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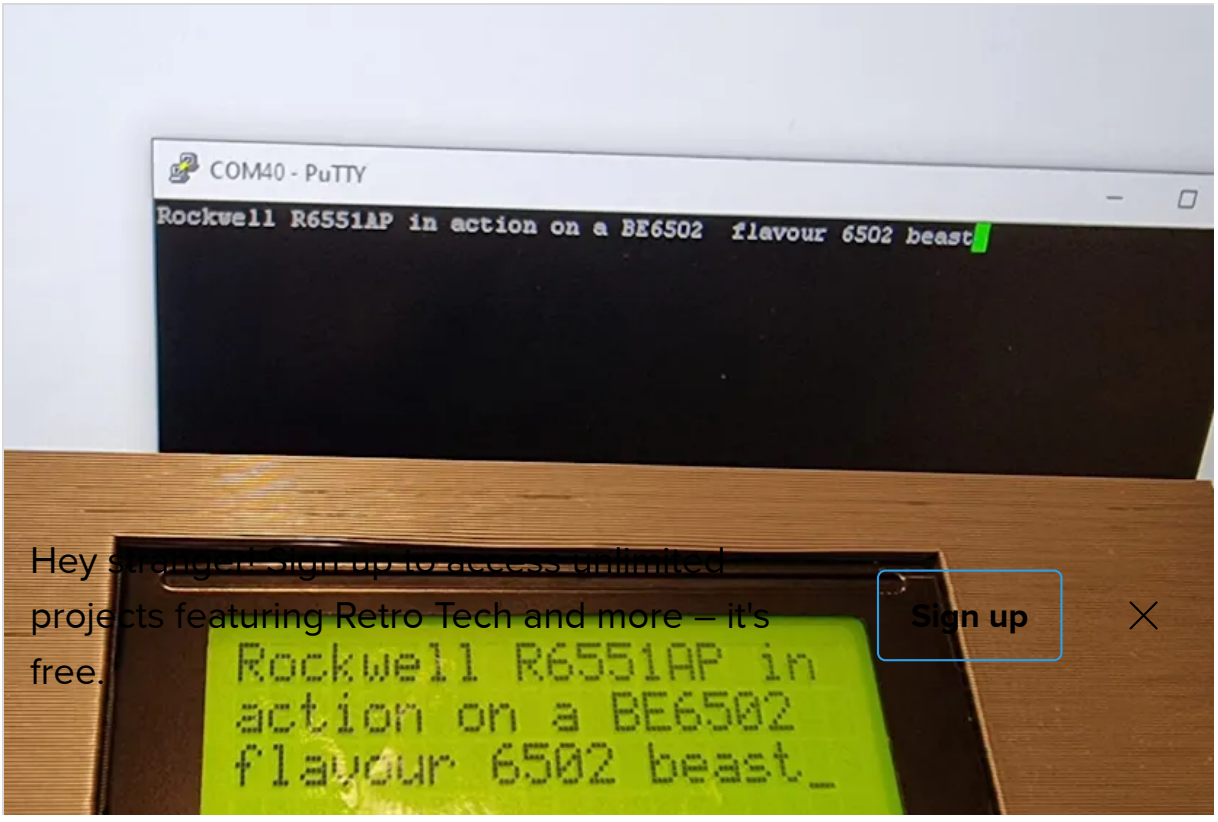
RS232: using a Rockwell R6551AP ACIA with a 6502 computer

Following along with Ben Eater's 6502 series but you have a Rockwell 65 rather than a WSC one? Here's how to make it work.

Intermediate(/projects?difficulty=intermediate) Protip 1 hour 265



Things used in this project

Hardware components

R6551AP × 1 (/products/buy/1061322?s=BAhJIhM1MDI3NzAsUHJvamVjdAY6BkVG%0A)

Software apps and online services

PuTTY (https://www.putty

Story

The Problem

In my previous project (https://www.hackster.io/michael-cartwright/6502-console-interface-using-arduino-uno-to-run-wozmon-ee9990)I mention tl struggle I had to not get my 6551 working with my Ben Eater style 6502 machine (https://eater.net/6502). Once I had everything else working, an a little better at using my oscilliscope, I figured it out.

Since it was no error of mine, I figure I'd share since others must be havir same trouble.

The Issues

While the Western Design Center and Rockwell versions of the 6551 app on the surface to be the same chip, they most certainly are not. There ar important differences that I eventually figured out:

- Rockwell included the 1M resistor and the 2 capacitors for the oscillat circuit in the chip so the only external component is the crystal. Addir extra two capacitors and a resistor will mess up the frequency.
- The Rockwell chip requires that /DSR, /DCD and /CTS be tied to grou not used. Perhaps the WDC version has built-in pulldowns but Ben Ea does not have these pins tied to ground in his schematic (https://eater.net/6502).

Of course, if I'd bought the RS232 kit from Ben, like I originally did for the 6502, then I wouldn't have this problem so strictly speaking, his schemat perfectly correct. For his kit. But I had already purchased the R6551AP *be* Ben posted his RS232 videos .. oh well.

The Solution

Well, I've already described it:

- tie 3 pins to ground
- exclude the two capacitors and the resistor

I've attached my full schematic for this module as a PDF. The code in Ber video (https://www.youtube.com/watch?v=CnA8nG3zYHw) works just fine the Rockwell chip after you make these hardware changes. I also include complete but minimalist version of the code required to get this interface work as an attachment to this project.

R6551AP ACIA for 6502 machine

If you are struggling to get a terminal working on Windows, take a look a instructions for configuring PuTTY (https://www.hackster.io/michael-cartwright/6502-console-interface-using-arduino-uno-to-run-wozmon-ee9990)in my previous project.

If you get stuck, like I did, please feel free to reach out to me via the comments below.

Milestone Reached!

With the ACIA interface successfully working, I've finally completed the perfboard part of my project! One motherboard and four daughterboards seems like a good time to post a little gallery of the entire system.

I've written firmware with useful APIs for LCD, Keyboard, Serial and Timer which I'm happy to share if anyone is interested. It took a while to get it s and reliable: easy when you just do one, harder when you include all the functionality in a single system.

6502 motherboard

RAM, EEPROM, ACIA (RS232) and VIA (LCD and PS/2 kbd) daughterboards

Guess who had WAY too many breadboard headers to spare?

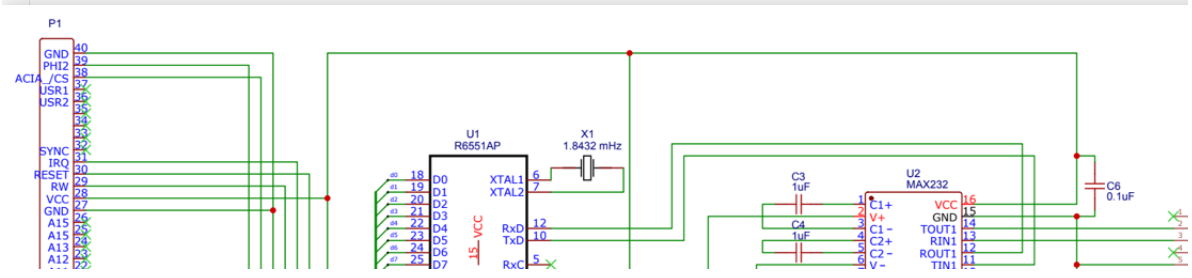
6502 computer with PS/2 keyboard, 20x4 LCD and RS232 port

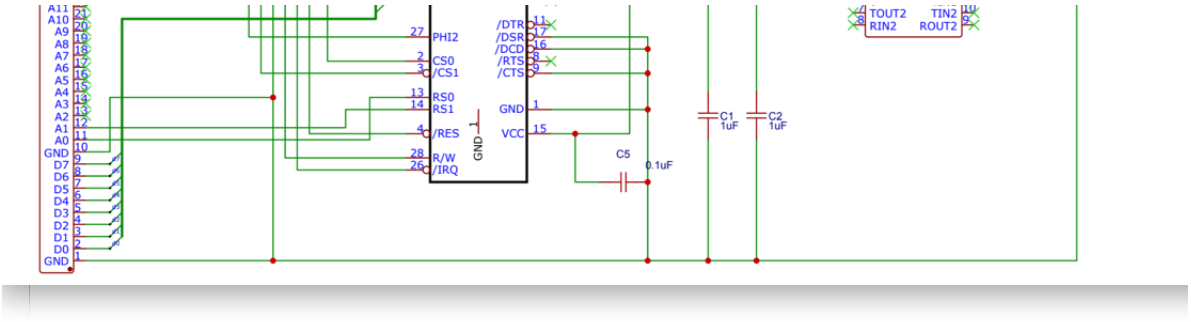
Schematics

R
6
5
5

1 APACIA for 6502 schematic

(https://hacksterio.s3.amazonaws.com/uploads/attachments/1614135/sch





Code

Minimal but complete code for the 6551 ACIA interface Assembly x86

The commented out LCD APIs give were used by me to echo the characters on the 6502 computer to the 20x4 LCD. They are useful for testing but not required to demonstrate that the RS232 is working.

(/code_files/644989/downlo

```
; yes, these are port addresses : mine are on the zero page
ACIADATA    = $EC ; 00
ACIASTATUS  = $ED ; 01
ACIACOMMAND = $EE ; 10
ACIACONTROL = $EF ; 11

  .org $8000

start:
```

```
sei             ; disable interrupts
cld             ; clear decimal arithmetic mode.

ldx #$ff        ; reset stack pointer
txs

; initialise 6551 ACIA
```

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