6522 as a PS2 keyboard controller?

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Author	Message
nerdy1	**Post subject:** 6522 as a PS2 keyboard controller? **Posted:** Wed Jan 24, 2018 4:56 am
offline **Joined:** Wed Jan 24, 2018 4:05 am **Posts:** 14	Hello all, I was wondering if any of you had ever heard of, or had experience with, using a 6522 as a keyboard controller for a PS/2 keyboard? I don't wish to use a microcontroller in my design, but I also don't wish to design and build my own keyboard! The PS2 keyboard protocol is kind of funky with an 11-bit packet and no common BAUD rate (it just pulses the clock "whenever it feels like it?" -- I see rates reported from 10kHz to 30kHz.) I can't wrestle that protocol with a typical UART. I'm not even sure it could be done with a 6522 but I thought I would ask. My fall-back position is to maybe connect the keyboard data line to a single data line on a regular peripheral interface adapter (or some other kind of latch?). I need the keyboard clock falling low to signal an interrupt on the CPU, but it can't be tied directly -- it needs to just pulse, so the IRQ line can return to high. Keyboard data line is valid while the clock line is low, so I could in theory then try to bit-bang the keyboard's serial data directly from the CPU. I am all still new to the hardware side of this stuff so I expect there are obvious things that I am missing. Your thoughts and comments are much appreciated!
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DerTrueForce	**Post subject:** Re: 6522 as a PS2 keyboard controller? **Posted:** Wed Jan 24, 2018 5:26 am
offline **Joined:** Sat Jun 04, 2016 10:22 pm **Posts:** 457 **Location:** Australia	I don't know anything about implementing PS2, but if you're willing to code scanning and decoding the keyboard, you could use one of these. Last edited by DerTrueForce on Wed Jan 24, 2018 5:33 am, edited 1 time in total.
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BigEd

Post subject: Re: 6522 as a PS2 keyboard controller? **Posted:** Wed Jan 24, 2018 5:27 am

offline

Joined: Thu Dec 11, 2008 1:28 pm
Posts: 7704
Location: England

Hi nerdy1, and welcome.

I had a look around, and I think I've found a couple of references to previous work (most people these days have used a microcontroller, but not everyone.) Hope you'll find it useful - but it would be great if you can succeed and publish your work too.

Daryl's SBC project has this:
http://sbc.rictor.org/io/pckb6522.html
(see also this thread)

And the late Lee Davison had this, using a GAL:
http://retro.hansotten.nl/lee-davison-w ... interface/
(also here, but with the pictures missing)

And Dieter managed something too, using some TTL shift registers to assist:
http://www.6502.org/users/dieter/drc2/drc2.htm

It seems the AT keyboard and PS/2 keyboard use the same protocol, just a different connector - if that's not so, please correct me! And, at least at one point, most USB keyboards also can use the PS/2 protocol and just need a trivial electrical adapter.

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GARTHWILSON

Post subject: Re: 6522 as a PS2 keyboard controller? **Posted:** Wed Jan 24, 2018 6:17 am

offline

Joined: Fri Aug 30, 2002 1:09 am
Posts: 6318
Location: Southern California

http://www.computer-engineering.org/ps2protocol/ looks helpful. You can do it with a 65(c)22. There's not a baud rate in the sense that a UART uses it, because it's synchronous, not asynchronous. Instead it's similar to I²C but with a minimum clock-low and clock-high time of 30µs and maximum of 50µs, and with a parity bit at the end instead of an ACK bit.

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nerdy1

Post subject: Re: 6522 as a PS2 keyboard controller? **Posted:** Wed Jan 24, 2018 7:11 am

offline

Joined: Wed Jan 24, 2018 4:05 am
Posts: 14

Thank you everyone for those links -- that is very helpful!
I am thrilled that it not only looks possible to do with a VIA, but there is even source code for me to "borrow"! (I think I will want an interrupt-based version of Daryl's code, but hopefully that will just be a software-only modification.)
New 65C22 is on the way...and I have some studying to do!

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GARTHWILSON

Post subject: Re: 6522 as a PS2 keyboard controller? **Posted:** Wed Jan 24, 2018 7:37 am

offline

Joined: Fri Aug 30, 2002 1:09 am
Posts: 6318
Location: Southern California

The VIA's CA1, CA2, CB1, and CB2 pins can be used as interrupt-on-change pins, suitable for an externally sourced clock signal. You can of course have a line connected to both that and one of the port pins at the same time, and then use the port pin to emulate an open-drain I/O by writing a 0 to its bit in the port's output register and then making the bit an output when you want to pull the line down, or an input when you want to read it or let it float up. Use an external pull-up resistor of course.

It isn't I²C, but very similar. I have an I²C-with-VIA part of the "circuit potpourri" page of the 6502 primer, at http://wilsonminesco.com/6502primer/pot ... ITBANG_I2C, and accompanying sample I²C bit-bang code that might give you some ideas, at http://wilsonminesco.com/6502primer/GENRLI2C.ASM .

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cbmeeks

Post subject: Re: 6522 as a PS2 keyboard controller? **Posted:** Wed Jan 24, 2018 2:41 pm

offline

Joined: Wed Aug 17, 2005 12:07 am
Posts: 1028
Location: Hixson, TN USA

This is very useful information. In my current "big board" SBC, I am using a VIA for a PS/2 keyboard, AY-3-8912 sound chip and a NES controller.

I'd love to learn more about those CA/CB pins. They are still a mystery to me. I'm planning on just bit-banging the VIA's for the moment. I will actually have two VIA's. One that I just mentioned and one for external ports.

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whartung

Post subject: Re: 6522 as a PS2 keyboard controller? **Posted:** Wed Jan 24, 2018 5:44 pm

offline

Joined: Sat Dec 13, 2003 3:37 pm
Posts: 1004

The question is how much CPU bandwidth on the 6502 is necessary to decode the PS/2 protocol. 30KHz is kind of busy for a 1Mhz CPU. You'd have to be polling for bits pretty regularly, and I don't think you'd want the PS/2 clock to be hammering an interrupt.

In constrast to a keyboard scanner/decoder. You're dealing more with human terms and response rates, and can probably be a little more sloppy vs syncing up to a synchronous clock running at a random rate.

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cbmeeks

Post subject: Re: 6522 as a PS2 keyboard controller? **Posted:** Wed Jan 24, 2018 6:51 pm

offline

Hmm. You got me thinking. It might be worth it to me to use a micro-controller tied to a 6522 now that I think about it. The micro-controller could handle the PS/2 and NES signals and just latch an 8 bit value on one of the VIA's ports.

Joined: Wed Aug 17, 2005 12:07 am
Posts: 1028
Location: Hixson, TN USA

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DerTrueForce

Post subject: Re: 6522 as a PS2 keyboard controller? **Posted:** Wed Jan 24, 2018 11:22 pm

offline

Joined: Sat Jun 04, 2016 10:22 pm
Posts: 457
Location: Australia

Garth did suggest using CA1/2 or CB1/2 as change interrupt pins. If you did that, you wouldn't need to poll them until an IRQ hits.

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GARTHWILSON

Post subject: Re: 6522 as a PS2 keyboard controller? **Posted:** Wed Jan 24, 2018 11:28 pm

offline

Joined: Fri Aug 30, 2002 1:09 am
Posts: 6318
Location: Southern California

If you don't want interrupts, putting the clock line on bit 6 or 7 of one of the ports lets you test it with BIT and then branch on the N or V flag, without regard to what's in A. Put it in a loop. The VIA does have several capabilities that do not initially meet the eye though. When you don't want the keyboard interrupting, and you don't want to miss any keyboard events, just pull its clock line low to make it wait until you're ready.

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nerdy1

Post subject: Re: 6522 as a PS2 keyboard controller? **Posted:** Thu Jan 25, 2018 12:23 am

offline

Joined: Wed Jan 24, 2018 4:05 am
Posts: 14

Thanks again Garth. It's important to me that my keyboard should be interrupt driven. I don't mind if it takes me a while to nail down the software.
Just so I am clear though, we are not talking about using the VIA's shift registers at all correct? We are just talking about using it to take control of the two keyboard lines, so I can drive them (or not) as needed?
Just out of curiosity, how crazy would it be to try to squeeze a 16-bit shift register into the middle there?

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GARTHWILSON

Post subject: Re: 6522 as a PS2 keyboard controller? **Posted:** Thu Jan 25, 2018 2:27 am

offline

Joined: Fri Aug 30, 2002 1:09 am
Posts: 6318

The odd frame size would make it a bit of a challenge to handle it with the VIA's SR, but there might be a way to do it anyway, possibly using the SR to get the first 8 bits and then finishing it up in bit-banging as we were talking about above. In addition to going to the CB1 input, the clock line could still go to a CA line to generate an interrupt when a frame starts, then you have plenty of time to get into the ISR and start polling the SR-full bit (bit 2 of the interrupt flag register, or IFR) for when the first 8 bits are completed, and take the rest of the bits in manually, then reset the SR and other things needed to start the process again for the next frame. I have not sharpened my pencil to figure out anything further than what I just wrote. It's just out-

Location: Southern California

loud thinking. There's usually a way to do these things. Be sure to address the VIA SR bug in mode 011 though (the only bug in the VIA, and it's in all brands) which I tell about in tip #8 of the Tip of the Day column, at viewtopic.php?p=2310#p2310 .

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Waveguide

Post subject: Re: 6522 as a PS2 keyboard controller? **Posted:** Thu Jan 25, 2018 7:45 am

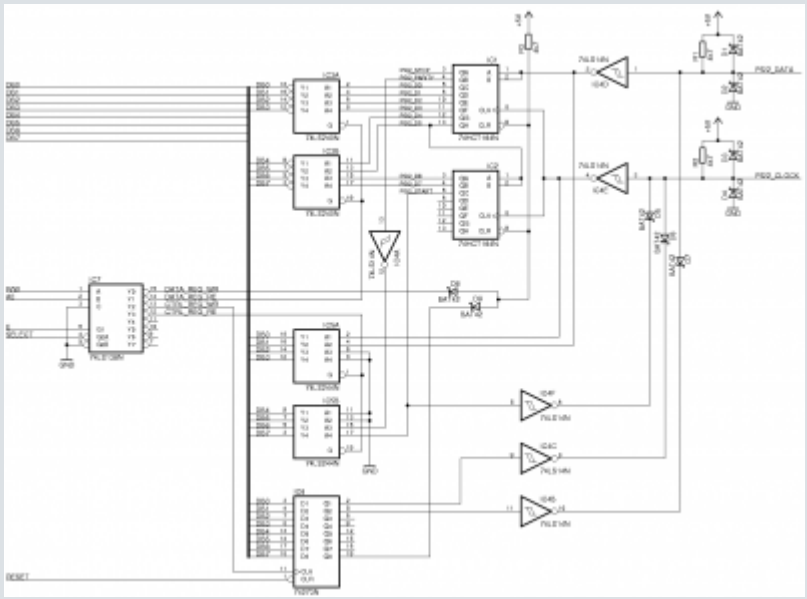
offline

Joined: Sat Jul 20, 2013 8:23 am
Posts: 6

This topic got me doing some archeology among old Eagle files from many years ago when I was toying around with the thought of a dedicated PS/2 keyboard interface. The idea I had was to use two shift registers to capture an entire byte from the keyboard including start, stop and parity bits. When all bits are captured the PS/2 clock line is pulled low to prevent further transfer (the keyboard will buffer) and the CPU can pull one byte from the data register without any stress. The interface have one RO data register and one RW control register. Sending data to the keyboard is bit banged but data in that direction is relatively rare (mainly updating the keyboard LEDs).

This circuit was hastily put together, have not been tested and may not work at all but maybe it will spark some ideas

Attachments:



ps2-interface.png [16.19 KiB | Viewed 3822 times]

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