ZX-VGA-JOY
v1.03a
RELEASE NOTES

v1.03a contains only a bug fix from version v1.03 related to boot procedure. Since firmware v1.03 was taken back, in these release notes, I included all from it.

It is recommended for all users to upgrade their ZX-VGA-JOYs firmware regardless which version (v1.01 or v1.02) is currently installed.
The firmware upgrade process is very simple, there is a video tutorial and PC tool available in download section at www.zx-vga-joy.com.

New firmware adds several new features and fixes few issues found in previous versions.

New features:

1. Interlaced mode option

Users can enable/disable this option using the icon menu. It affects all screen modes.
By default interlace mode is disabled and it is recommended to keep it disabled for all software that does not use interlace effects.

When interlaced mode is disabled, ZX-VGA-JOY provides 50Hz output frame rate with original resolution (256x192), showing each PAL half frame as full VGA frame.

When interlaced mode is enabled, even PAL frame appear on even VGA lines and odd PAL frame appear on odd VGA lines; if software is clever enough to output different data for each half-frame, this mode will effectively double output (vertical) image resolution (256x384).

Due to limited image persistence on old CRT TVs you might see flickering when running software that utilizes interlaced effect, which is not the case with ZX-VGA-JOY since output is progressive and both half-frames are buffered and transmitted as single frame.

When the interlaced effect is not used by software (which is the case for most of the ZX Spectrum software) and interlaced mode is enabled, picture will look like it has line spreading effect, so we highly recommend disabling interlaced mode for most common use cases.

2. 640x480 @50Hz VGA screen mode

This is the best ZX-VGA-JOY screen mode, but unfortunately, older monitors do not support it.
Luckily, many new LCD monitors do support this resolution even in cases were user manual emphasizes 56Hz as minimal refresh rate.
I have tested dozen of new LCDs (at my friend's computer shop), three of them had 56Hz specified as minimal refresh rate, but all of them recognized this resolution and worked perfectly.

Why this screen mode is the best?
PAL TV picture has 50Hz frame rate, so ZX Spectrum is build to generate a 50Hz picture. Most of software are relying on that frequency and uses that timing to move objects on the screen. For example: horizontal scrolling texts; On each PAL frame text is shifted left by one pixel, if you try to show it on 60Hz frame rate, every 5th frame you will be last frame repeated and it will look like a scroll has stopped for a very short moment.

It is not quite noticeable, most people will only see the difference if they change frame rate whilst observing scrolling text.

Since ZX Spectrum does not use 50.00Hz but 50.02(128k) and 50.08(48k), ZX-VGA-JOY measures frequency of computer and adjust VGA frame rate accordingly.
ZX-VGA-JOY can adjust its VGA freq. between 50.00 and 50.11 Hz.

NOTE: ZX-VGA-JOY still has 7 screen modes, I have removed one out of two unsymmetrical zoom modes on 800x600 which made no sense. But if someone finds this mode useful, please get in touch and I will put it back in.

3. Low power mode

Power consumption highly depends on the brightness of the image, more white regions – more current is drawn.
VGA line drivers on full white picture consume about 30% of overall current consumption, but it's not wise to try to save power there, so instead i have used sleep mode on the microcontroller while it's idle. Enabling this mode reduces power by approximately 23%.

Corrections of existing functionality:

1. Full decoding of paging register (0x7ffd) is replaced with partial decoding like on original computer 128k.
Some ZX spectrum software is taking advantage of partial decoding to speed up some operations.
With full decoding, some demos were not working properly, so I've change it to partial decoding.

2. Forbidden double screen buffer on 48K models.

Some games made before the release of the 128k model doesn't care what will happen if they write in paging register.
For that reason, when you enter 48k basic on 128k models, ROM software writes 1 to bit five of paging register to block further writes.
As result, screen buffer cannot be changed afterwards. For example, game Jetpac, selecting the keyboard as a control option, writes to paging register and switches screen buffer.
So if you loaded it from 128k loader it won't work on TV.
When you use ZX-VGA-JOY on 48k model, ROM software will not make write to bit 5 of paging register and ZX-VGA-JOY will change screen buffer if bit 3 in paging register is set.
To prevent unwanted behavior, when the 48k mode is detected, ZX-VGA-JOY doesn't use double screen buffer.

3. Timing issue between border and paper resolved.

In some cases, the border was one frame ahead, because its buffer was not copied to VGA buffer at the exact same point in time as paper.

4. Screen mode 800x600 @60Hz where ZX spectrum pixel=3x2 VGA pixels has been removed.

5. Various corrections that didn't cause any immediate bugs but had great potential of causing problems when running some software.