

VecDev Developer's Cartridge

By P.I. Nicholson
www.vectrex.co.uk

WHAT IS VECDEV?

Now at last software developers for the Milton Bradley Vectrex games console have something that is akin to an EPROM emulator but at much less the cost and equally as convenient. Richard Hutchinson's VecDev cartridge available for purchase from <http://www.vectrex.biz/> allows the programmer to conveniently download binaries to the Vectrex console an unlimited number of times. With VecDev the software development process is greatly speeded up, as changes in the binary can be programmed in-between downloads, and the results seen almost immediately.

Although Vectrex emulators are available and can be used as a first phase for program development, to date there are no Vectrex emulators existing that can truly emulate the Vectrex console. Often programs developed with a Vectrex emulator can behave differently when executed on a real Vectrex and then subsequently need to be "tweaked". VecDev allows program development to take place on a real Vectrex from the start.

The VecDev cartridge uses 32K volatile Static RAM to temporarily hold the downloaded binary. Using RAM instead of flash allows for much quicker downloads with speeds for small binary downloads comparable to an EPROM emulator. The Vectrex executes the binary contained in the RAM as though the VecDev was a standard MB Vectrex cartridge. After each download all the user has to do is hit the reset button on the Vectrex console to restart and execute the binary.

The user can choose to use the VecDev cartridge to this level but there is one additional option that makes this cartridge much more useful! By wiring a reset signal from the VecDev cartridge directly to the reset inside the Vectrex console, complete automatic operation of the download and execute process via the VecDev cartridge and PC based VecDev windows application software is possible.

Using the reset signal connection the VecDev software loads and executes the binary and because a reset signal is automatically sent directly afterwards, there is not the annoying Vectrex start-up screen. With this automatic option the software development cycle is considerably speeded up.

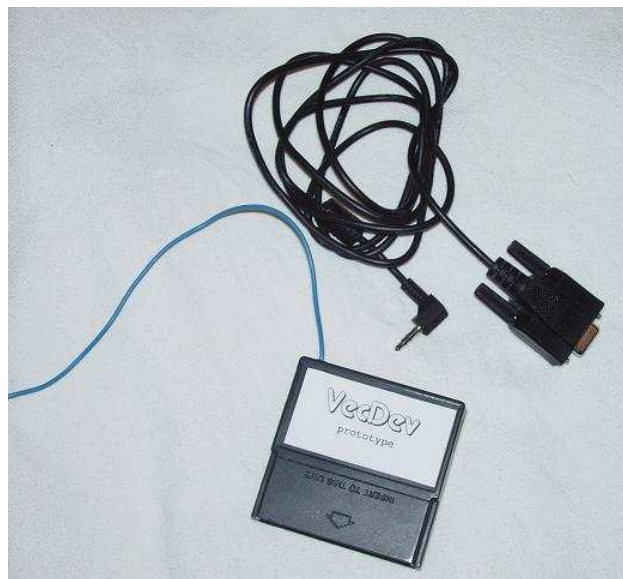


Fig.1 VecDev product contents - Cartridge (including integrated reset signal wire*) and 3.5mm jack serial download cable

*Please note that in the photo the reset signal wire is in blue insulation, but could be of a different colour in the supplied product.

VECTREX RESET MODIFICATION

Some Vectrex users may feel a bit wary about opening the Vectrex console to make the reset modification, perhaps fearing a complicated disassembly and assembly process. Some users may also be reluctant to delve into their Vectrex because they believe they might electrocute themselves as a result of the high discharge voltage components contained within.

Firstly, this modification can be achieved in less than 15 minutes. Secondly, although it is true that high voltage components are present in the Vectrex console, the change required for the reset option is on the logic board positioned at the bottom of the Vectrex. The logic board is located far from the area above it where the high voltage cathode ray tube and analogue electronics board reside. Therefore, providing the user is careful there should be no chance of accidentally touching the high voltage components present above the logic board.

Making the modification makes a big improvement on the software development cycle and once the modification has been made programmers won't want to develop without it! In addition the user can decide how permanent they want to make the reset modification. All that is required is to solder just one wire from the VecDev cartridge to the underside of the Vectrex console logic board. It is up to the user if they want to make the modification permanent and put a connector on the side of the console housing or they can just feed the wire through one of the slots in the back of the console. The following steps detail the least invasive way to incorporate the reset signal wire into the Vectrex console and would suit those users who don't want to deface their beloved Vectrex as a result of drilling holes in the console casing.

Preparation of reset wire

When the VecDev is supplied, the reset wire should be already attached to the VecDev cartridge. (1) The reset signal wire is approximately 1 meter in length and if the bare copper wire is not already exposed, a wire stripper should be used to remove insulation approximately 2 mm from the end. Make sure not more than 2 mm of bare copper is exposed otherwise there is increased risk of shorting neighbouring pads when soldering the wire to the logic board. (2) Twist the copper strands of the bare wire together and apply some solder.

Disassemble Vectrex Console

(1) Disconnect the Vectrex console from the mains socket. (2) Place the Vectrex console screen down on clear clean surface. A good clear clean surface is a towel. (3) Remove the five screws from the back of the Vectrex cover which attach the rear cover to the front cover. Make a note of which screws come out of which holes. (4) Whilst holding the rear cover, gently pull upwards until the rear cover separates from the front cover. (5) Place the rear cover nearby.

Pass the reset wire through a bottom slot of the rear cover

(1) Take the reset signal wire and pass through one of the slots of the rear Vectrex Cover – see figure 3.

Solder the reset signal wire to the logic board PCB

Only a single wire is required to be soldered to the Vectrex logic board PCB, as the ground signal is already present on the Vectrex cartridge connector and connects directly to the VecDev cartridge. Two wires from the reset switch mounted on the front of the Vectrex consoled should be seen to be soldered to two pads on the logic board PCB (see black wires in figure 2). (1) Solder the reset signal wire to the right hand side pad connecting to one of the black wires. -Take care not to short out any

neighbouring pads with the newly introduced reset wire.

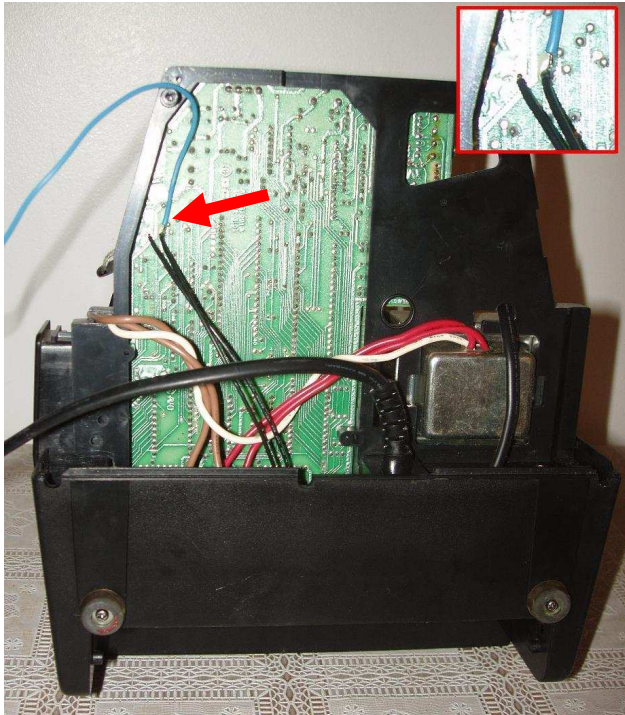


Fig. 2 Underside of Vectrex (screen down) with rear cover removed showing the end of the (blue) reset wire soldered on the underside of the logic board

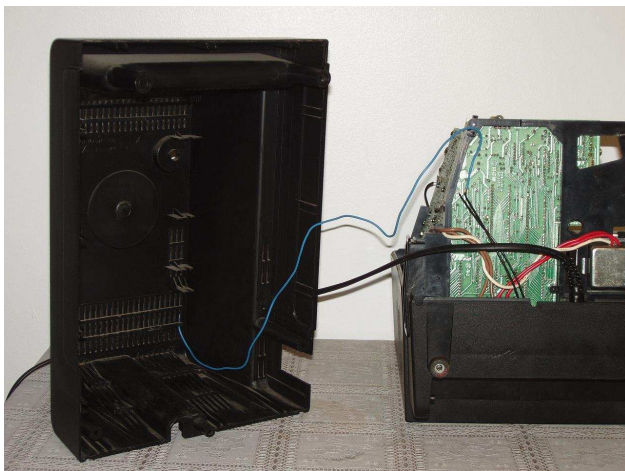


Fig. 3 Signal reset wire passed from VecDev cartridge through Vectrex rear cover and soldered to logic board.

Reassemble Vectrex Console

(1) Place the Vectrex console front cover and innards with screen down on clear clean surface. A good clear clean surface is a towel.
 (2) Gently lower the rear cover towards the front mating cover whilst at the same time

pulling the reset signal wire gently through the rear cover slot. (3) In some circumstances full mating of the front and rear covers maybe obstructed because the “brightness” adjustment potentiometer shaft is not exposed through the rear cover hole. Using a pen or small screwdriver it is possible to “pull” the shaft into the correct position for protrusion through the hole (see figure 4). (6) Reinsert the five screws taking care to put the different length screws in the correct holes.



Fig. 4 Using a pen to “pull” the brightness shaft into the correct position



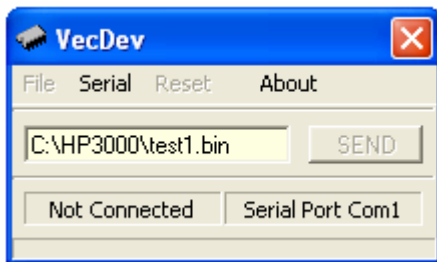
Fig. 5 VecDev cartridge and reset signal incorporated with Vectrex console

VECDEV WINDOWS APPLICATION SOFTWARE

The VecDev Windows application software is downloadable from <http://www.vectrex.biz/>. The software has been tested on Windows XP and should also run in Windows 2000 and Vista environments. The application is hard coded to communicate with the VecDev cart at 115200 Bits per second. The application will not function correctly on PCs with hardware and software specifications of less than the above.

Binary Download steps

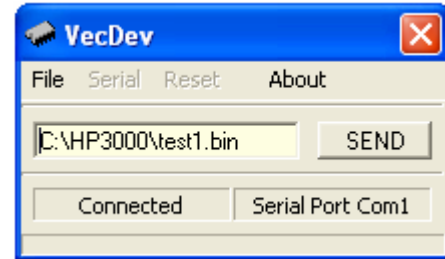
- 1) Ensure that the serial cable connects the PC to the VecDev Cartridge. The 3.5 mm jack plug end of the serial cable should be inserted into the 3.5mm jack socket on the VecDev cartridge. The 9 pin 'D' plug should be connected to a serial COM port on the PC. The default COM port used is COM port 1.
- 2) Ensure that the Vectrex console remains switched off.
- 3) After PC power on – execute the VecDev software application.



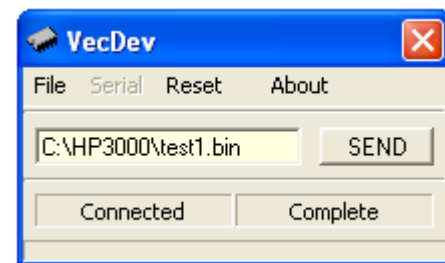
At this stage the default COM port can be changed if necessary by mouse clicking on 'Serial' from the menu – The user can then select the appropriate COM Port from a drop down menu.

- 3) Switch on the Vectrex – the VecDev software application should say connected – if

not, make sure the correct serial port COM number is selected. The Vectrex Screen should be blank with no buzz present because the RAM does not contain any executable binary.



- 4) The name of the file and folder location is shown in the text control box. Browse for a different file via the File menu. The last binary name and location is remembered by the VecDev application. This is useful as typically during development the same binary is developed.



- 5) Mouse click on the Send Button – the Vectrex should reset and the binary file should download. During download a status bar reflects the percentage of binary still to download.

- 6) Once the binary has downloaded the binary is executed. The user can reset execution of the binary by mouse clicking on the 'Reset' menu. Alternatively steps 4 or 5 can be repeated again.

Download transfer speeds

The VecDev product communicates with the PC by RS232 serial port only. With the widespread use of the Universal Serial Bus (USB) most modern day computers are not supplied with a RS232 serial port. However, USB to Serial adapters are widely and cheaply available and can be used instead of a dedicated RS232 serial bus. There is a computing overhead incurred when transferring data via a USB to RS232 adapter, and download times are longer compared to a dedicated RS232 serial port or RS232 serial port provided via a PCI card solution. Table 1 shows example timing comparisons measured after downloading binaries of different sizes via a PCI based serial card and a USB to Serial adapter. It is clear that a serial port provided with a PCI based card solution is much faster.

Binary size	Serial PCI card	USB to Serial Adapter
32K	28 Secs	66 Secs
16K	9 Secs	33 Secs
8K	7 Secs	16 Secs
4K	3 Secs	6 Secs

Table 1 Comparison of transfer times between dedicated serial hardware and USB to serial converter

CONCLUSION

This product differs from Richard Hutchinson's other product called VecFlash, in that for VecDev volatile SRAM is used to hold the program rather than flash. With VecFlash writing to flash memory takes much longer, and the number of times the flash can be programmed is not infinite unlike SRAM. In addition the VecFlash cartridge (USB option) was never designed to be programmed whilst physically in the console, and for the VecFlash (RS232 option) the Vectrex has to be powered on and off in order to upload new binaries. This all adds extra unwanted time to the software development cycle. VecFlash is ideal as a

programmable multi-cart and is very useful for storing multiple (finished) binaries. On the other hand VecDev is suited for developers, who want to be able to quickly download binaries and to see their programs executing immediately after download as part of their software development cycle. VecDev is also suited to users who like to use their PC as a huge Vectrex software library. They can then choose any binary from that library for quick download and execution on their Vectrex via their PC.

DISCLAIMER

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