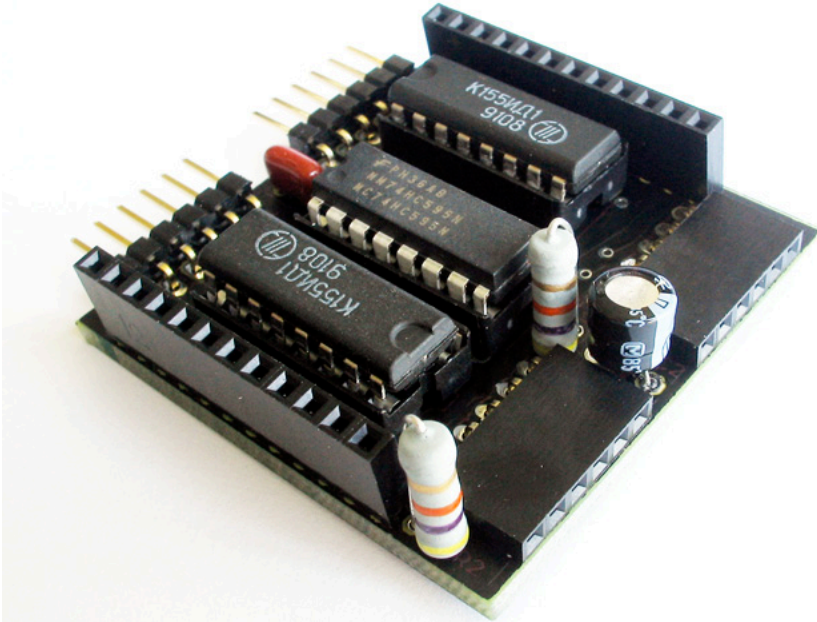
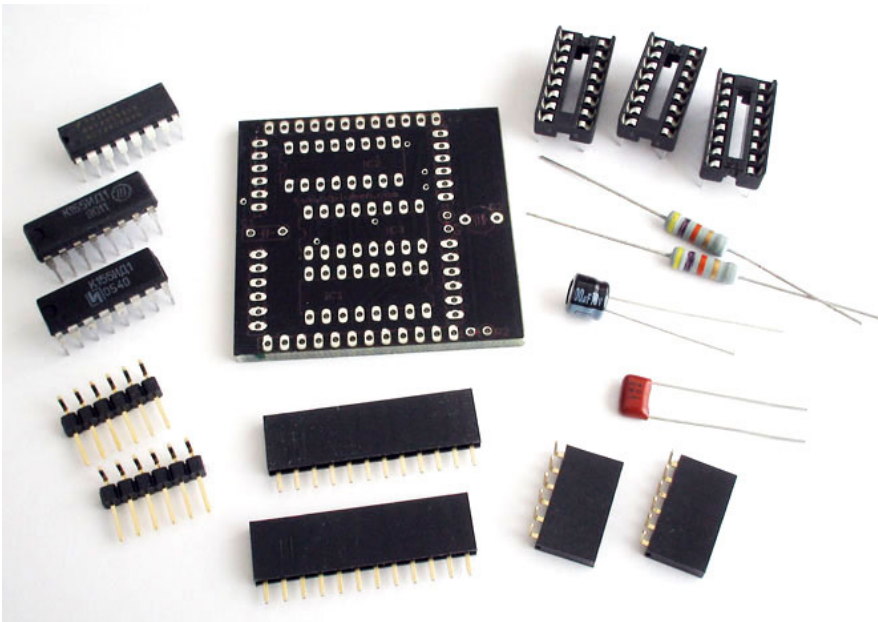


NIXIE DRIVER *assembly*



The **NIXIE DRIVER** board is designed to receive serial input from an external microcontroller (**Arduino**, etc.) and output decimal information and route power to one pair of nixie tubes. The **NIXIE DUO** board mounts on top of the **NIXIE DRIVER** board and supports two IN-12A type nixie tubes via two phenolic sockets. The high voltage requirements of at least eight pairs of IN-12A nixie tubes may be provided by our **NIXIE TUBE POWER SUPPLY**.

The right-angle male and female header pins on the **NIXIE DRIVER** board allow multiple pairs of **NIXIE DUO** and **NIXIE DRIVER** boards to be joined edge-to-edge. This densely packed configuration permits minimum digit spacing while threading power and serial data connections to all elements.

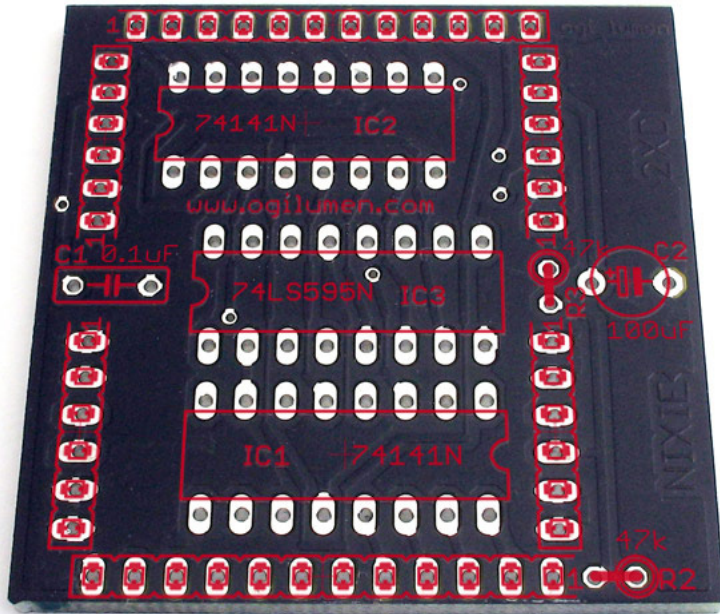


Parts List:

- 1 - **NIXIE DRIVER** printed circuit board
- 2 - K155ИД1 (**74141**) 16-pin IC
- 1 - **74HC595** 16-pin IC
- 3 - 16-pin IC socket
- 2 - straight 12-pin female header (1x12)
- 2 - right-angle 6-pin male header (1x6)
- 2 - right-angle 6-pin female header (1x6)
- 2 - 47kΩ 1 watt resistor
- 1 - 100µF electrolytic capacitor
- 1 - 0.1µF metal film capacitor

Dimensions (assembled):
2.0 x 1.7 x 0.5 inches (50 x 44 x 14 mm)

Kit Weight: 1.0 oz (29 g)

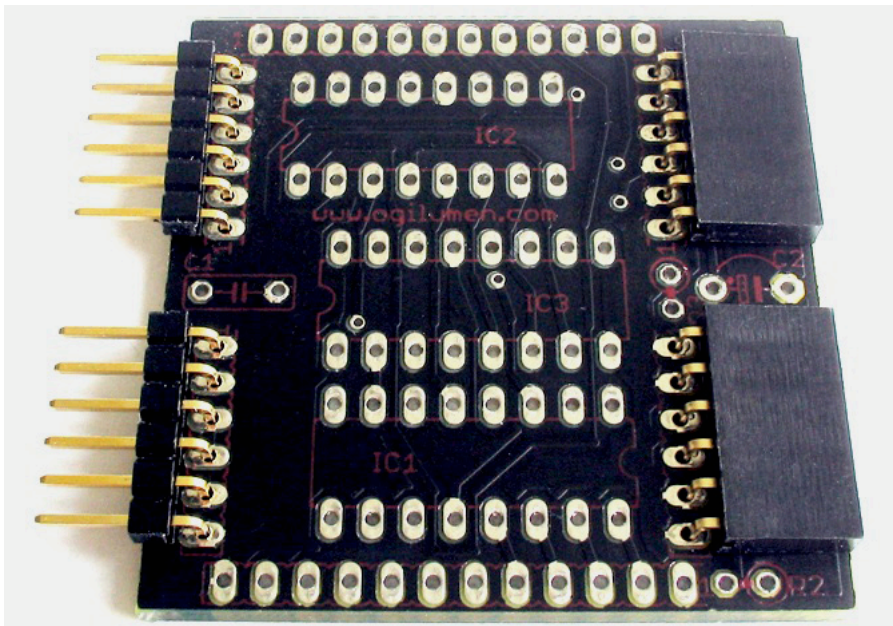


Soldering:

The **NIXIE DRIVER** boards can be assembled in about 45 minutes.

For those new to electronic assembly, here are two links to excellent soldering tutorials:

- [Sparkfun](#)
- [Curious Inventor](#)



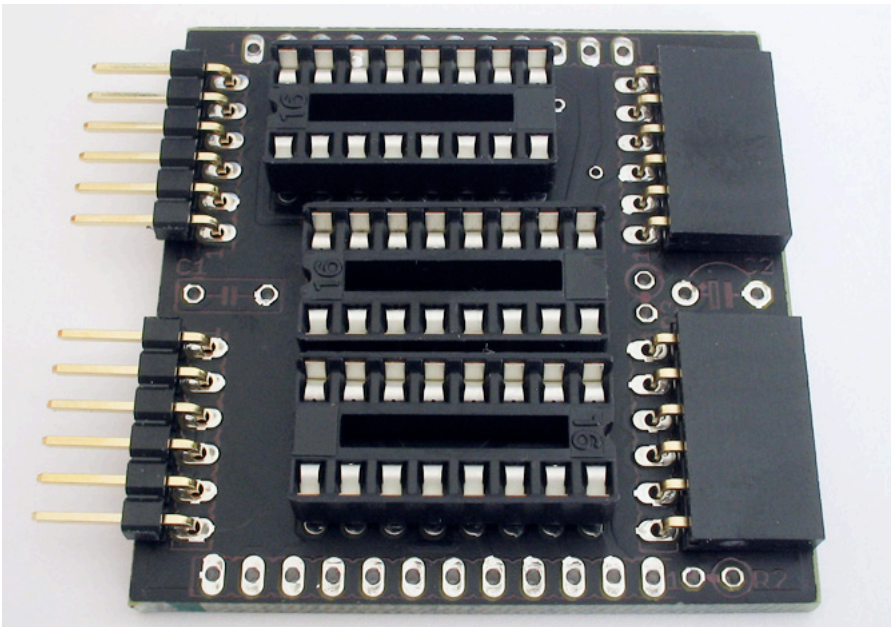
Assembly:

Note carefully to orient the **NIXIE DRIVER** printed circuit board with the component placement information facing up. This is the side that will receive all of the supplied components.

Insert the male and female right-angle 6-pin headers as shown and begin soldering. These headers can be held in place by the weight of the board. Anchor the pins with solder on either end first, and confirm final position, before soldering all of the pins.

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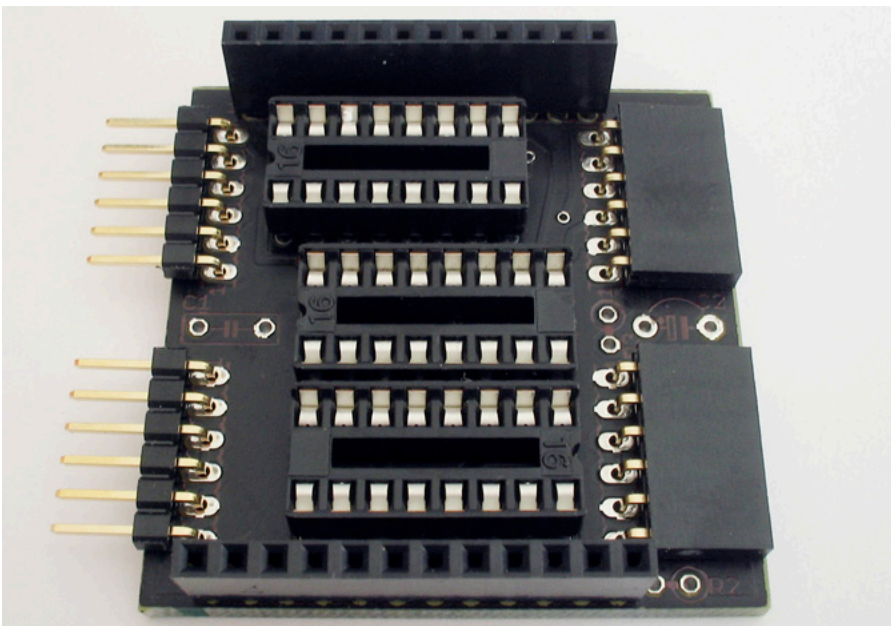
If anticipating left and right connections to additional **NIXIE DUO** and **NIXIE DRIVER** board pairs, ensure that these headers lay flat for best fit.



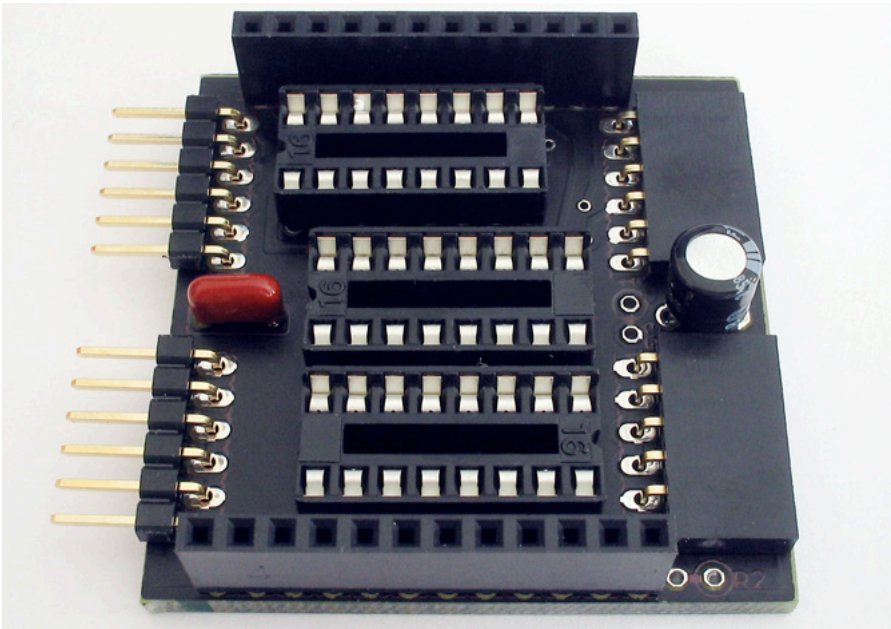
Note the indent on each of the 16-pin DIP sockets. Align this indent with those marked on the board, then insert and solder all three DIP sockets in place.

It is very difficult to adjust the position of a DIP socket after it has been soldered to the printed circuit board. A good strategy is to first anchor a socket by soldering two opposing corner pins. In this way, the socket will not shift before the rest of the pins are secured.

The indent on the DIP sockets corresponds to a similar indent on the two K155ИД1 (74141) ICs and on the 74HC595 IC. These three ICs should be inserted into the sockets after all soldering is completed.



The two straight 12-pin female headers can be added next. You can use the weight of the board to hold these in place while soldering. Similarly, it is a good idea to start with end pins, and check final position, before soldering the remaining pins.

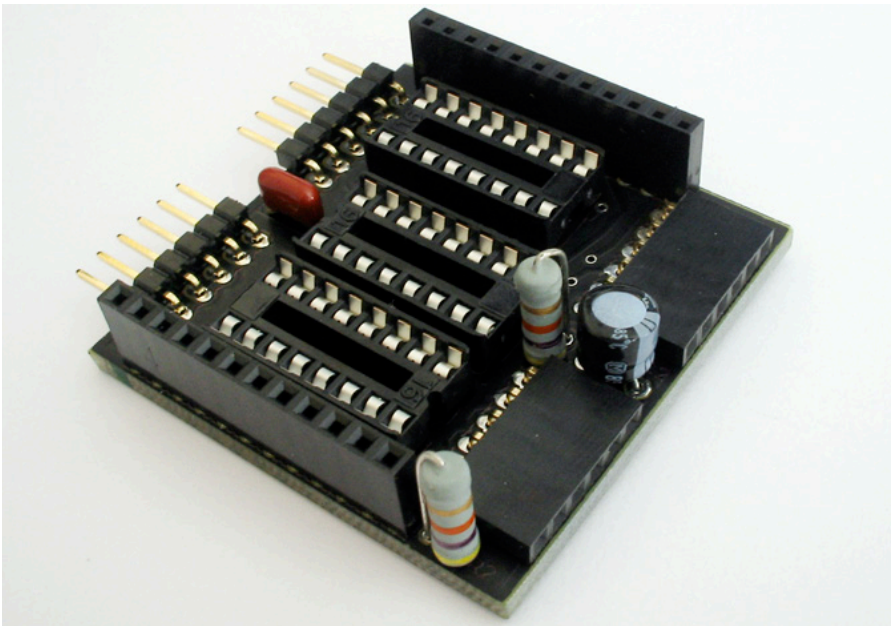


There are two de-coupling capacitors on each **NIXIE DRIVER** board. Locate C1 on the board, and insert the non-polar metal film capacitor (here pictured red). Solder it in place and trim the leads.

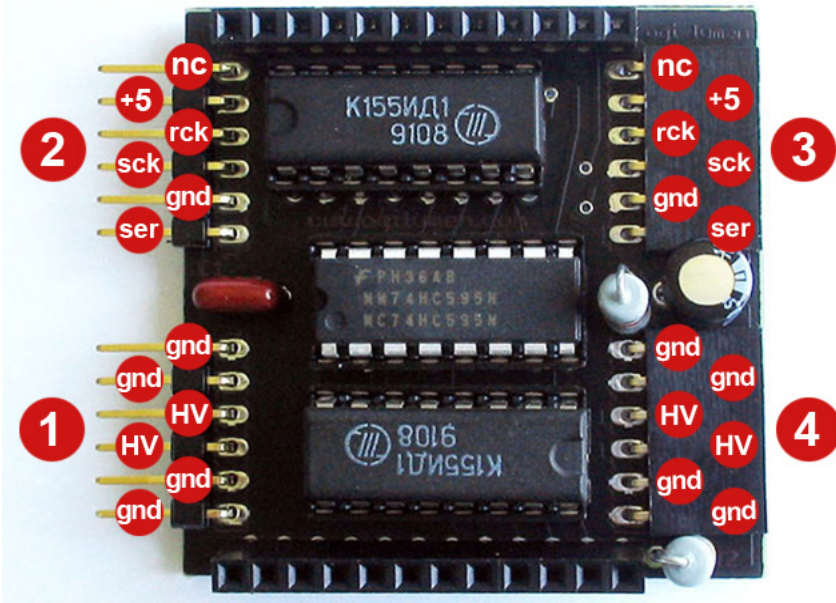
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C2 is on the opposite end of the board and does have a polarity. The negative side of C2 is toward the outer edge of the board; the negative lead of this capacitor is marked with a white band. Insert C2 as shown, solder it in place and trim the leads.

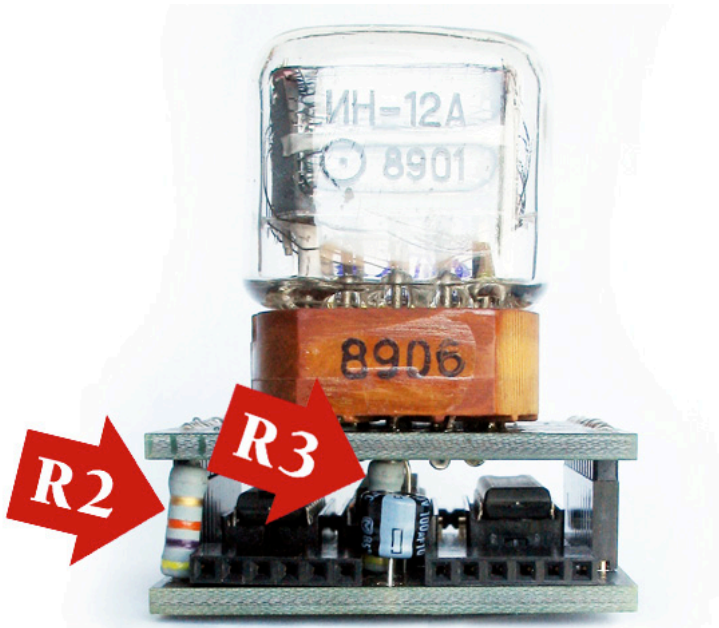
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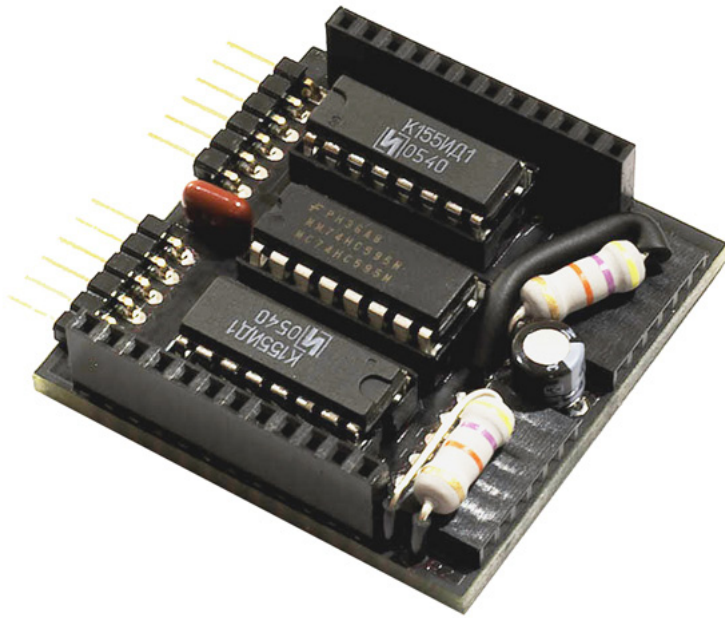
The final two components of the **NIXIE DRIVER** board are current limiting resistors for the two nixie tubes. R2 and R3 should be prepared for minimum height on the board; doing so will ensure a good seat for the **NIXIE DUO** board. Turn over one lead of each resistor and insert them vertically into position for soldering. Solder and trim the leads on the reverse side.



The three ICs can now be safely inserted into their sockets. Neither of these ICs are of the CMOS variety, and are not especially sensitive to static electricity. Note that ICs from the factory have pins set at a slightly wider angle than will fit into an IC socket. You can gently roll an IC on its side to uniformly bend in each row of pins so that it can then be inserted into its socket. This should be done with care, however, once the IC pins are well aimed into the socket receptacles, considerable force may be applied to seat the IC.

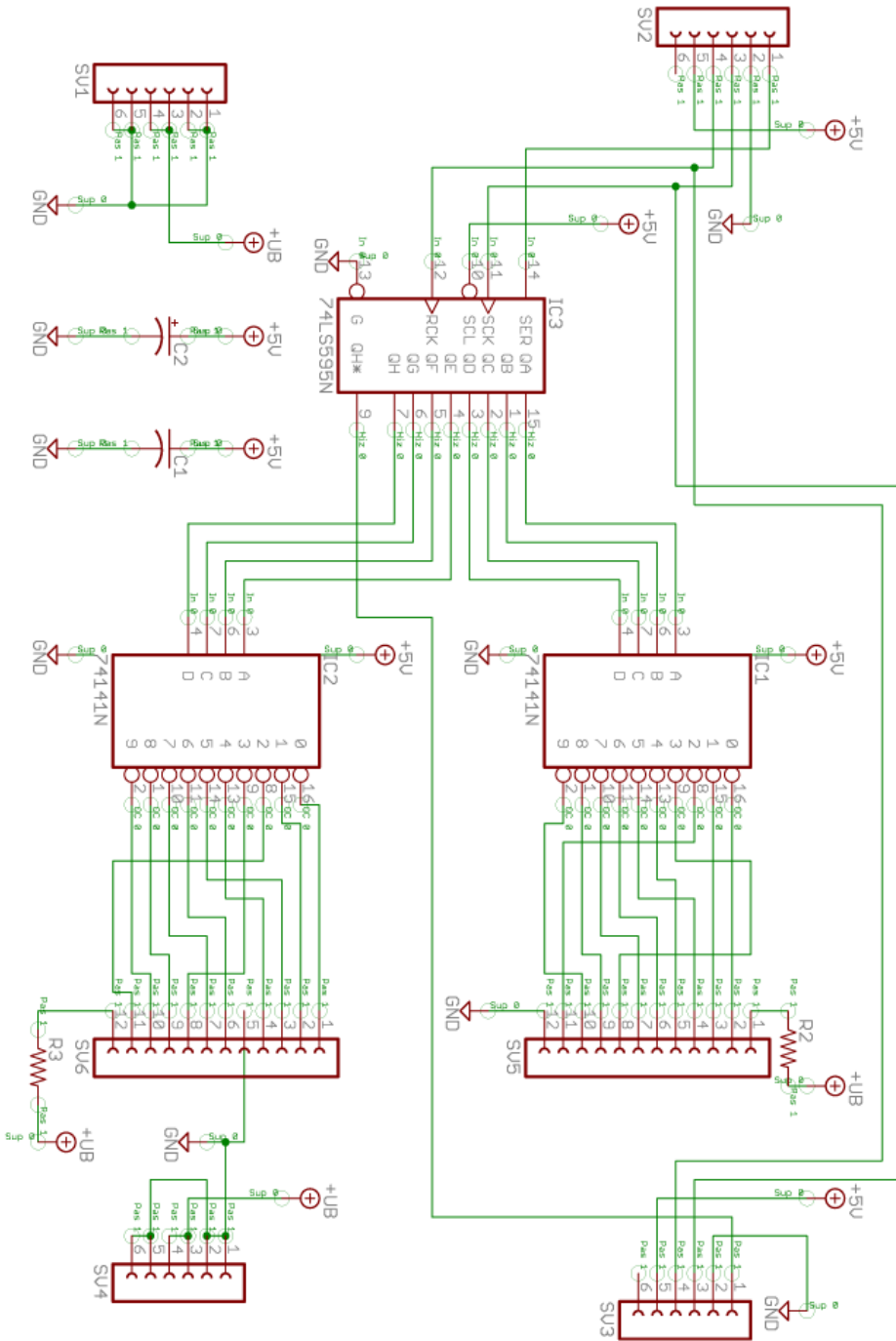


When attaching a **NIXIE DUO** board above the **NIXIE DRIVER** board, direct the top of R3, as shown, into the hole in the board above. This prevents accidental contact with the nixie tube pins. Also, slightly bend in R2 to permit the two boards to seat flat.

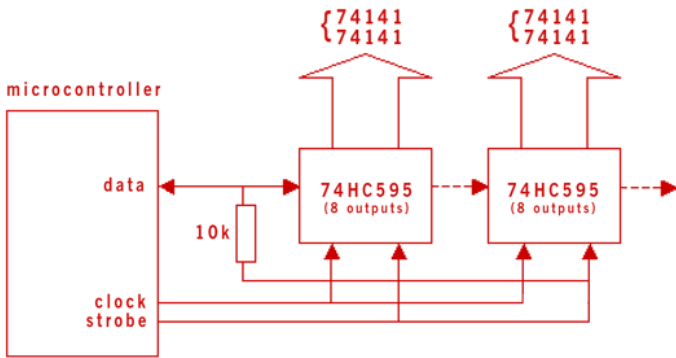


Depending on the size of the resistors R2 and R3 that you have, you may find that it is difficult to install them so that the **NIXIE DUO** board will lay flat above the **NIXIE DRIVER** board. You could also choose, therefore, to mount R2 and R3 horizontally as shown. Given that these resistors are rated at one watt, you could also choose to replace them with 1/2 watt rated resistors (smaller in size), depending on the nixie tubes being driven. (This is adequately the case for the IN-12A type nixie tubes.)

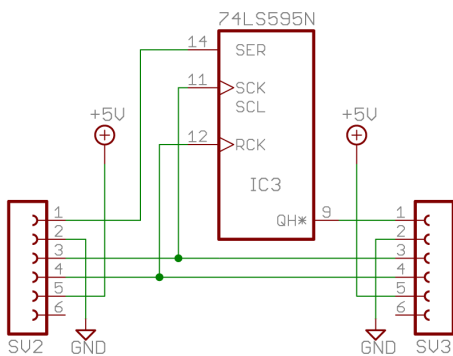
Schematic:



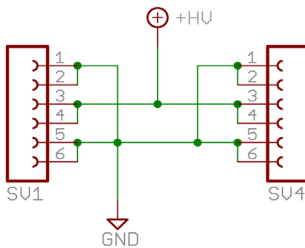
Circuit Operation:



The **NIXIE DRIVER** permits a microcontroller (Arduino, etc.) to address two nixie tube digits, and via a shift register chain, multiple pairs of nixie tube digits. The **74HC595** shift register is used here to extend the microcontroller output functions.

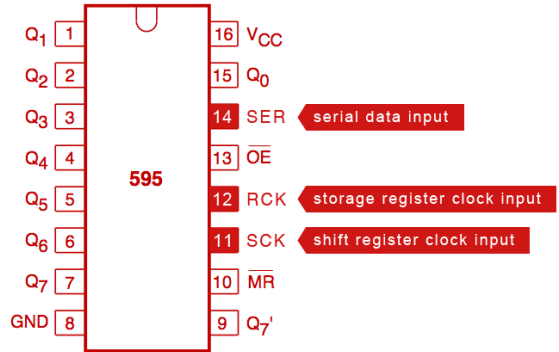


When connecting **NIXIE DUO** boards edge-to-edge, the serial data for controlling the display of digits should enter via pin 1 of SV2. Each board then outputs the serial data stream via pin 1 of SV3.

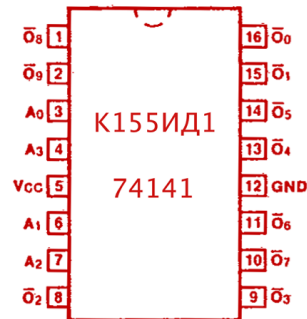


The nixie tube high voltage supply should be presented to pins 3 and 4 of SV1, and will then also be present on pins 3 and 4 of SV4.

74HC595 outputs are interpreted for the nixie tubes by two **74141** BCD to decimal decoder ICs.



The **74141**s are unique in that they are made to withstand the high voltage at which the nixie tubes operate.



For an example of how the **NIXIE DRIVER** board may be supported by an external microcontroller, see the **NIXIE DRIVER ARDUINO DIECIMILA DEV CODE**. Multiple **NIXIE DRIVER** boards are seen operating together with **NIXIE DUO** boards in the **NIXIE DUO** and **NIXIE DRIVER MOVIE**.

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