

Raspberry Pi Based LCD Clock



Introduction

A Raspberry Pi 4B based pseudo-nixie clock that uses six 320x240 LCD displays instead of actual nixie tubes.

The LCDs, from Waveshare, cost about \$15 each and use the ST7789 controller chip.

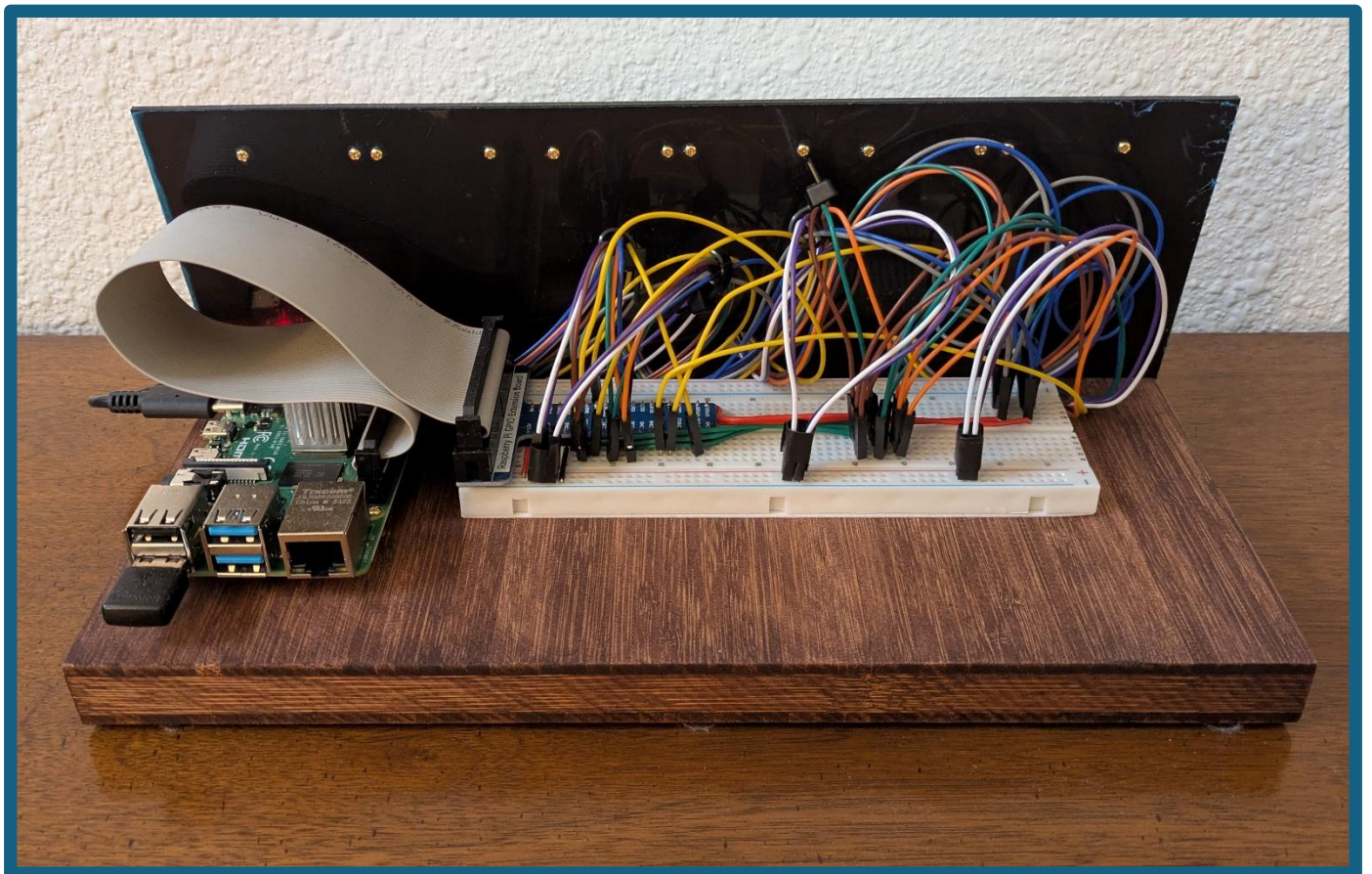
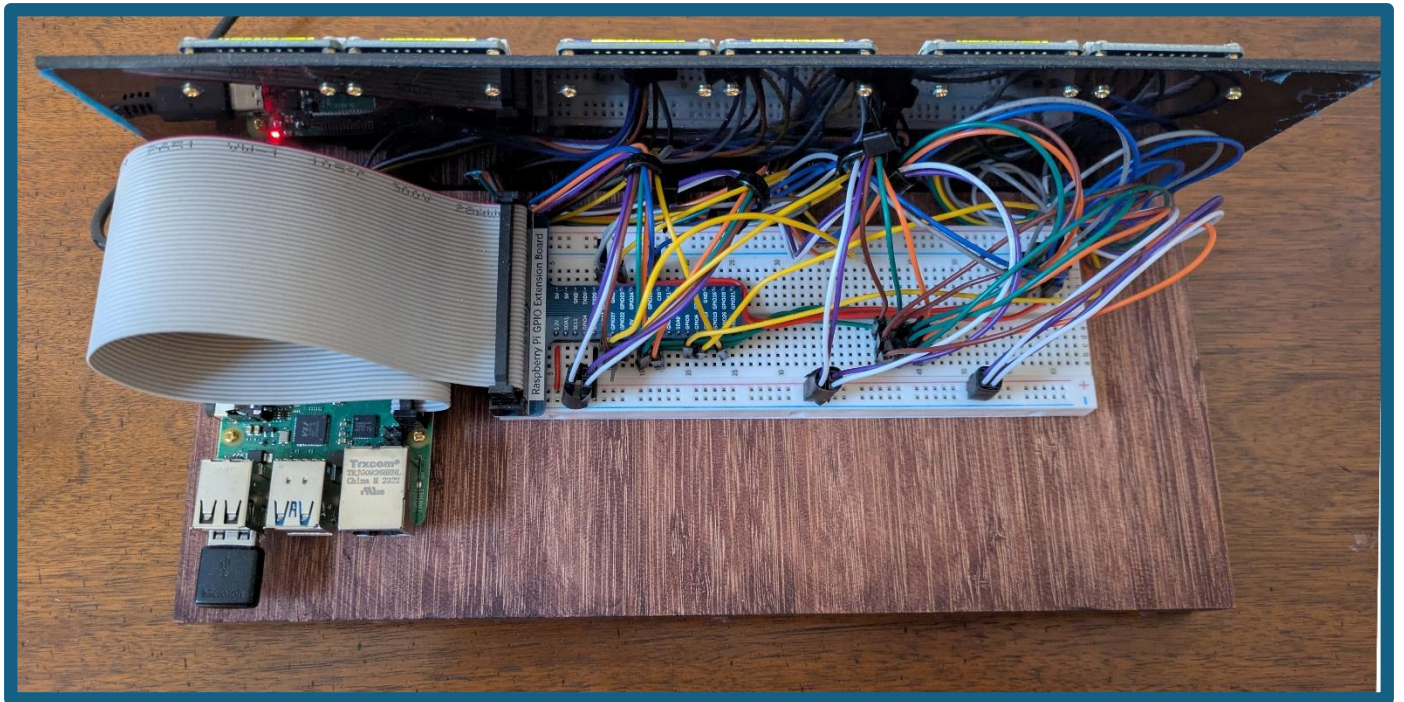
The Raspberry Pi is about \$60.

Additionally, there is a solderless bread board, a 40-pin ribbon cable and various jumper wires all of which come to about \$30.

The RPi talks to the LCDs over an SPI interface – the wiring for this interface is provided later in this document.

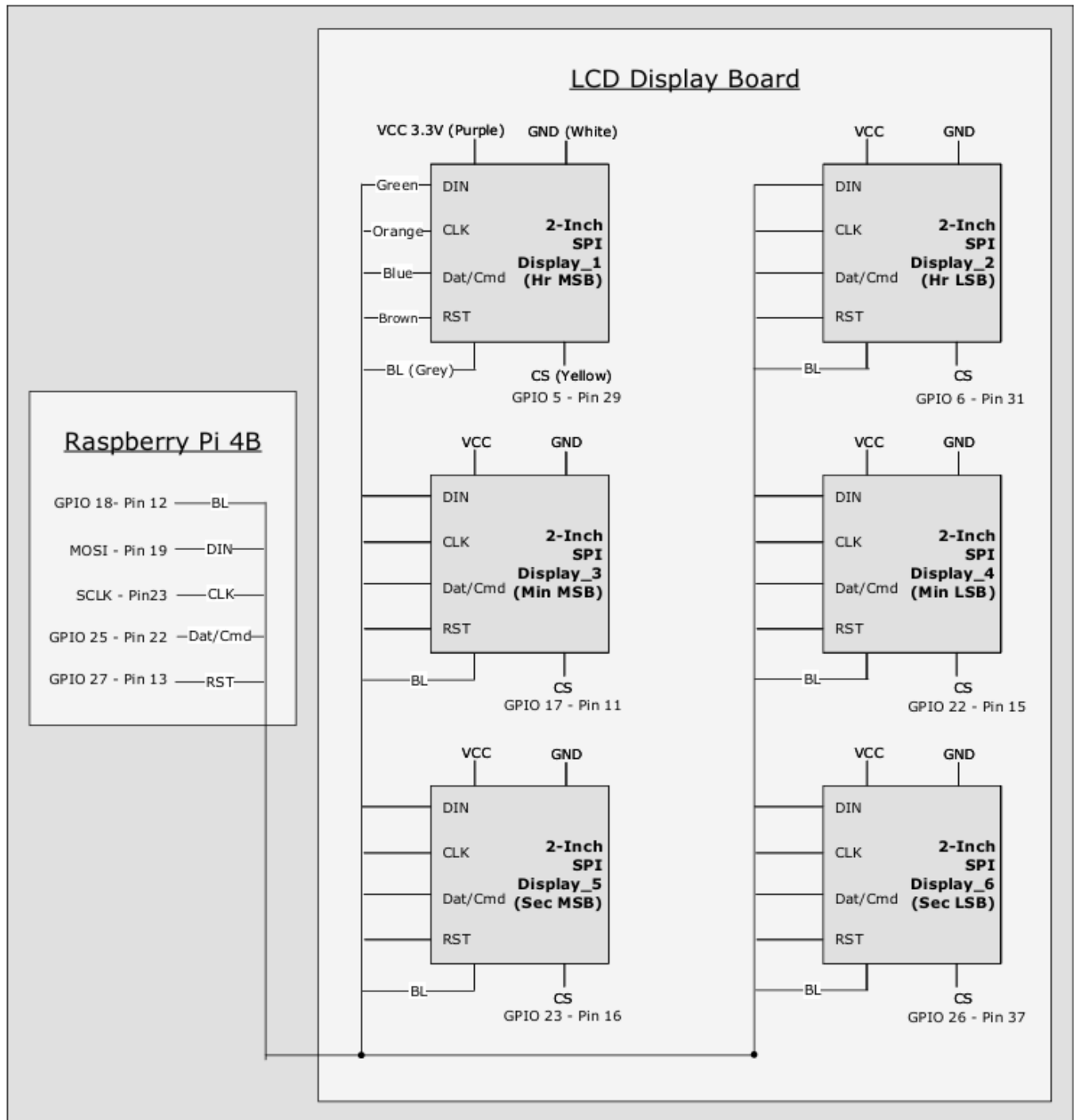
Control of the clock is accomplished by running a python script (client.py) on a remote machine (PC, Phone). The clock on the Rpi runs within a server on the Rpi and the server will communicate with a remote machine running a client. Information on this client/server implementation can be found here:

<https://github.com/sgarrow/sockets/blob/main/docs/clientServer.pdf>



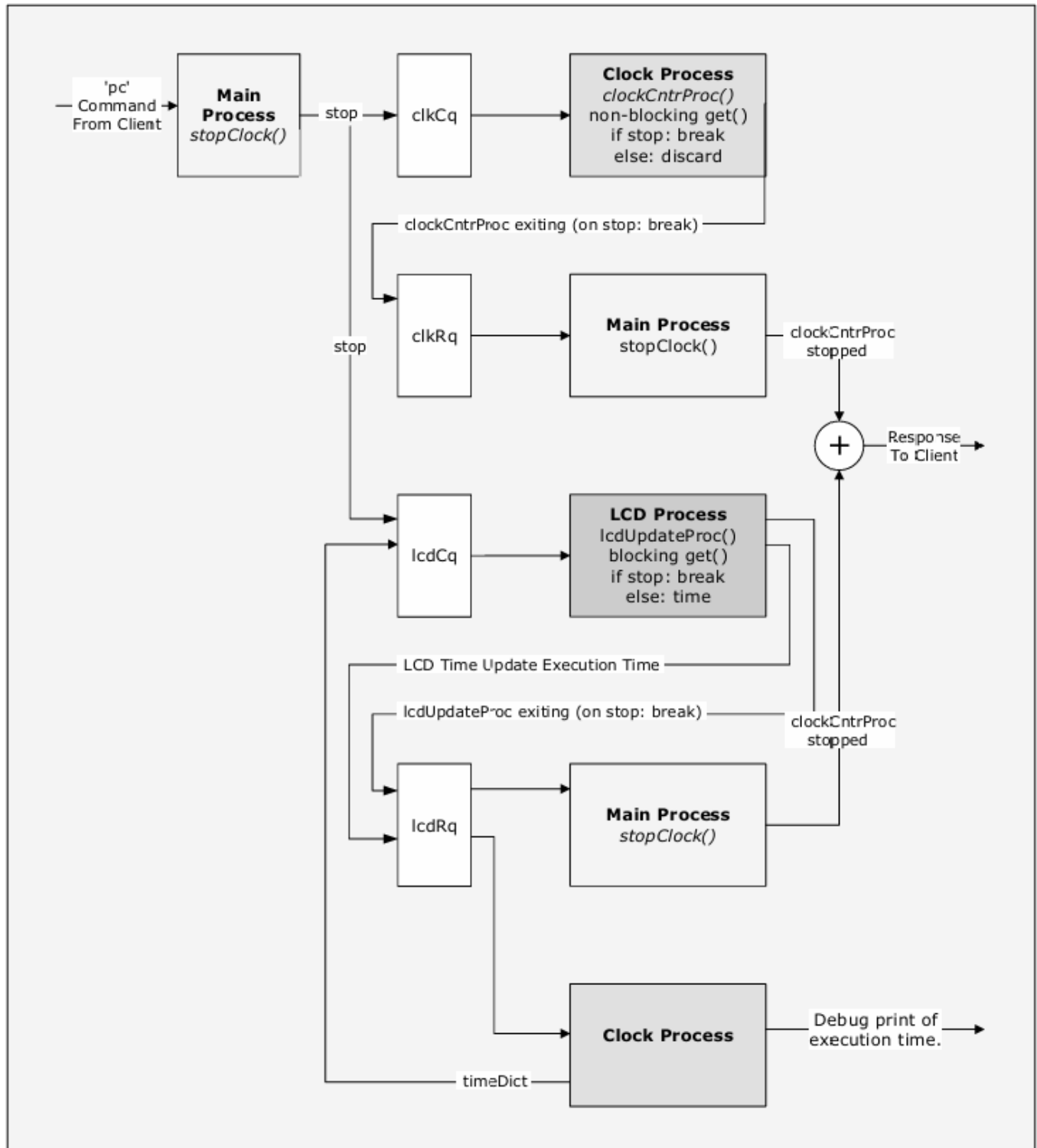
SPI Wiring

A simplified SPI wiring diagram is presented below.



Communication Queues

The clock runs on three separate cores. One core runs the server (Main Process), another runs the clock counter (Clock Process) and the third controls the displays (LCD Process). These three processes communicate with each other using four of Python's awesome multiprocessing-communication-queues. Two queues are used for sending commands and the other two are used for receiving responses. A simplified communication diagram is presented below.



Running the client

Below is an example client session. After the client is started and a connection is accepted by the server (the clock) a prompt is presented. When 'm' is entered at the prompt a list of available commands is presented. When the gAs is entered a list of available font styles is presented.

```
PS C:\01-home\14-python\spiClock> python .\client.py
sndBufSize 65536
rcvBufSize 65536

Accepted connection from: ('192.168.1.110', 54858)

Choice (m=menu, q=quit) -> m

CLOCK COMMANDS
sc - Start Clock
pc - stoP Clock

STYLE COMMANDS
gas - Get Active Style
gds - Get Day Style
gns - Get Night Style
gAs - Get ALL Styles
sas - Set Active Style
sds - Set Day Style
sns - Set Night Style
mus - Make User Style
dp - Disp Pics
us - Update SW

MISC COMMANDS
gvn - Get Version Number
tm - Test Menu

Choice (m=menu, q=quit) -> gvn

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Choice (m=menu, q=quit) ->
```