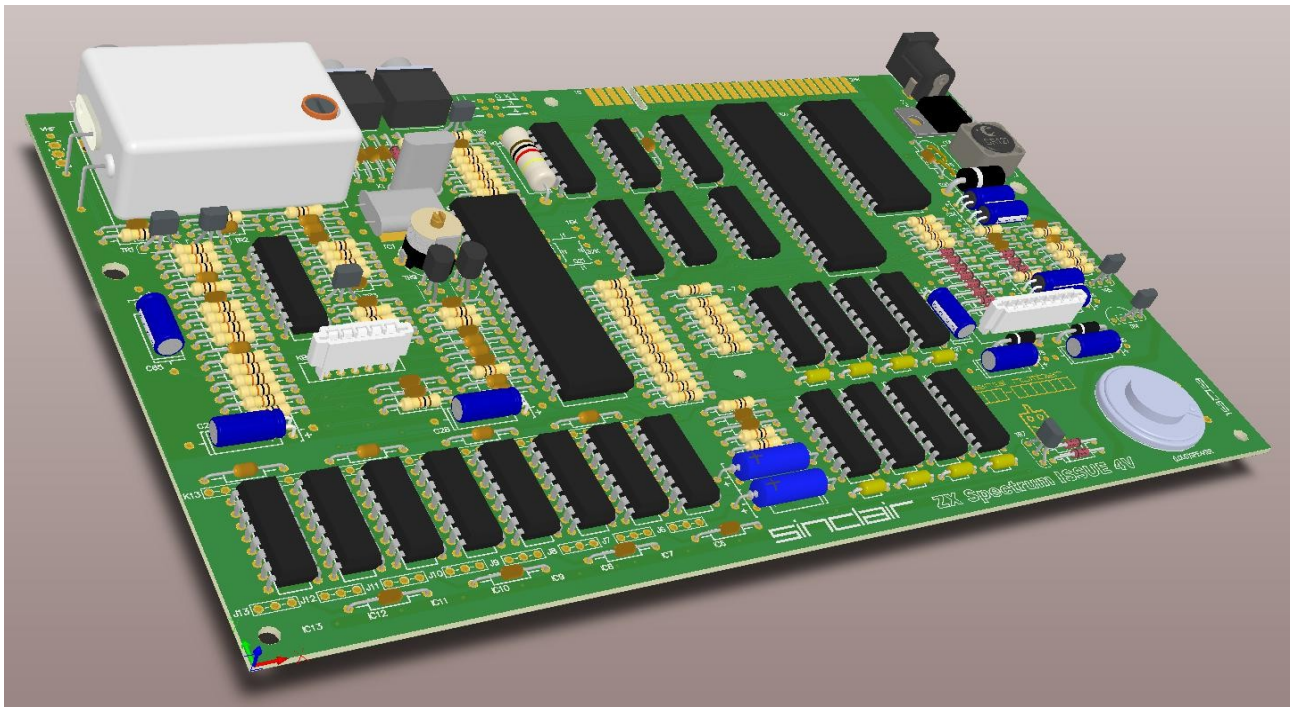
ZX Spectrum

Issue 4V



Feature List

welcome!

Dear Sinclair enthusiast,

Congratulations for buying a ZX Spectrum Issue 4V kit. The purpose of this kit is to provide a way to build a working ZX Spectrum, as close as possible to the original one, out of recovered components from a similar salvaged donor board, or also from individual components purchased through various sources of both New Old Stock and New Production parts.

During the past 35 years or so, most of the existing ZX Spectrums have gone through their fair share of adventures and nightmares, before finally settling in the hands of a caring enthusiast who wants to bring them back to life. Many times they have suffered abnormal wear on the edge connector, have gone through servicing of sometimes very questionable quality, with stripped and badly repaired connections, or have been stored in such extremes of heat and damp that their boards exhibit various degrees of oxidation. Although a lot of servicing can be still successfully done on existing machines, sometimes the outcome is still so unpredictable and unreliable that it's simply not worth to invest time and energies. This is where the Issue 4V can make a difference.

So, what is this "Issue 4V" all about?

During its 1982-1986 production window (and many millions of units hitting the market), the ZX Spectrum has gone through a few major revisions, or "Issues" of its schematics. Each subsequent Issue built in some more reliability, or some cost reduction (or both) over the previous Issue. Therefore, a Spectrum could be an Issue 1, 2, 3, 3A, 3B, 4A, 4B, 5, 6A or 6B. Incidentally, the Issue number can be easily read on the lower side of the board.

Going through the Issues, we reach the Issue 4B which is the very last that used standard commercial integrated circuits to control the Random Access Memory, while all subsequent issues relied on a custom chip purposely designed for Sinclair Research. Issue 4B is also considered, by most Sinclair hardware experts, the most reliable and most easily serviceable of the lot.

Therefore, the Issue 4B schematics were used as a base from which to develop the new board, which has been christened 4V after the designer's family name initial.

The new board removes a number of idiosyncrasies and also includes a lot of useful improvements, aimed both at improved reliability and ease of servicing. True to the spirit of staying as close as practical to the original, nothing has been included to increase performance or change the original specifications. Of course, there are significant differences between the various Issues, however care has been taken to minimize the amount of work and changes to allow each Issue to be brought up to Issue 4V specs. Now, let's get down to business!

features

Standard Rubber Key / Plus layout compatible

The board fits perfectly both the standard Rubber Key and Plus Case. All critical components (sockets, edge connector, holes) are accurately located as per original specs.

Gold plated edge connector

The board is a high-quality product with green silkscreening on both sides (unlike the original which has the silkscreening on the bottom side only), and a gold-plated edge connector which definitely solves the annoying problem of dirty and/or oxidized edge connector contacts.

As an interesting option, the board can be produced also in red, blue, yellow, white or black silkscreening (a price premium and minimum quantity apply, contact us for details).

Polarity protection on +9V power socket

A very common fault is when a Spectrum is connected to a third-party, user-selected power supply. If the user does not check beforehand and the new power supply has reversed polarity on the output connector, the Spectrum goes up in smoke as soon as the plug is connected to the +9V socket. This mod makes this unfortunate event a thing of the past.

Choice between UHF modulator and RCA socket

The standard Spectrum features a Channel 36 tuned UHF modulator, which drives a standard analog TV. Nowadays, due to the difficulty making this set-up to work reliably on modern digital TVs, the modulator is deactivated and its output socket re-routed to the composite video signal. On issue 4V the user has a choice between re-fitting the original, modified modulator for fidelity’s sake, or soldering a simple RCA socket. The latter option is also the only viable solution if the new board is being built from NOS parts, as UHF modulators are obsolete.

Improved lower RAM bank decoupling

The standard Spectrum shows various image artifacts having multiple reasons, one of which is the marginal decoupling of the power supply rails of the lower RAM bank. On Issue 4V four more decoupling capacitors have been added on the +12V power supply line to address the problem, and the values have been increased by a factor of 10. This mod is based on sound and long-estabilished field practices already in use throughout the Spectrum community.

ROM jumper extension

The standard Spectrum has a ROM jumpers section, allowing both NEC and Hitachi made ROMs to be fitted. As time went by, people saw the need to fit EPROMs instead, both because original ROMs are no longer produced and hence unavailable as spares, and to allow experimenting with custom ROMs. On Issue 4V the jumper section has been extended to accommodate the revised circuitry to address EPROMs as well as standard ROMs. Also, an address selector allows both 27128 (16K) and 27256 (32K) EPROMs to work, the latter allowing to hold two different ROM images to be selected at will.

“Dot crawl” full control

A well-known “feature” of the standard Spectrum is the very slight blurring of the image, especially with certain combination of paper and ink colors, known as “dot crawl”, which originates from odd interactions between the clock and the color subcarrier frequency. Issue 2 boards feature a trimmer TC1 to change slightly the clock frequency, allowing to reduce this phenomenon to an acceptable minimum, while all subsequent Issues have this frequency fixed to what is usually perceived as an acceptable value. Issue 4V allows to select either configuration, depending on user’s preferences.

Lower RAM bank servicing made easy

One of the most common Spectrum faults is one or more blown 4116 RAM chips from the lower (16K) RAM bank. The chip is obsolete nowadays, and replacement parts are somehow available as New Old Stock parts, or Working Pulls from decommissioned boards. As 4164 (64K) and 41256/4256 (256K) RAM chips seem to be more easily available on the market (although obsolete as well), various techniques have been exploited to accommodate the few pin-out differences between the two chips. The Issue 4V features 16 jumpers which allow each chip to be either a standard 4116, a 4164 or a 41256 RAM chip. Of course, it is also possible to fit one of the various “RAM replacement module” available on the market.

Inexpensive recapping option

The quintessential preventive maintenance for a 35 year old Spectrum is the replacement of all its electrolytic capacitors. Finding replacements in the provided axial form can be sometimes difficult, as capacitors are mostly produced in radial form nowadays. The Issue 4V allows fitting both axial and the more easily available radial capacitors. Also, all non-polarized capacitors have dual-pitch footprint to accommodate both axial (from UK boards) and disc (from Samsung boards) capacitors.

appendix

Issue 4V components layout.