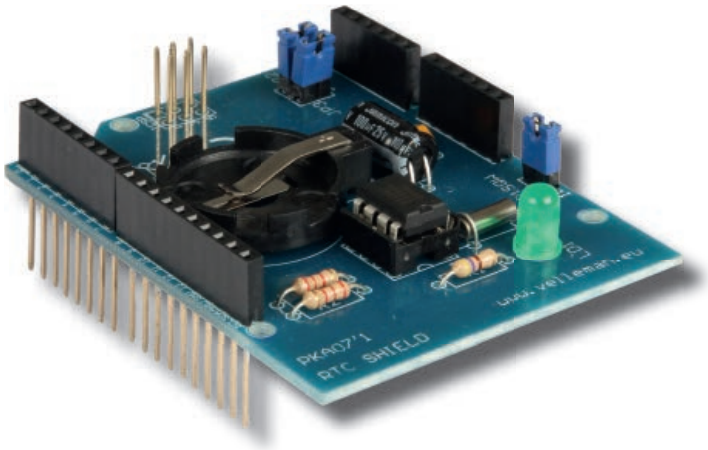
RTC shield for Arduino®

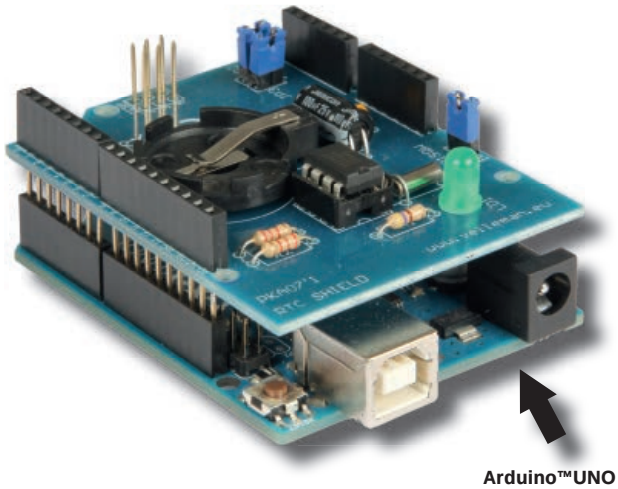
Component KA07

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
- requires 1 Arduino UNO™ (not included)
- stackable design: the shield can be stacked with other shields



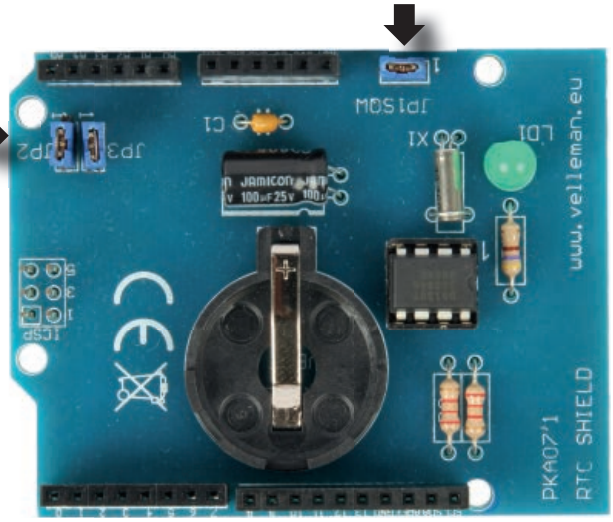
Arduino™UNO board
(not included)

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”

Enable SQW output

I2C interface



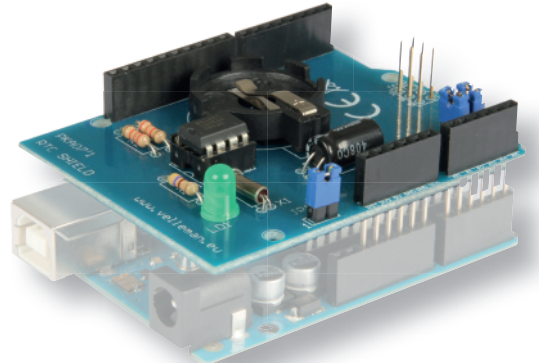
KA07

ILLUSTRATED ASSEMBLY MANUAL HKA07IP'1

RTC shield for Arduino®

velleman projects

@velleman_RnD



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

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- counts seconds, minutes, hours, date of month, day of the week, year and leap-year
- 12 or 24h system selectable
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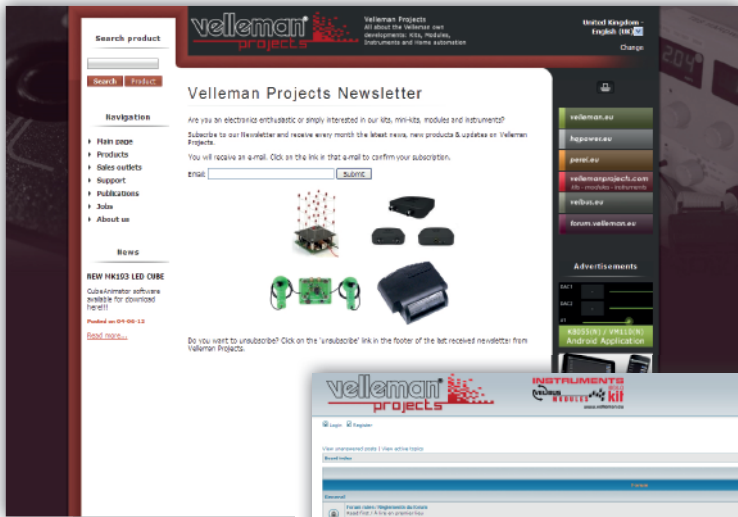
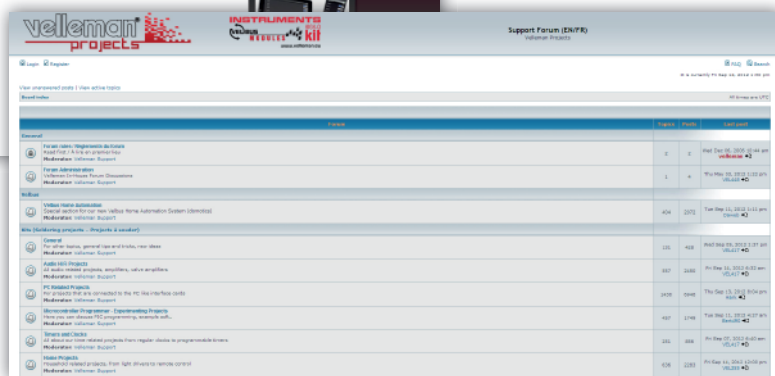
Made for ARDUINO





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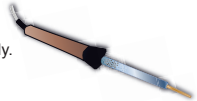
assembly hints

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.

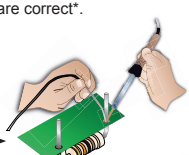
1.2 Assembly Hints :

- 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.

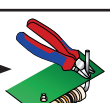
1.3 Soldering Hints :

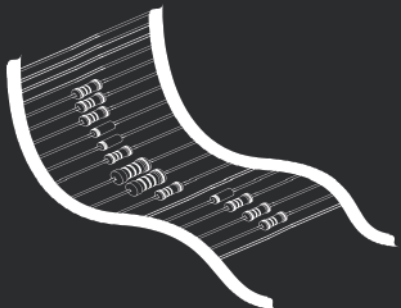
1. Mount the component against the PCB surface and carefully solder the leads.



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

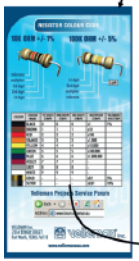
3. Trim excess leads as close as possible to the solder joint.

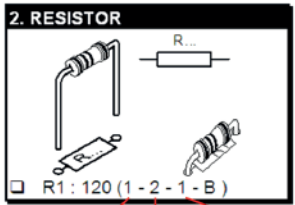




REMOVE THEM FROM THE TAPE ONE AT A TIME !

Included in this kit



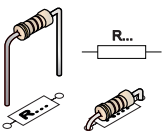


COLOUR	COLOUR NAME	1ST DIGIT/ STRIPE	2ND DIGIT/ STRIPE	3RD DIGIT/ STRIPE	MULTIPLIER STRIPE	TOLE 4TH
	BLACK	0	0	0	x1	1%
	BROWN	1	1	1	x10	
	RED	2	2	2	x100	
	ORANGE	3	3	3	x1.000	
	YELLOW	4	4	4	x10.000	
	GREEN	5	5	5	x100.000	
	BLUE	6	6	6	x1.000.000	

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

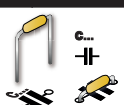
I CONSTRUCTION

1 Resistors



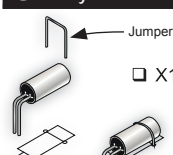
- ❑ R1: 470 (4 - 7 - 1 - B)
- ❑ R2: 2K2 (2 - 2 - 2 - B)
- ❑ R3: 2K2 (2 - 2 - 2 - B)

2 Ceramic capacitor



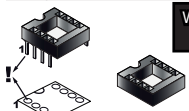
❑ C1: 100nF (104)

3 Crystal



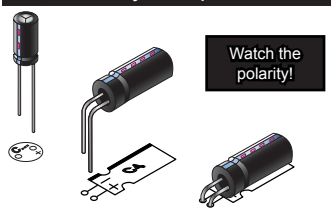
❑ X1: 32.768 MHz

4 IC-socket



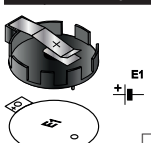
❑ IC1: 8p

5 Electrolytic capacitor



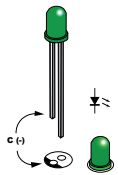
❑ C2: 100µF

6 Battery holder



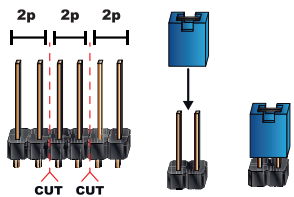
❑ CR2032 VBAT

7 LED



❑ LD1: Green (5mm)

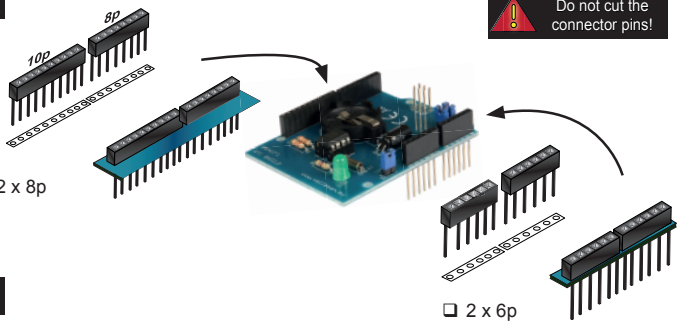
8 Male headers



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

9 Female headers

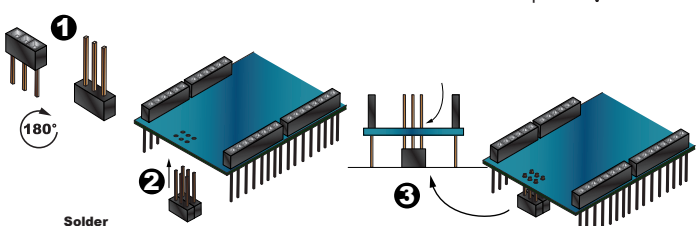
A



❑ 2 x 8p

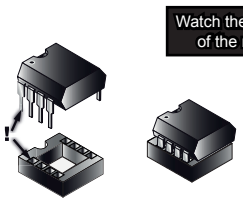
❑ 2 x 6p

B



❑ SK6: 2 x 3p

10 IC

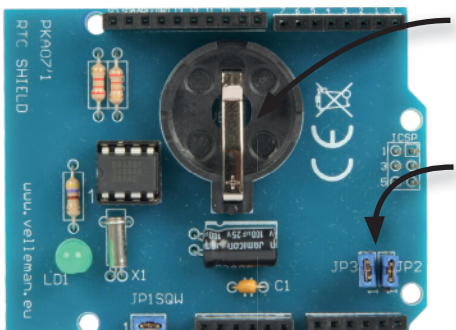


❑ IC1: DS1307

II General information

Library

Download the library from www.vellemanprojects.eu.



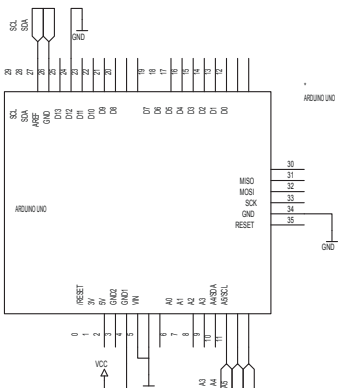
Back-up battery: provides power to the shield when the Arduino Uno is not active.

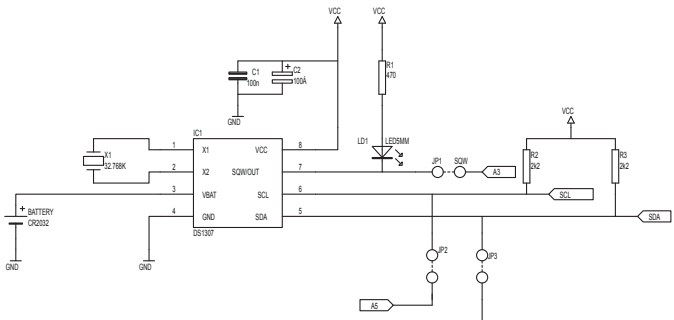
Place jumpers JP2 and JP3 when using the shield with the Arduino Uno rev2 or Arduino 2009.

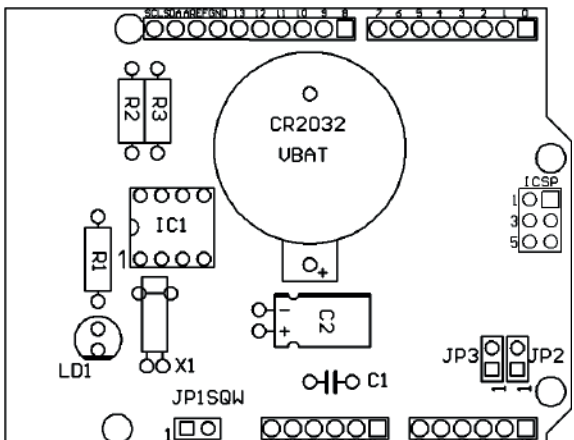
The IC drives an LED, which blinks at the same frequency as the SQW output. Select via jumper JP1 whether this signal goes to pin A3 of the shield.

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

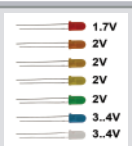
0: LED off
1: 1 Hz
2: 4096 Hz
3: 8192 Hz
4: 32768 Hz


SCL
SDA
GND
ARDUINO UNI
MISO
MOSI
SCK
GND
RESET
VCC
GND
A3
A4
A5

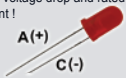

VCC
VCC
C1
100n
C2
100A
GND
R1
470
IC1
X1
32.768K
LD1
LED5MM
JP1
SQW
A3
R2
2K2
R3
2K2
SCL
SDA
BATTERY
CR2032
DS1307
X1
X2
VBAT
GND
VCC
SQW/OUT
SCL
SDA
JP2
JP3
A5
A4

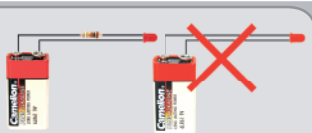

SCL SDA AREF GND 13 12 11 10 9 8
7 6 5 4 3 2 1 0
R2
R3
CR2032
VBAT
ICSP
IC1
R1
C2
LD1
X1
JP3
JP2
C1
JP1SQW
RST 3V3 5V GND GND VIN
A0 A1 A2 A3 A4 A5

Leds and how to use them

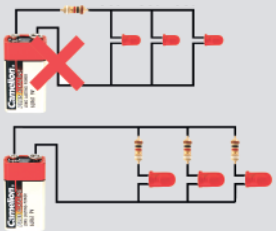


Leds feature a specific voltage drop, depending on type and colour. Check the datasheet for exact voltage drop and rated current !





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)

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

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

closest value : use a 1k5 resistor

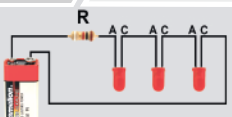
Required resistor power handling=
voltage over resistor x current passed trough resistor

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

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)



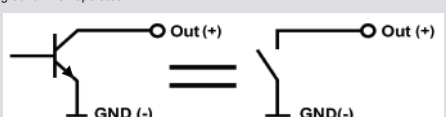
$$\frac{\text{Supply voltage (V) - (number of leds x led voltage (V))}}{\text{required current (A)}} = \text{series resistance (ohms)}$$

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

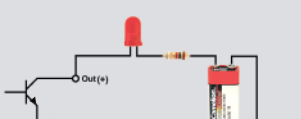
use an 820 ohm resistor

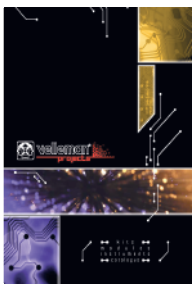
open collector outputs

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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