes the video signal to the Digital Video output but preserves the original timing. Pass-thru mode may be useful for video capture so that more advanced de-interlacing techniques can be applied later in software.

Pass-thru mode may also be useful for 480i games, especially if latency is not important in the gameplay, since the TV can apply more advanced de-interlacing to the video signal.

High resolution chroma mode may be enabled by pressing the 'Filter' button then quickly pressing the 'Mode' button and releasing both after a second. High resolution chroma mode is not saved between power cycles.

*\*A special thanks to JAMES-F for helping me research the different comb filter settings and optimizing them for retro consoles.*



## **Firmware Upgrade**

The 2X-Pro has the ability to upgrade the firmware over USB using a PC-based application. No special tools are needed.

Firmware upgrades requires that the 2X be started in bootloader mode. Hold the 'INPUT' button down while connecting the 2X to a PCB via USB cable. The LED indicator should remain solid RED.

If the upgrade process fails, simply restart by powering off the device and re-entering the bootloader. Since the bootloader resides in a protected region on memory on the microcontroller, bricking the device is extremely unlikely.

To exit bootloader mode without upgrading, disconnect the microUSB cord from the 2X, then reinsert without holding the 'INPUT' button down.

Detailed instructions may be found on [www.retroink.com](http://www.retroink.com)



## Troubleshooting

*Q: No image is shown.*

A: Double check that the 2X is powered up and that the Digital Video cable from the 2X is securely plugged into your TV. Try another TV and Digital Video cable. Without any console connected, you should see a colorbar test pattern. If you do not, contact your seller for additional assistance.

*Q: Image is black and white.*

A: Press the 'MODE' button to cycle to the correct input mode (composite, S-Video, component).

*Q: Image is okay but then becomes glitchy when switching input sources.*

A: Power cycle the device if this happens.

*Q: Some consoles work but other consoles show a black screen on the TV*

A: Retro-consoles deviate from standard video refresh rates and timing. The 2X is a low-latency line doubler and thus, does not alter these off-spec timings. It is likely your TV does not like the output rate of a specific console. Try another TV or monitor.

*Q: Picture is noisy and/or interference is seen.*

A: In almost every case, the noise originates from the console, console's power supply and/or the cables used to connect the console to the 2X. The noise almost never originates from the 2X itself. In addition, to preserve image sharpness, the 2X does minimal filtering to attempt and smooth out noisy sources. For the best image quality, always use official power supplies for your console and shielded video cables.

*Q: No sound is heard.*

A: Double check to make sure the audio cables are connected correctly. Try another TV. The off-spec video timing of some-retro consoles causes some displays to reject the audio stream in the Digital Video connection. Alternatively, directly connect the audio output from your console to your sound system and bypass the 2X.

## Specifications

<b>Input Connections</b>	CVBS, S-Video, Component and Analog Stereo Audio
<b>Output Connection</b>	Digital Video Connector, TMDS
<b>Supported Formats</b>	240p, 288p, 480i, 576i
<b>Supported Standards</b>	NTSC, PAL, PAL-60, PAL-M (untested), SECAM (untested)
<b>Latency</b>	< 100 $\mu$ S from analog input to Digital Video output
<b>Data Interface</b>	FTDI USB Virtual Serial Port, 115200 bps 8-N-1 RTS/CTS Flow Control
<b>Power</b>	< 300 mA over microUSB, 500 mA PTC fuse for overcurrent protection

## Disposal

If your RetroTINK malfunctions, please contact the place of purchase via e-mail or through their website to arrange repair or replacement. All RetroTINK units come with one years warranty. Outside of warranty, resellers may also offer repair services at their discretion.

If you do need to dispose of the unit, in most countries you can recycle the unit for free at your local recycling centre. To find your nearest centre in the UK, visit the Recycle More website at <http://www.recycle-more.co.uk> and type in your postcode. In the Republic of Ireland, visit <https://www.weeeireland.ie/household-recycling/where-can-i-recycle/>.

If you live outside of the UK or ROI, please check with local authorities or contact us to arrange for a return of your unit.

