This ULU

The *ULU.18 – 8x8 Switch ROM* can be used to address 8 memory positions of 8 bits. Address selection is done by a 4-bit data bus and switches are used to program the ROM. Two Switch ROMs can be put parallel, creating a large 16x8-bit switch ROM. Than the bank-switch is used to distingue between the lower bank (address bit 3 is 0) and upper bank (address bit 3 is 1).

Used parts

The following standard parts are used:
1x casing 100 x 98 x 25mm;
2x 2mm signal connector;
2x black O-ring 9 x 5 x 2mm;
3x 4-bit data connector;
3x colored O-ring 8 x 5 x 1.5mm;
1x power connector;
1x 8-bit LED bar;
8x resistor to dim the LEDs;
2x 1-pole ON-ON switch;
5x micro (G6K-2F-Y-5VDC) relay;
5x fly back diode (1N4148);
72x Diode 1N5817.

The following extra parts are used:
64x 5.8 x 5.8mm self-locking switches;
64x switch caps for the switches;
4x M3 x 10mm hex bolt;
8x M3 x 5mm hex bolt;
6x 8mm M3 F/F standoff;
2x 5m M3 M/F standoff;
4x small M3 0.6mm washer.

Construction

The standard ULU specifications are applicable as specified in the datasheet *ULU.00 – Common specifications*. However, this is one of the mechanically more demanding ULUs. Fabrication is not easy.

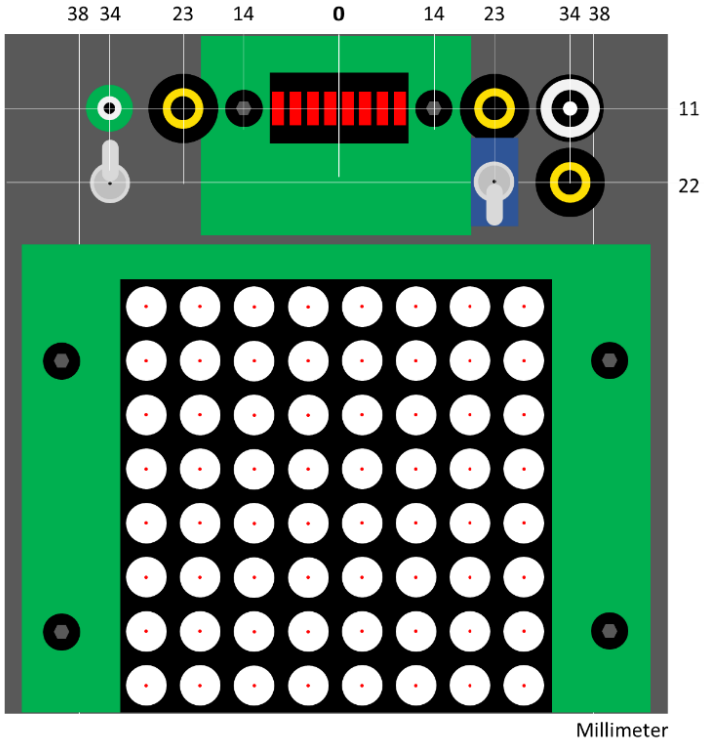

Figure 1 – Drill guide

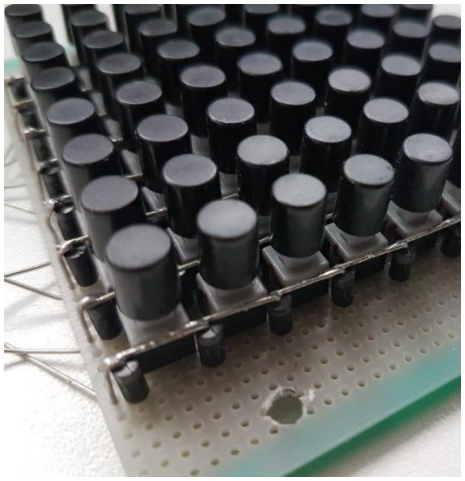

Figure 2 – The switch matrix

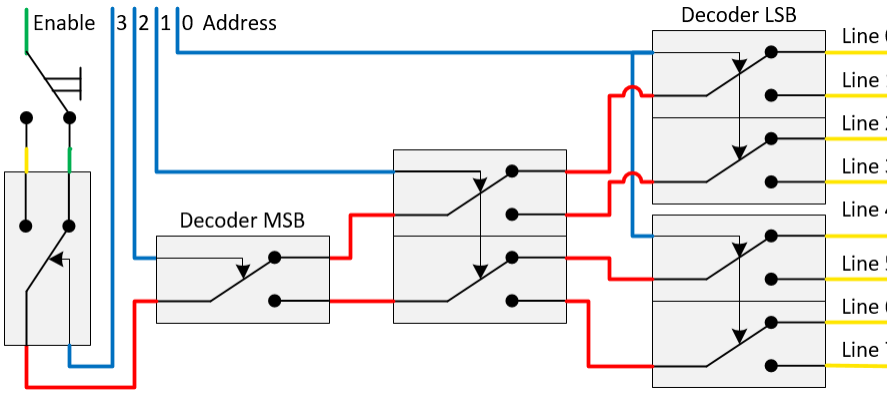

Figure 3 – Decoder schematic

Figure 4 – The XNOR relay

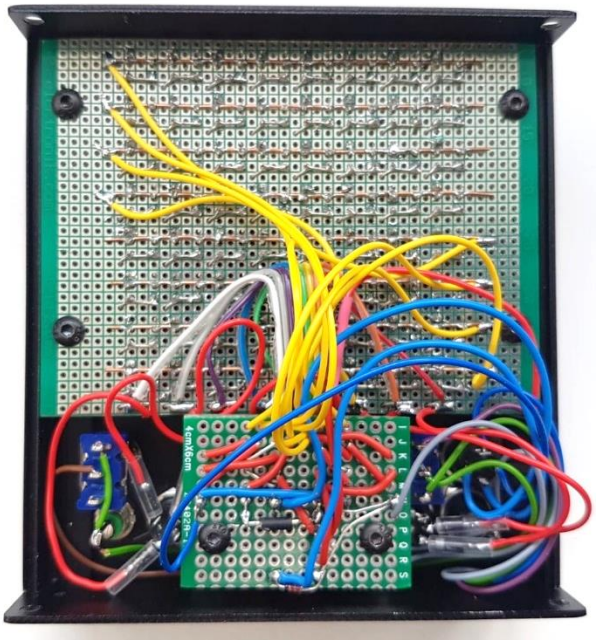

Figure 5 – ULU inside

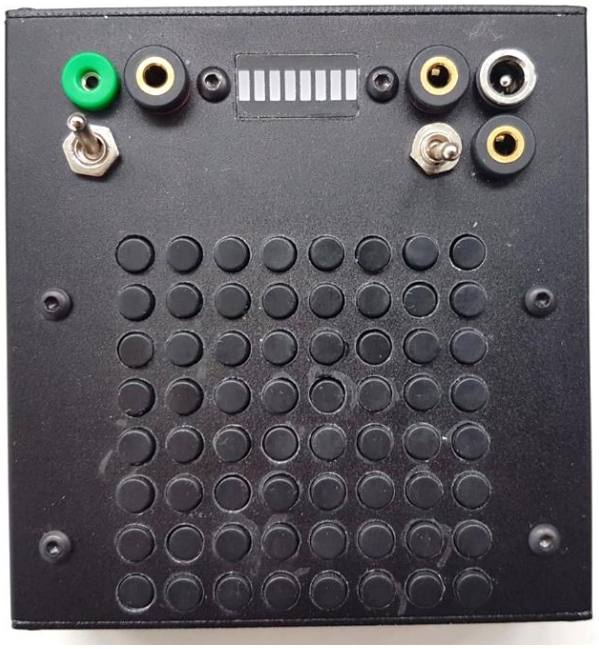

Figure 6 – The finished ULU

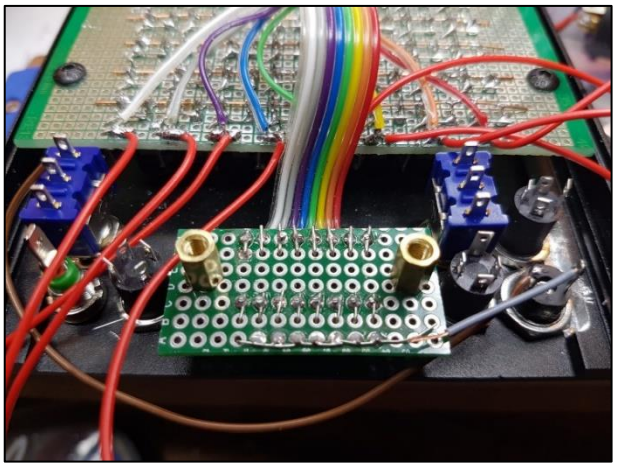

Figure 7 – LED bar graph with resistors attached

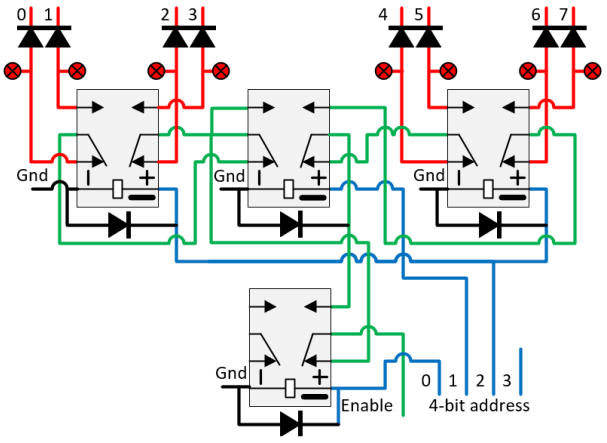

Figure 8 – Decoder soldering schematic

Main component is the 8x8 switch board. The common poles pole the switches within a row are soldered together, using a long uninsulated wire. This can be seen in Figure 5. Diodes are used to connect the normally open poles of the switches within each column tot the data output. Every diode is put in an upright position. This can be seen in Figure 2. The experiment bord (approximately 70 x 95mm) is a special variant with a distance between the holes of 2mm and not 2.54mm to accommodate the switches. A micro relay is used to form a XNOR gate together with the bank switch. This XNOR will only propagate the enable signal to the relay encoder when the bank selection and address bit 3 are both 1. With this circuit two switch ROMS can put parallel, creating a large 16x8-bitROM. The schematic of the relay encoder can be found in both Figure 3 and Figure 8.

Mechanical construction can be done as follows. First the 64 holes of 6.2mm are drilled. Then the four attachment holes of the PCB are drilled. They are placed in the middle of the small beam that is on both sides inside the enclosure. After that, the holes in the PCB are marked by drilling from the front of the enclosure into the PCB. The drill guide (Figure 1) can be used to mark and drill the gaps for the LED bar, the connectors and switches. The small beam on both sides of the enclosure must be drilled to the same level as the front platen to make room for the nuts of the connectors. This can be seen at the front right of Figure 7. To level the pressed down switches with the surface of the enclosure, I needed some thin M3 washers. To bring the PCB board a bit down.

Usage

When the address is entered and the ULU is enabled, the ULU will provide an 8-bit word according to the switches in the row determined by the address.

The position of the switches can be easily seen if the ULU is viewed on an angle. They can be pressed down using a pencil with an attached eraser. The bank switch determines if the ULU contains the low bank (address bit 3 is 0) or the high bank (address bit 3 is 1). When the ULU is used stand alone, the bank switch must be in position 0 (down)

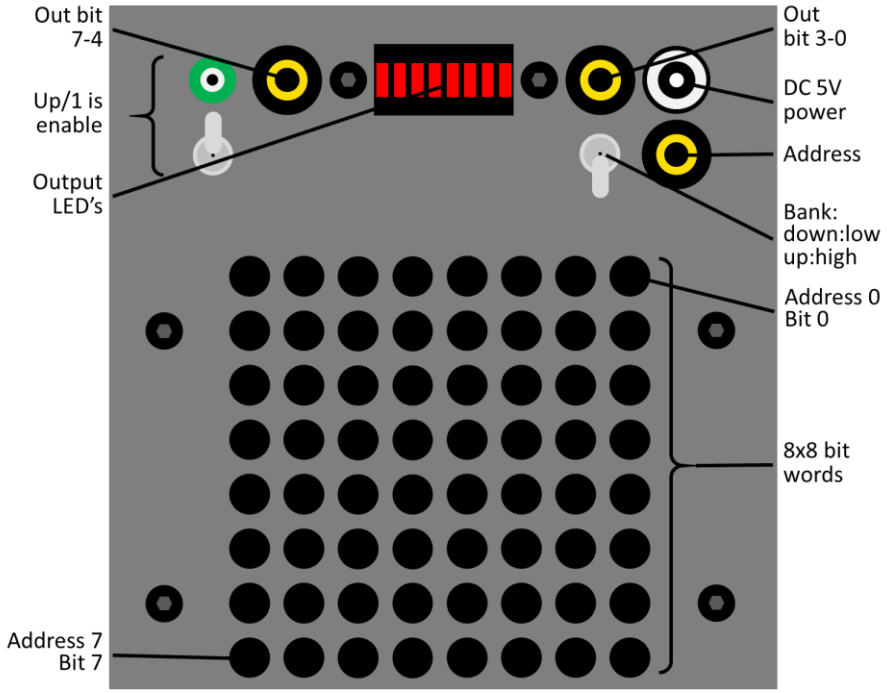

Figure 9 – Controls and connectors