

# KA07

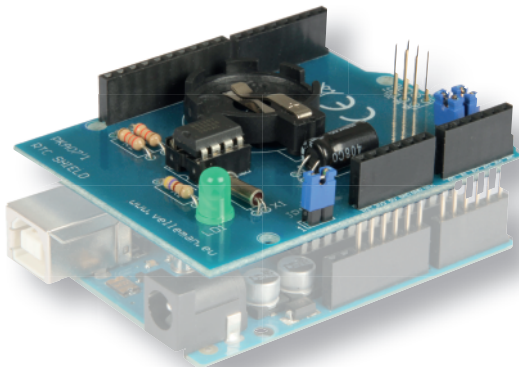
ILLUSTRATED ASSEMBLY MANUAL HKA07IP'1

## RTC shield for Arduino®



velleman®  
projects

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**Add a real time clock shield to your projects to ensure accurate and easy timekeeping. While the shield keeps track of time and date, the controller can focus on other tasks.**

### Features

- based on Maxim-Dallas DS1307 IC
- counts seconds, minutes, hours, date of month, day of the week, year and leap-year
- 12 or 24h system selectable
- AM/PM indication
- large user community
- requires 1 Arduino UNO™ (not included)
- stackable design: the shield can be stacked with other shields

### Specifications

- I2C interface
- accuracy: 20ppm (depends on crystal)
- power consumption: 1.5mA
- with backup battery holder (500nA when running on battery)
- dimensions: 68 x 53mm / 2.67 x 2.08"



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## News

## NEW HK103 LED COBE

CubeAnimator software available for download here!!!

Posted on 04-08-12

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**Velleman N.V.**  
**Legen Heirweg 33**  
**9890 Gavere**  
**(België)**

## assembly hints

### 1. Assembly (Skipping this can lead to troubles ! )

Ok, so we have your attention. These hints will help you to make this project successful. Read them carefully.

#### 1.1 Make sure you have the right tools:

- A good quality soldering iron (25-40W) with a small tip.
- Wipe it often on a wet sponge or cloth, to keep it clean; then apply solder to the tip, to give it a wet look. This is called 'thinning' and will protect the tip, and enables you to make good connections. When solder rolls off the tip, it needs cleaning.
- Thin raisin-core solder. Do not use any flux or grease.
- A diagonal cutter to trim excess wires. To avoid injury when cutting excess leads, hold the lead so they cannot fly towards the eyes.
- Needle nose pliers, for bending leads, or to hold components in place.
- Small blade and Phillips screwdrivers. A basic range is fine.

For some projects, a basic multi-meter is required, or might be handy.



#### 1.2 Assembly Hints :

- Make sure the skill level matches your experience, to avoid disappointments.
- Follow the instructions carefully. Read and understand the entire step before you perform each operation.
- Perform the assembly in the correct order as stated in this manual.
- Position all parts on the PCB (Printed Circuit Board) as shown on the drawings.
- Values on the circuit diagram are subject to changes, the values in this assembly guide are correct\*.
- Use the check-boxes to mark your progress.
- Please read the included information on safety and customer service.

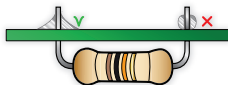
\* Typographical inaccuracies excluded. Always look for possible last minute manual updates, indicated as 'NOTE' on a separate leaflet.

#### 1.3 Soldering Hints :

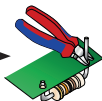
1. Mount the component against the PCB surface and carefully solder the leads.

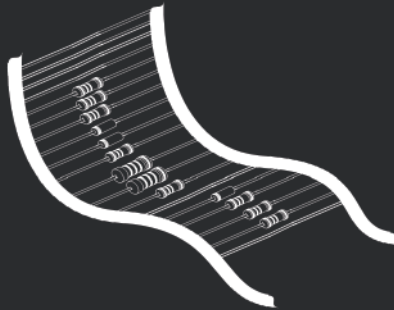


2. Make sure the solder joints are cone-shaped and shiny.



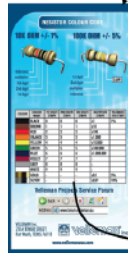
3. Trim excess leads as close as possible to the solder joint.



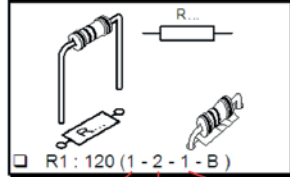


REMOVE THEM FROM THE TAPE ONE AT A TIME !

Included in  
this kit



## 2. RESISTOR

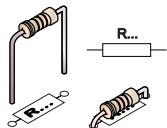


COLOUR	COLOUR NAME	1ST DIGIT/ STRIPE	2ND DIGIT/ STRIPE	3RD DIGIT/ STRIPE	MULTIPLIER STRIPE	TOLERANCE
	BLACK	0	0	0	x1	1%
	BROWN	1	1	1	x10	
	RED	2	2	2	x100	
	ORANGE	3	3	3	x1.000	
	YELLOW	4	4	4	x10.000	
	GREEN	5	5	5	x100.000	
	BLUE	6	6	6	x1.000.000	

**DO NOT BLINDLY FOLLOW THE ORDER OF THE COMPONENTS ON THE TAPE. ALWAYS CHECK THEIR VALUE ON THE PARTS LIST!**

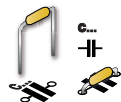
## I CONSTRUCTION

### 1 Resistors



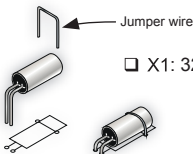
- ☐ R1: 470 (4 - 7 - 1 - B)
- ☐ R2: 2K2 (2 - 2 - 2 - B)
- ☐ R3: 2K2 (2 - 2 - 2 - B)

### 2 Ceramic capacitor



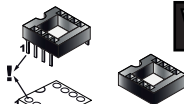
- ☐ C1: 100nF (104)

### 3 Crystal



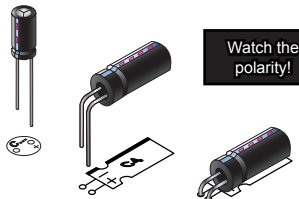
- ☐ X1: 32.768 MHz

### 4 IC-socket



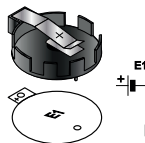
- ☐ IC1: 8p

### 5 Electrolytic capacitor



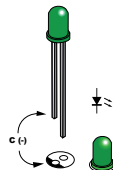
- ☐ C2: 100μF

### 6 Battery holder



- ☐ CR2032 VBAT

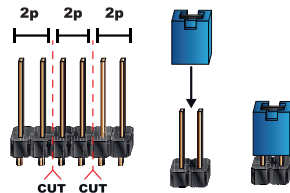
### 7 LED



Watch the polarity!

- ☐ LD1: Green (5mm)

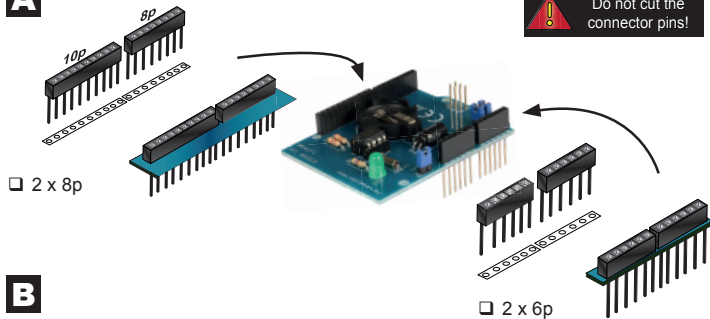
### 8 Male headers



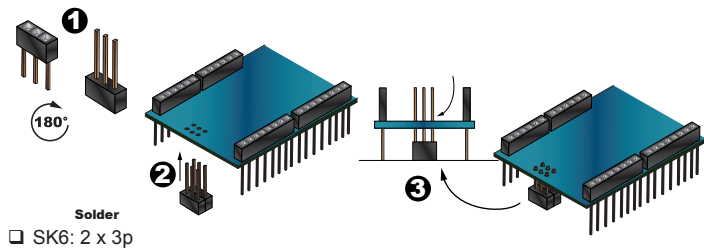
- ☐ JP1: Enable SQW output
- ☐ JP2: I2C interface
- ☐ JP3: I2C interface

## 9 Female headers

**A**

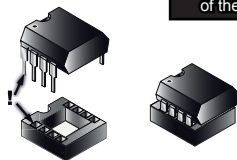


**B**



## 10 IC

Watch the position of the notch!

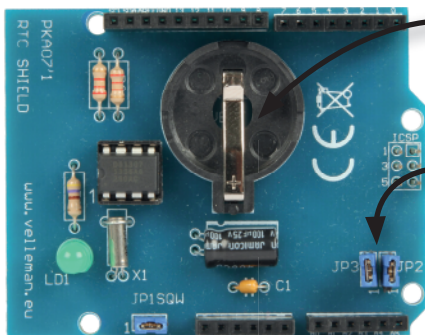


IC1: DS1307

## II General information



Download the library from [www.vellemanprojects.eu](http://www.vellemanprojects.eu).



Back-up battery: provides power to the shield when the Arduino Uno is not active.



Place jumpers JP2 and JP3 when using the shield with the Arduino Uno rev2 or Arduino 2009.

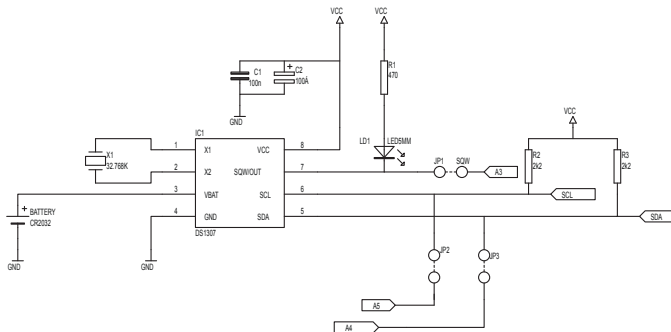


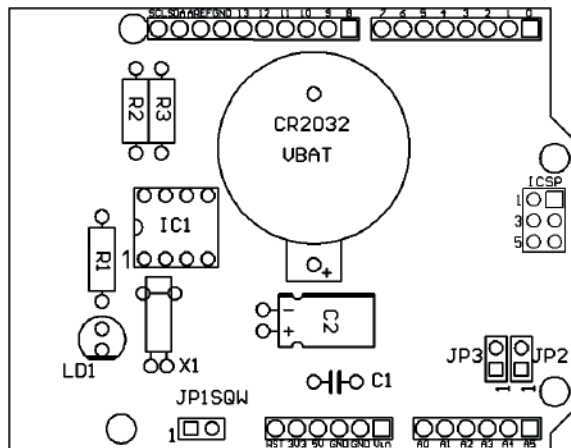
The IC drives an LED, which blinks at the same frequency as the SQW output. Select via jumper JP1 whether this signal goes to pin A3 of the shield.

The library allows you to manage the frequency of the LED. Use command `RTC.sqw(x)`. Values for 'x':

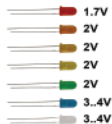
- 0: LED off
- 1: 1 Hz
- 2: 4096 Hz
- 3: 8192 Hz
- 4: 32768 Hz



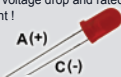




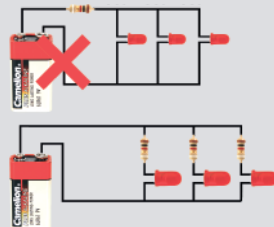
# Leds and how to use them



Leds feature a specific voltage drop, depending on type and colour. Check the datasheet for exact voltage drop and rated current !



Never connect leds in parallel



## How to Calculate the series resistor:

Example: operate a red led (1.7V) on a 9Vdc source.

Required led current for full brightness: 5mA (this can be found in the datasheet of the led)

$$\frac{\text{Supply voltage (V) - led voltage (V)}}{\text{required current (A)}} = \text{series resistance (ohms)}$$



$$\frac{9V - 1.7V}{0.005A} = 1460 \text{ ohm}$$

closest value :  
use a 1k5 resistor

Required resistor power handling=  
voltage over resistor x current passed trough resistor

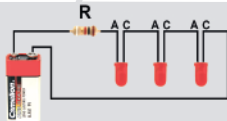


$$(9V - 1.7V) \times 0.005A = 0.036W$$

a standard 1/4W resistor  
will do the job

## LEDs in series:

Example: 3 x red led (1.7V) on 9V battery  
Required led current for full brightness: 5mA  
(this can be found in the datasheet of the led)



$$\frac{\text{Supply voltage (V) - (number of leds x led voltage (V))}}{\text{required current (A)}} = \text{series resistance (ohms)}$$

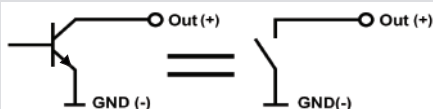


$$\frac{9V - (3 \times 1.7V)}{0.005A} = 780 \text{ ohm}$$

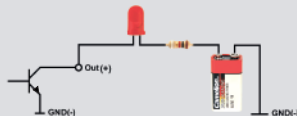
use an  
820 ohm resistor

## open collector outputs

An open collector output can be compared to a switch which switches to ground when operated



Example: How to switch an LED by means of an open collector output





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