

## Generic Parts

<https://www.youtube.com/playlist?list=PLowKtXNTBypGqImE405J2565dvjafglHU>

| Part                         | Amount | Description                         | Datasheet   |
|------------------------------|--------|-------------------------------------|---|
| 22 gauge wire                | -      |                                     |   |
| Breadboard                   | 16     | 830 tie point solderless breadboard |   |
| EEPROM programmer (optional) | 1      | Used to program the EEPROM chips    | <a href="http://www.ebay.com/itm/191816776888">http://www.ebay.com/itm/191816776888</a> |
| Jumper wires                 | -      |                                     |   |

## Clock Module

<https://www.youtube.com/watch?v=SmQ5K7UQPMM>

| Part                   | Amount | Description                 | Datasheet   |
|------------------------|--------|-----------------------------|---|
| 555 timer              | 3      |                             | <a href="http://www.ti.com/lit/ds/symlink/lm555.pdf">http://www.ti.com/lit/ds/symlink/lm555.pdf</a>       |
| 74LS04                 | 1      | Hex inverter                | <a href="http://www.ti.com/lit/ds/symlink/sn74ls04.pdf">http://www.ti.com/lit/ds/symlink/sn74ls04.pdf</a> |
| 74LS08                 | 1      | Quad AND gate               | <a href="http://www.ti.com/lit/ds/symlink/sn74ls08.pdf">http://www.ti.com/lit/ds/symlink/sn74ls08.pdf</a> |
| 74LS32                 | 1      | Quad OR gate                | <a href="http://www.ti.com/lit/ds/symlink/sn54ls32.pdf">http://www.ti.com/lit/ds/symlink/sn54ls32.pdf</a> |
| Capacitor 0.01 $\mu$ F | 3      |                             |   |
| Capacitor 0.1 $\mu$ F  | 2      |                             |   |
| Capacitor 2 $\mu$ F    | 1      |                             |   |
| LED (blue)             | 1      |                             |   |
| Momentary switch       | 1      | Microtivity 6mm tact switch |   |
| Resistor 1k $\Omega$   | 5      |                             |   |
| Resistor 1M $\Omega$   | 1      |                             |   |
| Toggle switch          | 1      | Double-pole toggle switch   |   |
| Trimpot 1M $\Omega$    | 1      | Variable resistor           |   |

## A Register

<https://www.youtube.com/watch?v=9WE3Obdjtv0>

| Part      | Amount | Description           | Datasheet   |
|-----------|--------|-----------------------|---|
| 74LS173   | 2      | 4-bit D-type register | <a href="http://www.ti.com/lit/ds/symlink/sn74173.pdf">http://www.ti.com/lit/ds/symlink/sn74173.pdf</a>     |
| 74LS245   | 1      | Octal bus transceiver | <a href="http://www.ti.com/lit/ds/symlink/sn74ls245.pdf">http://www.ti.com/lit/ds/symlink/sn74ls245.pdf</a> |
| LED (red) | 8      |                       |   |

## B Register

<https://www.youtube.com/watch?v=9WE3Obdjtv0>

| Part    | Amount | Description           | Datasheet   |
|---------|--------|-----------------------|---|
| 74LS173 | 2      | 4-bit D-type register | <a href="http://www.ti.com/lit/ds/symlink/sn74173.pdf">http://www.ti.com/lit/ds/symlink/sn74173.pdf</a> |

|           |   |                       |   |
|-----------|---|-----------------------|---|
| 74LS245   | 1 | Octal bus transceiver | <a href="http://www.ti.com/lit/ds/symlink/sn74ls245.pdf">http://www.ti.com/lit/ds/symlink/sn74ls245.pdf</a> |
| LED (red) | 8 |                       |   |

## Instruction Register

<https://www.youtube.com/watch?v=9WE3Obdjtv0>

| Part         | Amount | Description           | Datasheet   |
|--------------|--------|-----------------------|---|
| 74LS173      | 2      | 4-bit D-type register | <a href="http://www.ti.com/lit/ds/symlink/sn74173.pdf">http://www.ti.com/lit/ds/symlink/sn74173.pdf</a>     |
| 74LS245      | 1      | Octal bus transceiver | <a href="http://www.ti.com/lit/ds/symlink/sn74ls245.pdf">http://www.ti.com/lit/ds/symlink/sn74ls245.pdf</a> |
| LED (blue)   | 4      |                       |   |
| LED (yellow) | 4      |                       |   |

## ALU

<https://www.youtube.com/watch?v=S-3fXU3FZQc>

| Part      | Amount | Description             | Datasheet   |
|-----------|--------|-------------------------|---|
| 74LS245   | 1      | Octal bus transceiver   | <a href="http://www.ti.com/lit/ds/symlink/sn74ls245.pdf">http://www.ti.com/lit/ds/symlink/sn74ls245.pdf</a> |
| 74LS283   | 2      | 4-bit binary full adder | <a href="http://www.ti.com/lit/ds/symlink/sn54s283.pdf">http://www.ti.com/lit/ds/symlink/sn54s283.pdf</a>   |
| 74LS86    | 2      | Quad XOR gate           | <a href="http://www.ti.com/lit/ds/symlink/sn74ls86a.pdf">http://www.ti.com/lit/ds/symlink/sn74ls86a.pdf</a> |
| LED (red) | 8      |                         |   |

## RAM Module

<https://www.youtube.com/watch?v=5r1tEFXKt0>

| Part                 | Amount | Description                    | Datasheet   |
|----------------------|--------|--------------------------------|---|
| 74LS00               | 1      | Quad NAND gate                 | <a href="http://www.ti.com/lit/ds/symlink/sn7400.pdf">http://www.ti.com/lit/ds/symlink/sn7400.pdf</a>   |
| 74LS04               | 2      | Hex inverter                   | <a href="http://www.ti.com/lit/ds/symlink/sn74ls04.pdf">http://www.ti.com/lit/ds/symlink/sn74ls04.pdf</a>   |
| 74LS157              | 4      | Quad 2-to-1 line data selector | <a href="http://www.ti.com/lit/ds/symlink/54ls157.pdf">http://www.ti.com/lit/ds/symlink/54ls157.pdf</a>   |
| 74LS173              | 1      | 4-bit D-type register          | <a href="http://www.ti.com/lit/ds/symlink/sn74173.pdf">http://www.ti.com/lit/ds/symlink/sn74173.pdf</a>   |
| 74LS189              | 2      | 64-bit RAM                     | <a href="http://www.ndatasheet.com/datasheet-frame/300/mdownload.php?id=529296">http://www.ndatasheet.com/datasheet-frame/300/mdownload.php?id=529296</a> |
| 74LS245              | 1      | Octal bus transceiver          | <a href="http://www.ti.com/lit/ds/symlink/sn74ls245.pdf">http://www.ti.com/lit/ds/symlink/sn74ls245.pdf</a>   |
| DIP switch (4 bit)   | 1      |                                |   |
| DIP switch (8 bit)   | 1      |                                |   |
| LED (green)          | 1      |                                |   |
| LED (red)            | 9      |                                |   |
| LED (yellow)         | 4      |                                |   |
| Momentary switch     | 1      | Microtivity 6mm tact switch    |   |
| Resistor 1k $\Omega$ | 2      |                                |   |
| Toggle switch        | 1      | Double-pole toggle switch      |   |

## EEPROM Programmer (optional)

<https://www.youtube.com/watch?v=K88pgWhEb1M>

| Part         | Amount | Description                                  | Datasheet   |
|--------------|--------|--|---|
| 74HC595      | 2      | 8-bit serial-in, parallel-out shift register | <a href="http://www.nxp.com/documents/data_sheet/74HC_HCT595.pdf">http://www.nxp.com/documents/data_sheet/74HC_HCT595.pdf</a>               |
| Arduino Nano | 1      | Microcontroller                              | <a href="https://www.arduino.cc/en/uploads/Main/ArduinoNanoManual23.pdf">https://www.arduino.cc/en/uploads/Main/ArduinoNanoManual23.pdf</a> |

## Output Module

<https://www.youtube.com/watch?v=5r1tEFXk0>

| Part                   | Amount | Description                      | Datasheet   |
|------------------------|--------|----------------------------------|---|
| 555 timer              | 1      |                                  | <a href="http://www.ti.com/lit/ds/symlink/lm555.pdf">http://www.ti.com/lit/ds/symlink/lm555.pdf</a>   |
| 74LS139                | 1      | Dual 2-to-4 line decoder         | <a href="http://www.ti.com/lit/ds/symlink/sn54ls139a.pdf">http://www.ti.com/lit/ds/symlink/sn54ls139a.pdf</a>   |
| 74LS76                 | 1      | Dual JK flip-flop                | <a href="http://www.ti.com/lit/ds/symlink/sn5476.pdf">http://www.ti.com/lit/ds/symlink/sn5476.pdf</a>   |
| 7-segment display      | 4      | Common cathode 7-segment display |   |
| Capacitor 0.01 $\mu$ F | 2      |                                  |   |
| CAT28C16AP             | 1      | 16 Kbit CMOS parallel EEPROM     | <a href="http://www.alldatasheet.com/datasheet-pdf/pdf/57374/CATALYST/CAT28C16AP-20T.html">http://www.alldatasheet.com/datasheet-pdf/pdf/57374/CATALYST/CAT28C16AP-20T.html</a> |
| Resistor 100k $\Omega$ | 1      |                                  |   |
| Resistor 1k $\Omega$   | 1      |                                  |   |

## Program Counter Module

[https://www.youtube.com/watch?v=tNwU7pK\\_3tk](https://www.youtube.com/watch?v=tNwU7pK_3tk)

| Part        | Amount | Description                      | Datasheet   |
|-------------|--------|----------------------------------|---|
| 74LS161     | 1      | 4-bit synchronous binary counter | <a href="http://www.ti.com/lit/ds/symlink/sn74ls161a.pdf">http://www.ti.com/lit/ds/symlink/sn74ls161a.pdf</a> |
| 74LS245     | 1      | Octal bus transceiver            | <a href="http://www.ti.com/lit/ds/symlink/sn74ls245.pdf">http://www.ti.com/lit/ds/symlink/sn74ls245.pdf</a>   |
| LED (green) | 4      |                                  |   |

## Output Register

<https://www.youtube.com/watch?v=-6JAgFWCL9w>

*This module can also be build in the same way as the A/B/Instruction Register if you don't have the additional 74LS273 which is not used in any other module (so far)*

| Part    | Amount | Description                       | Datasheet   |
|---------|--------|-----------------------------------|---|
| 74LS08  | 1      | Quad AND gate                     | <a href="http://www.ti.com/lit/ds/symlink/sn74ls08.pdf">http://www.ti.com/lit/ds/symlink/sn74ls08.pdf</a>   |
| 74LS273 | 1      | Octal D-type flip-flop with clear | <a href="http://www.ti.com/lit/ds/symlink/sn74ls273.pdf">http://www.ti.com/lit/ds/symlink/sn74ls273.pdf</a> |

## Data Bus

<https://www.youtube.com/watch?v=-6JAgFWCL9w>

| Part      | Amount | Description   | Datasheet |
|-----------|--------|---------------|-----------|
| LED (red) | 8      | Data bus LEDs |           |

|               |   |   |
|---------------|---|---|
| Resistor 470Ω | 8 | Current limiting resistors for the LEDs |
| Resistor 10kΩ | 8 | Pull down resistors                     |

## Control Word

<https://www.youtube.com/watch?v=AwUirxi9eBg>

| Part          | Amount | Description  | Datasheet   |
|---------------|--------|--------------|---|
| 74LS04        | 2      | Hex inverter | <a href="http://www.ti.com/lit/ds/symlink/sn74ls04.pdf">http://www.ti.com/lit/ds/symlink/sn74ls04.pdf</a> |
| Resistor 470Ω | 15     |              |   |
| LED (blue)    | 15     |              |   |

## Control Module

<https://www.youtube.com/watch?v=dHWFpkGsxOs>

| Part        | Amount | Description                      | Datasheet   |
|-------------|--------|----------------------------------|---|
| CAT28C16AP  | 2      | 16 Kbit CMOS parallel EEPROM     | <a href="http://www.alldatasheet.com/datasheet-pdf/pdf/57374/CATALYST/CAT28C16AP-20T.html">http://www.alldatasheet.com/datasheet-pdf/pdf/57374/CATALYST/CAT28C16AP-20T.html</a> |
| 74LS161     | 1      | 4-bit synchronous binary counter | <a href="http://www.ti.com/lit/ds/symlink/sn74ls161a.pdf">http://www.ti.com/lit/ds/symlink/sn74ls161a.pdf</a>   |
| 74LS138     | 1      | Dual 3-to-8 line decoder         | <a href="http://www.ti.com/lit/ds/symlink/sn54ls138.pdf">http://www.ti.com/lit/ds/symlink/sn54ls138.pdf</a>   |
| LED (blue)  | 1      |                                  |   |
| LED (red)   | 3      |                                  |   |
| LED (green) | 5      |                                  |   |