

# BlueBox Micro Construction Kit

## Contents:

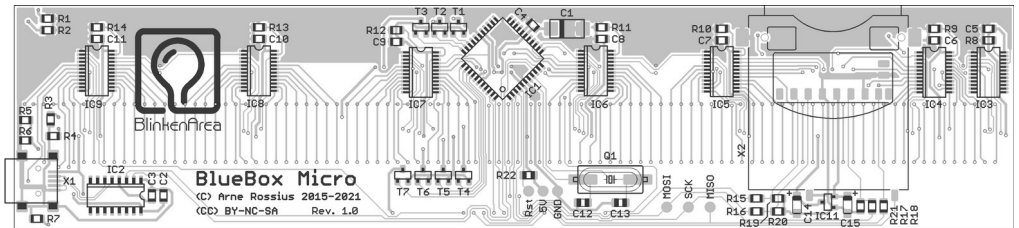
- 1 PCB "BlueBox Micro Rev. 1.0" with LEDs
- 1 Microcontroller ATmega644A (TQFP)
- 1 USB/UART converter CH340C (SOIC16)
- 7 16-bit Current Sink Shift Reg. (SSOP24)
- 1 3.3 V Voltage Regulator (SOT23)
- 7 p-Ch. MOSFETs IRLML6402 (SOT23)
- 1 Crystal, 14.7456 MHz (SMD, HC49)

- 4 Resistors 1 kΩ (0805)
- 11 Resistors 1.8 kΩ (0805)
- 2 Ceramic Capacitors 33 pF (0805)
- 10 Ceramic Capacitors 100 nF (0805)
- 2 Tantalum Capacitors, 1 μF (size A / 3216)
- 1 Tantalum Capacitor, 100 μF (size C / 6032)
- 1 SD Card Slot (Attend 104G-TAA0-R)
- 1 Mini-USB-B Connector (SMD, female)

## SMD Soldering Advice

To solder the SMD components, tin only one of the pads, then grab the component with tweezers, re-heat the tinned pad and slide the component in sideways. When the component is aligned properly, remove the soldering iron, let the solder joint cool down and solder the rest of the pins. **I recommend soldering the components in the order listed below.**

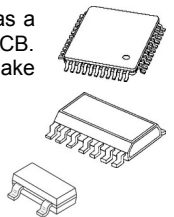
The circuit board (PCB) comes with the LEDs already soldered.



PCB bottom component placement

**1. Integrated Circuits (IC1~IC9, IC11):** Orientation is important for the ICs. Each IC has a small dent or dot next to pin 1, which must match the circle or half-circle printed on the PCB. Use flux when soldering the small pin pitch ICs to avoid solder bridges between pins. Make sure not to mix up IC11 with the transistors.

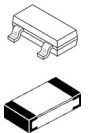
IC	Part Number	Orientation Note
IC1	ATmega644A	Circular dent in corner must match circle
IC2	CH340C	Circular dent in corner must match half-circle
IC3~9	SCT2024, TM5020A, etc.	Circular dent in corner must match half-circle
IC11	MCP170x-3302	Orientation is obvious



**2. Transistors (T1~T7):** The MOSFET transistors only fit in one orientation.

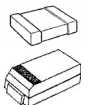
**3. Resistors:** Orientation doesn't matter, the value is marked as a 3 or 4 digit code (the last digit is a base-10 exponent, e.g. 182 =  $18 \cdot 10^2 \Omega = 1800 \Omega = 1.8 \text{ k}\Omega$ ).

Name	R1~R7	R8~R14, R19~R22	R15~R18
Value	not fitted	1.8 kΩ	1 kΩ
Marking	—	182 or 1801	102 or 1001



**4. Capacitors:** Only the larger tantalum capacitors (1 μF) have a specific orientation, marked by the thick bar printed on the top. This bar must face toward the small plus sign on the PCB. The smaller ceramic capacitors are unmarked, make sure not to mix up the two values.

Name	C1	C2~C11	C12, C13	C14, C15
Value	100 μF (tantalum)	100 nF (ceramic)	33 pF (ceramic)	1 μF (tantalum)
Marking	107 or A8	none	none	105 or A6



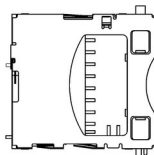
**5. Quartz Crystal (Q1):** Orientation doesn't matter. After soldering, keep heating the pads for a while to allow the solder to flow under the crystal.



**6. USB Connector (X1):** The USB connector locks in place with two plastic pins on the bottom side. Solder the four large pads first to secure the connector in place, then continue with the five smaller pins. Use flux to avoid solder bridges between the small pins.



**7. SD Card Slot (X2):** The SD card slot locks in place with two plastic pins on the bottom side. Solder the large outer pins first, then remove the SD card dummy before soldering the inner pins.



### Power Supply

The BlueBox Micro is powered through the USB port and requires approx. 1.1 A with all LEDs at maximum brightness. For use with an SD card, a USB "charger" rated for at least 1.2 A can be used. When connected to a PC, make sure the port can supply enough current before displaying frames with many LEDs turned on, as the USB standard only allows for 500 mA (approx. 45% of the LEDs turned on at full brightness, or all LEDs at brightness level 3/7).

### Using the BlueBox Micro

After turning it on, the BlueBox Micro should display a "BlueBox  $\mu$ " logo followed by a "Chaosknoten".

You can now send an MCUF stream through the USB virtual serial port (115200 Baud) or insert an SD card. The MCUF streaming format is described at <http://wiki.blinkenarea.org/index.php/MicroControllerUnitFrameEnglish>

MMC, SD and SDHC cards are supported with a FAT16 or FAT32 filesystem. Very small MMC and SD cards (up to 32 MB) use FAT12 and must be reformatted to FAT16 before they can be used. The first primary partition with a FAT16 or FAT32 partition ID (0x04, 0x06, 0x0B, 0x0C) will be used. Some SD cards come with no partition at all, in which case a partition must be created and formatted. If your SD card isn't compatible with the BlueBox Micro, an error message will scroll across the LEDs.

Files on the SD card must be stored in a directory with the name `BLUEBOX`. The files in that directory will be played in the order listed in the FAT (usually the order in which they were copied onto the SD card, or use 'fatsort' from <http://fatsort.sourceforge.net/>). If the directory doesn't exist or doesn't contain any supported files, an error message will scroll across the LEDs. All files must be 98x7 pixels, 1 channel. The supported file formats are:

Filename extension	Format
BIN	BlinkströmAdvanced file (binary, 8 greyscale)
BLM	BlinkenLights Movie (simple ASCII format, no grayscale support)
BML	Blinkenlights Markup Language (XML-based, 2 to 256 greyscales, but only 8 greyscales displayed by the BlueBox Micro)
BBM	Binary BlinkenMovie (binary, 2 to 256 greyscales, but only 8 displayed)

More information about the file formats: <http://wiki.blinkenarea.org/index.php/FileFormats>

### Programming the Controller

The kit comes with a pre-programmed controller. If you want to update the firmware or use your own, you can use the solder pads to connect an AVR ISP programmer. The latest firmware is available for download from the BlinkenArea wiki (see below for URL).

Pad Name	Rst	5V	GND	MOSI	SCK	MISO
ISP Function	#Reset	VCC	GND	MOSI	SCK	MISO

**Questions? Problems? Comments? Ideas?** Please contact me by e-mail: [arne@blinkenarea.org](mailto:arne@blinkenarea.org)

### Project Webpage

Hardware project page: <http://wiki.blinkenarea.org/index.php/BlueBoxMicroEnglish>

Firmware project page: <http://wiki.blinkenarea.org/index.php/BlinkenPlusEnglish>