This ULU

The *ULU.14 Patch Panel* can be used to implement a ROM or diode matrix. Nowadays, patch panels are not often used. But looking back to the early computers, it was the preferred way to program a computer.

Used parts

Only standard parts are used:

1x casing 80 x 50 x 20mm;
26x 2mm signal connector;
26x black O-ring 9 x 5 x 2mm;
1x 4-bit data connector;
1x colored O-ring 8 x 5 x 1.5mm;
1x power connector;
4x 3mm round LED ;
4x resistor to dim the LED;
4x LED holder;
18x Diode 1N5817.

Construction

The standard ULU specifications are applicable as specified in the datasheet *ULU.00 – Common specifications*. Basically the 70*100mm enclosure is filled with holes. Every hole contains a connector. A black O-ring is not necessary, the 25mm depth of the enclosure ensures enough space. The panel contains six columns or switching paths, as shown in Figure 2

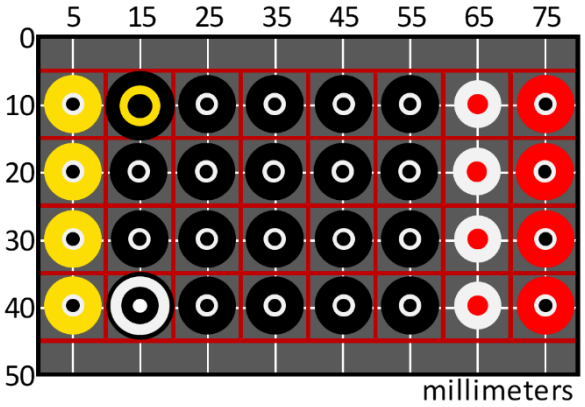

Figure 1 – Drill guide (rotated 90°)

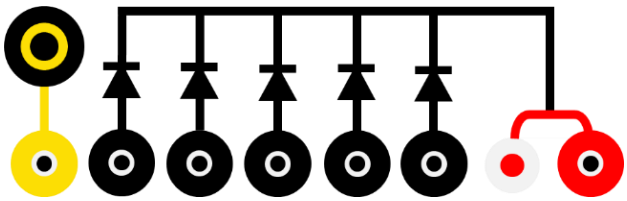

Figure 2 – Column schematic

Figure 3 – ULU inside

Figure 4 – Finished ULU

The power plug is only used to provide the ground for the LEDs. The four-bit data connector is connected to the input of the left four switching paths. The left most path uses the most significant bit, the path with the data bus connector, the least significant bit. The white connectors are stand alone and not connected to the data bus.

Usage

A diode matrix is in essence a read-only memory (ROM). It can be implemented as a full matrix, see ULU.13 8x8 switch ROM and ULU.14 8x18 paper ROM, but that is not always the most economical (in terms of used components) implementation. When most cells of a matrix are empty, it is called a sparse matrix. The switch panel is an economical way to implement a sparse matrix. With only one switch panel used it is not: a 6x6 matrix uses 36 connectors and the patch panel has 48 connectors. But with more than one patch panel used, it is. For instance, a 12x12 matrix uses 144 connectors. But two patch panels only use 96 connectors. That is approximately two third of the connectors of a full matrix. Furthermore, the patch panel uses a cable for every connection that needs to be made, see the example below. This is more economical then putting a switch in every matrix cell. On the output connectors, the cables may be stacked on each other. This is not the case with the black connectors, there only one cable per connector may be used.

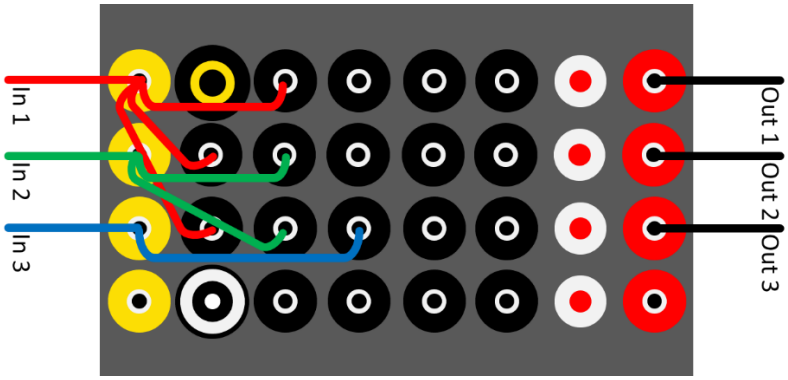

Figure 5 – Implementation

	Out 1	Out 2	Out 3
In 1	1	1	1
In 2		1	1
In 3			1

The implemented matrix

A sparse matrix is applicable for an instruction decoder of a computer. Using a memory or Arduino, is not as easy as it seems. It requires a relay for every output and filling (programming) the matrix is not trivial. So, the patch panel is the best way to implement an instruction decoder.

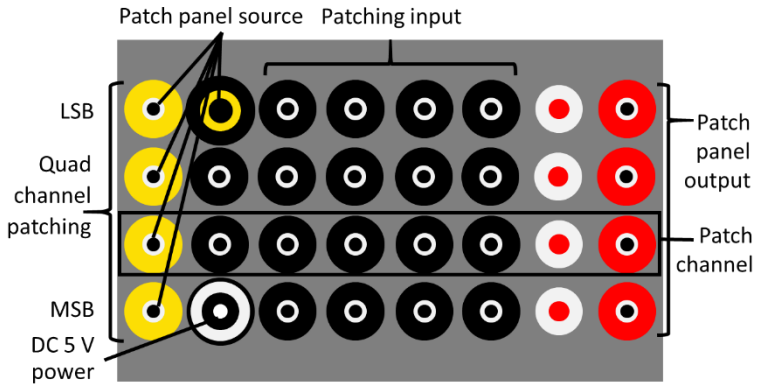

Figure 6 – Controls and connectors