Junior Computer][Keyboard rev. 2 Assembly Instructions

The assembly of the keyboard is not that easy. Therefore, please read the instructions to assemble the keyboard in the best possible way.

For assembly you need:

- A small bench vise to clamp the board vertically while you solder the key switches.
- A ruler at least 30 cm long to align the keys neatly and prevent twisting of the keys.
- Two small, strong clamps or duct tape to hold the ruler to the board.
- Of course, a soldering iron, solder, a side cutter and flat nose pliers.
- Patience and time!

Use a piece of cardboard or similar on each side of the PCB to avoid scratching the solder mask while clamping the board. Clamp the lower edge of the board horizontally in the bench vice so that it can be easily viewed from both sides.

Begin placement at the top row of the keys (1, 2, 3...).

For each row of keys, first loosely insert only the left and right keys on the PCB. Then clip the ruler with the two clamps under the two switches so that they are seated in position with as little play as possible. The keys should be aligned exactly within the silkscreen square printed on the circuit board.

Press and hold the switch to be soldered with your thumb firmly on the board so that it does not shift or twist anymore and then solder one of the connection pins of the switch module. The second connection should not be soldered at this time.

After that, check again, if the button is still exactly aligned to the silkscreen print and if it is not tilted in any other way. If this is not the case, re-solder the connection pin until it fits exactly.

Please take your time to get the alignment as good as possible, because every slightly twisted button will result in an unattractive appearance.

When the first two buttons of the row are properly assembled, you can now solder the second terminal pin to fix them in place.

Now equip each further switch in the row individually, as described above. The ruler helps to align the buttons at the same height. Please also leave the second connection pin unsoldered for the moment, so that you can correct any misalignment later if necessary.

When you have finished inserting a row of switches, carefully press the key caps onto the modules. This will help you to detect and correct slightly twisted or slipped buttons. Only when you are satisfied with the result, solder the remaining, second connection pins.

Equip all other rows of keys in the same way.

The key stabilizers for the wider keys are only inserted at the very end. Otherwise, they prevent the ruler from lying close to the key modules.

The keys "Backspace", "Enter", "Space" and the right "Shift" key need stabilizers. Use the key puller to remove the corresponding keycaps and possibly the keycaps of the "Home" key.

Now place the stabilizers with the two plastic noses in the two lower holes provided for the respective key. Then carefully press the two upper nubs with the metal screw connections through the holes, e.g. with a small Phillips screwdriver. Please also use some paper washers for screwing in order not to damage the solder mask with the screw heads. These are normally included with the stabilizers.

Finally assemble the three resistors, the IC socket and the LEDs according to the printed circuit board. Which LED color you take for power and which for (caps) lock is completely up to you. The Caps Lock LED D1 can be populated either on the upper right corner beside the Power LED or next to the Caps Lock key. In the second case it's up to you to drill a hole at the right position into the Caps Lock key cap.

Pin headers P0 and P1 are used to configure the desired keyboard layout.

Programming the ATMega32 Microcontroller:

The microcontroller must be programmed using a compatible programmer like the cheap MiniPro TL866A. First select the ATMEGA32 Microcontroller. Then you have to configure the appropriate fuse bits. To do so click the "Config" button on the right of the programmer window and change the fuse bits configuration as shown below

This configures the used ATMega32 microcontroller for an internally 8MHz clock signal, with a startup time of 0 millisecond. All lock bits remains to 0.

Then click the Code Mem0 button to switch back to the hex editor view. Load the included JC2_ASCII_Keyboard Firmware2.2.hex firmware file and click the programming button or use the menu "Device(D) -> Program(P)". In the programming window leave all settings at the default values.

The Firmware is distributed under the Creative Commons Attribution 4.0 International License.

So you can feel free to modify the included source code file main.c to suit your needs. But if you do so, you have to give credits to me in the modified source file. To compile the source code you need the latest Microchip Studio for AVR development environment including the GNU compiler suite which can be downloaded from the Microchip website.

After you placed the microcontroller into the socket, you can apply a +5V supply voltage to the 16-pin socket (**pin 2 +5V, pin 16 GND - see pin assignment**). Immediately after applying the voltage the POWER LED should light up and after pressing the CAPS LOCK button once the LOCK LED should light up. A second press on CAPS LOCK switches the LED off again.

At last squeeze the two connectors onto the ribbon cable. Do this carefully to avoid accidentally breaking the connectors.

To use the keyboard on the Junior Computer][you need at least BIOS version 1.0.2, which can be downloaded from https://www.old-computer-tech.net/downloads and IO Board Revision 1C or newer.

Both pin 1 of the connectors on the keyboard and on the IO/Language Board is located on the left. So the cable can be plugged in 1:1.

Have fun with the keyboard

Jörg Walke, February 2024

Parts list :

Part	Count	Value	Description and Order-Link	Distributor
R1	1	10 kOhm	Metal Film Resistor 1W	
R2,3	2	680 Ohm	Metal Film Resistor 1W	
D1	1	LED green	5mm LED green color maybe 3mm for use in the Caps Lock	
D2	1	LED red	5mm LED red color	
U1	1	ATMega32-16PU	ATMega32 CPU, 16 MHz	
IC-Soc	1	IC-Socket 40 pin	40 pin DIL precision IC-Socket	
J2	1	Pin Header	2x8-pin Pin Header, angled, 2,54mm spacing	
SW 1-66	66	Cherry MX switch	Cherry MX switch, brown, 2 pin, 100 pcs. https://www.aliexpress.us/item/3256802260307415.html	
Caps	Set	Key Caps	Milk theme key caps for MX switch mechanical keyboard. https://www.aliexpress.us/item/3256803714431360.html Set "Color" to English for US-Key Caps !	ESC keycap Store
Stab	Set	Key Caps Stabilizer	Mechanical Keyboard PCB Screw Stabilizers 1 x 6.25U 3 x 2U Cherry Stabilizers https://www.aliexpress.us/item/3256803460598353.html	
Con1	1	DIL16 crimp connector	16 pin DIL-16 ribbon cable crimp connector for connecting to the Junior Computer][IO Board.	
Con2	1	2x8-pin crimp connector	2x8 pin crimp connector for ribbon cables	
Cable	1	16 lead ribbon cable	30 cm, 16 lead ribbon cable	

AIM 65 Connection:

The keyboard is connection compatible to an AIM 65 computer via the 16 pin DIL socket called AIM 65-Keyboard. For this the upper part of the board could also be cut off along the white separating line. If this is not done, the keyboard electronics must not be powered while an AIM 65 is connected.

If connected to an AIM 65, some additional keys will not be recognized without a change to the AIM 65 ROM, plus the keycap labels are not completely identical. The CAPS LOCK and RESET functions are generally not available on the AIM 65.

Special Keyboard Functions:

Press the SHIFT-CTRL and DEL keys simultaneously to initiate a 250 milliseconds low pulse on the /RESET line of the keyboard.

Press the HOME key to initiate a 25 milliseconds high pulse on the CLEAR_SCREEN line and generate an ASCII code (see below) on D0..D6.

Some keys on the keyboard do not have a standardized ASCII Code. The Junior Computer][keyboard uses the following ASCII Codes for this special keys:

Key Function	ASCII Code (decimal) and corresponding relation
LEFT ARROW	008 Backspace (BS)
RIGHT ARROW	021 Negative Acknowledge (NAK)
UP ARROW	011 Vertical Tab (VT)
DOWN ARROW	010 Line Feed (LF)
HOME	001 Start Of Header (SOH) - CLS signal on pin 12
PRINT	020 DC 4 (XON)
F1	017 DC 1
F2	018 DC 2 (XOFF)
F3	019 DC 3
CTRL-SHIFT +DEL	/RESET signal on keyboard connector pin 1
CTRL (-SHIFT) + LEFT ARROW	006 Acknowledge (ACK). Use as Back Tab (BT)
CTRL (-SHIFT) + RIGHT ARROW	009 Horizontal Tab (HT)
CTRL (-SHIFT) + UP ARROW	024 Cancel. Use as Page Up (PU)
CTRL (-SHIFT) + DOWN ARROW	012 Form Feet (FT). Use as Page Down (PD)

A key press on any key except the modifier keys (CAPS LOCK, SHIFT, and CTRL) generates a 2 microsecond low pulse on the /STROBE line. The D7 line goes low 7 microseconds before /STROBE and rises back to high 2 microseconds before /STROBE line is going low. This is used for the Junior Computer][as the "data available" signal.

Because data is always stable around 7 microseconds before /STROBE and stays stable until any other key is pressed, you can use the /STROBE pulse to trigger at the falling or rising edge.
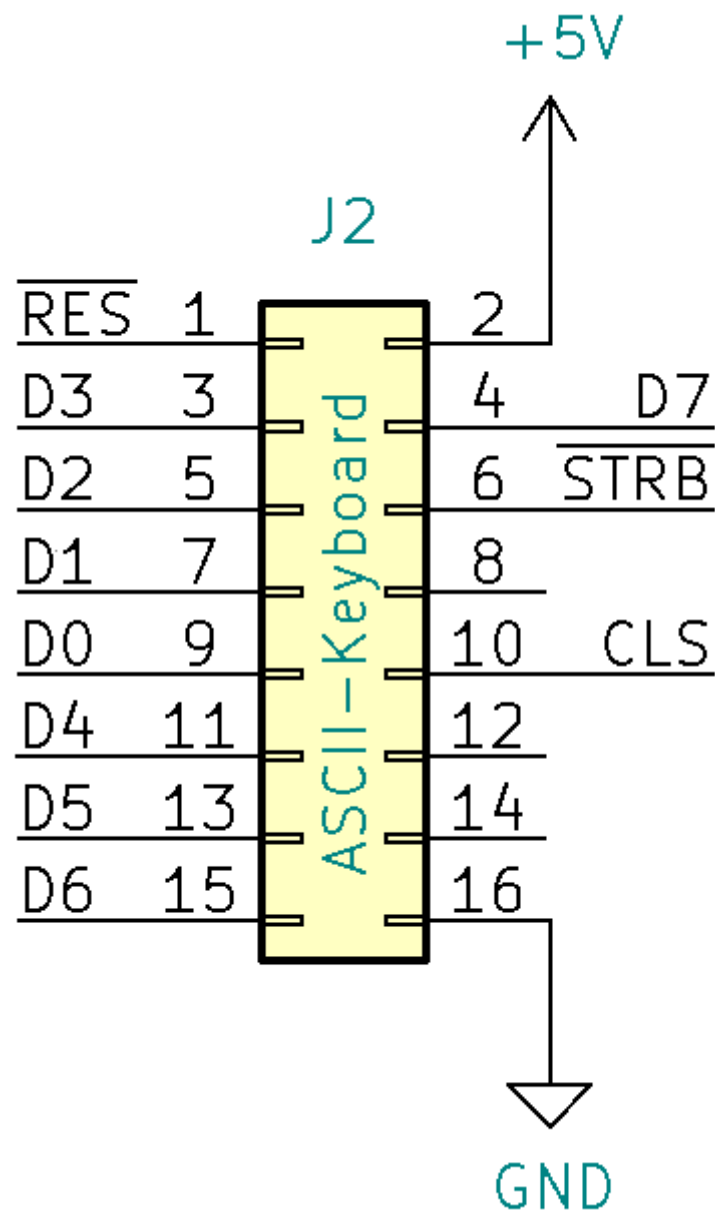
The keyboard is capable of N-key roll over, which means that a freshly pressed key is detected even if another key is held down.

Pressing and holding a key for 500 milliseconds enables the auto repeat function. The standard typematic rate lies around 25 chars/s.

The keyboard generates a 7 bit ASCII code on D0..D6. The connected computer should ignore D7 for the ASCII code and set the most significant bit (MSB) of the received code to 0 (zero).

The CAPS LOCK key switches between lowercase (CAPS LOCK off) and uppercase (CAPS LOCK On) characters a..z and A..Z respectively. The number and special chars are not modified by CAPS LOCK. This is only done by pressing the SHIFT key. Pressing SHIFT while CAPS LOCK is On reverses the uppercase characters back to the lowercase ones. So CAPS LOCK behaves more like an ALPHA LOCK key.

Assignment of the 16 pin ASCII keyboard connector:

+5V

J2

$\overline{\text{RES}}$	1		2	
D3	3		4	D7
D2	5		6	$\overline{\text{STRB}}$
D1	7		8	
D0	9		10	CLS
D4	11		12	
D5	13		14	
D6	15		16	

ASCII–Keyboard

GND

Top view – Pin 1 is marked as square solder pad on the PBC

Jumper P0 / P1 settings:

Set Jumper pair P0/P1 to select desired keyboard language layout.

P0	P1	Keyboard Layout
Open	Open	English US
Open	Closed	German
Closed	Open	English US (reserved for future layout)
Closed	Closed	English US (reserved for future layout)