KA08

ILLUSTRATED ASSEMBLY MANUAL (KA08IP)

I/O SHIELD FOR ARDUINO® YÚN

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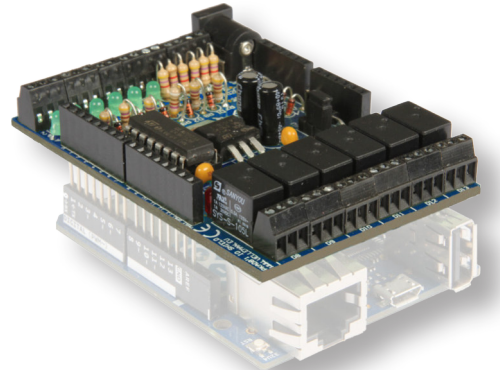


General purpose INPUT - OUTPUT shield for Arduino Yún

Features

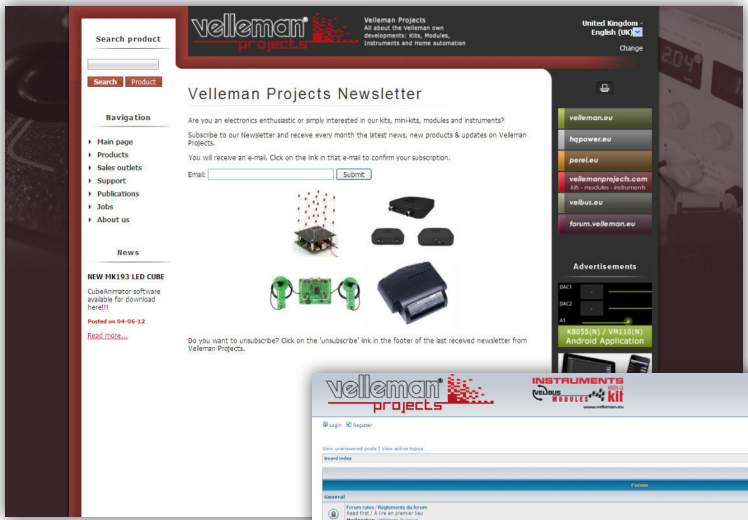
- suited for Arduino Yún
- requires 1 Arduino Yún (not included)

Specifications

- inputs:
  - » 6 analogue
  - » 6 digital
- outputs: 6 NO/NC relay outputs (1A/30VDC)
- LED status indicators
- power supply: 7-15VDC
- dimensions: 80x54mm / 3.15 x 2.12”

Made for ARDUINO®

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



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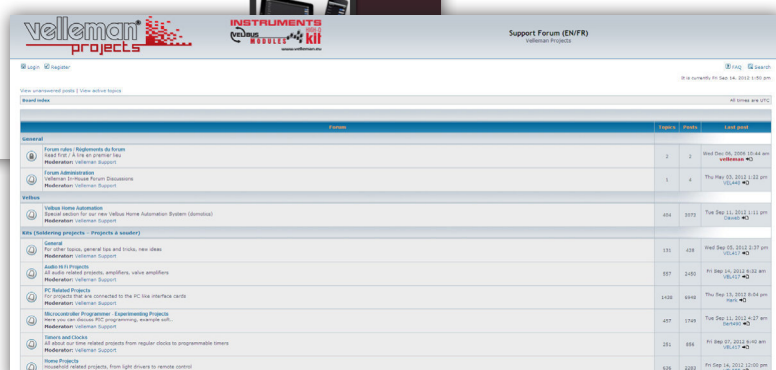
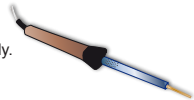


assembly hints

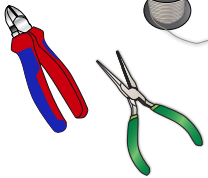
1. Assembly (Skipping this can lead to troubles !)

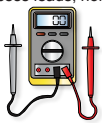
Ok, so we have your attention. These hints will help you to make this project successful. Read them carefully.



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.





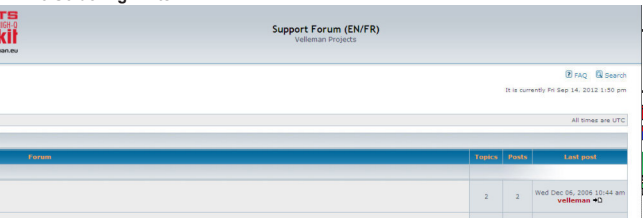
For some projects, a basic multi-meter is required, or might be handy.

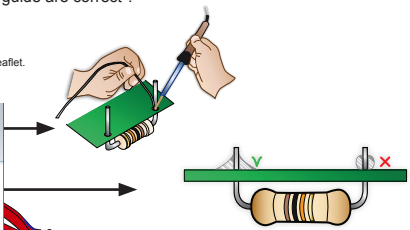
1.2 Assembly Hints :

- 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.

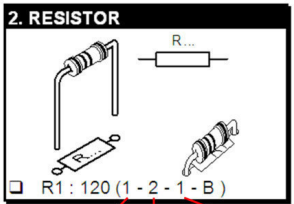
1.3 Soldering Hints :





REMOVE THEM FROM THE TAPE ONE AT A TIME !

Included in this kit

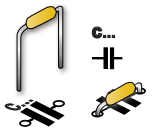


COLOUR	COLOUR NAME	1ST DIGIT/ STRIPE	2ND DIGIT/ STRIPE	3RD DIGIT/ STRIPE	MULTIPLIER STRIPE	TOLE 4TH S
	BLACK	0	0	0	x1	1%
	BROWN	1	1	1	x10	
	RED	2	2	2	x100	
	ORANGE	3	3	3	x1.000	
	YELLOW	4	4	4	x10.000	
	GREEN	5	5	5	x100.000	
	BLUE	6	6	6	x1.000.000	

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

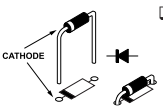
I CONSTRUCTION

1 Ceramic capacitors



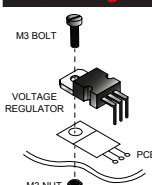
- ❑ C2: 100nF (104)
- ❑ C3: 100nF (104)
- ❑ C4: 100nF (104)

2 Shotkey diode



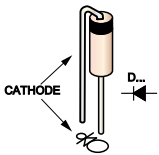
- ❑ D7: 1N5819

3 Voltage regulator



- ❑ VR1: UA7805

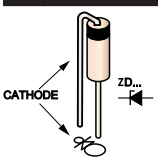
4 Diodes



Watch the polarity!

- ❑ D1 : 1N4148
- ❑ D2 : 1N4148
- ❑ D3 : 1N4148
- ❑ D4 : 1N4148
- ❑ D5 : 1N4148
- ❑ D6 : 1N4148

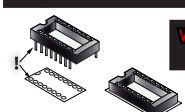
5 Zenerdiodes



Watch the polarity!

- ❑ ZD1 : 5V1
- ❑ ZD2 : 5V1
- ❑ ZD3 : 5V1
- ❑ ZD4 : 5V1
- ❑ ZD5 : 5V1
- ❑ ZD6 : 5V1

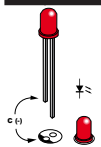
6 IC-socket



Watch the position of the notch!

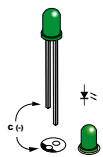
- ❑ IC1: 16p

7 LED's



- ❑ LD1 : Red
- ❑ LD2 : Red
- ❑ LD3 : Red
- ❑ LD4 : Red
- ❑ LD5 : Red
- ❑ LD6 : Red

Watch the polarity!



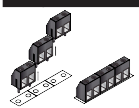
- ❑ LD7 : Green
- ❑ LD8 : Green
- ❑ LD9 : Green
- ❑ LD10 : Green
- ❑ LD11 : Green
- ❑ LD12 : Green

8 Resistors

- ❑ R1 : 1K (1 - 0 - 2 - B)
- ❑ R2 : 1K (1 - 0 - 2 - B)
- ❑ R3 : 1K (1 - 0 - 2 - B)
- ❑ R4 : 1K (1 - 0 - 2 - B)
- ❑ R5 : 1K (1 - 0 - 2 - B)
- ❑ R6 : 1K (1 - 0 - 2 - B)
- ❑ R7 : 470 (4 - 7 - 1 - B)
- ❑ R8 : 470 (4 - 7 - 1 - B)
- ❑ R9 : 470 (4 - 7 - 1 - B)
- ❑ R10 : 470 (4 - 7 - 1 - B)
- ❑ R11 : 470 (4 - 7 - 1 - B)

- ❑ R12 : 470 (4 - 7 - 1 - B)
- ❑ R13 : 4K7 (4 - 7 - 2 - B)
- ❑ R14 : 4K7 (4 - 7 - 2 - B)
- ❑ R15 : 4K7 (4 - 7 - 2 - B)
- ❑ R16 : 4K7 (4 - 7 - 2 - B)
- ❑ R17 : 4K7 (4 - 7 - 2 - B)
- ❑ R18 : 4K7 (4 - 7 - 2 - B)

9 Terminal blocks



Analog IN

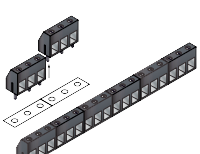
❑ 3 x 2p

V-out

❑ 2 x 2p

Digital IN

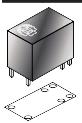
❑ 2 x 3p



INPUTS

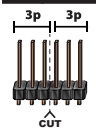
- ❑ D8 : 2p
- ❑ D9 : 2p
- ❑ D10 : 2p
- ❑ D11 : 2p
- ❑ D12 : 2p
- ❑ D13 : 2p

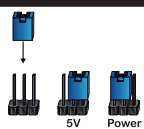
10 Relays



- ❑ RY1
- ❑ RY2
- ❑ RY3
- ❑ RY4
- ❑ RY5
- ❑ RY6

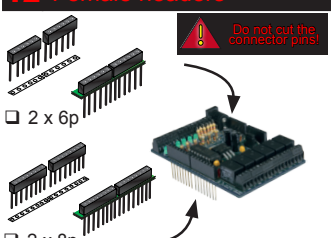
11 Male header





❑ SK16: 3p

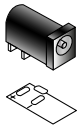
12 Female headers

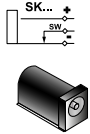


❑ 2 x 6p

❑ 2 x 8p

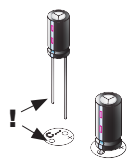
13 DC-jack





❑ SK15

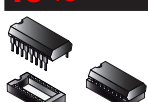
14 Electrolytic capacitors



Watch the polarity!

- ❑ C1 : 100µF
- ❑ C5: 100µF

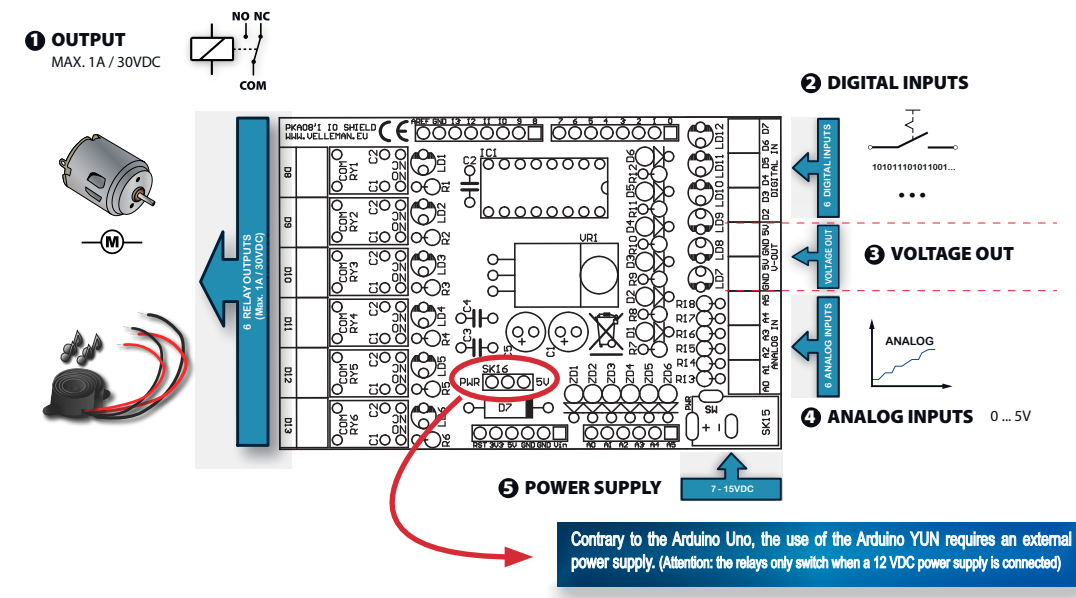
15 IC



Watch the position of the notch!

❑ IC1: ULN2003

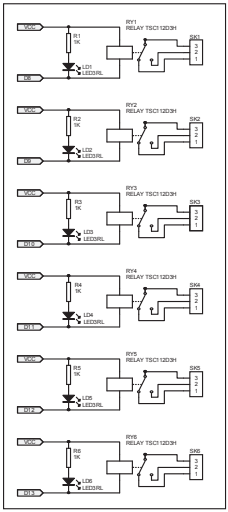
II CONNECTION DIAGRAM



III GENERAL INFORMATION

The I/O shield makes it easy to switch loads and handle digital/analogue signals. The digital inputs and outputs feature an LED that show the status of the port.

DIGITAL OUTPUT SECTION (FIG.1):



The digital outputs correspond to Arduino lines 8, 9, 10, 11, 12 and 13. Each line drives a relay through a transistor.

Fig.1 Digitial output section

DIGITAL INPUT SECTION (FIG.2):

The digital inputs correspond to Arduino lines 2, 3, 4, 5, 6 and 7, configured as digital input. Protection diodes secure the inputs in case voltages higher than 5 V are applied.

Activate the input by bringing it to a low logic level (GND) (inverse logic).

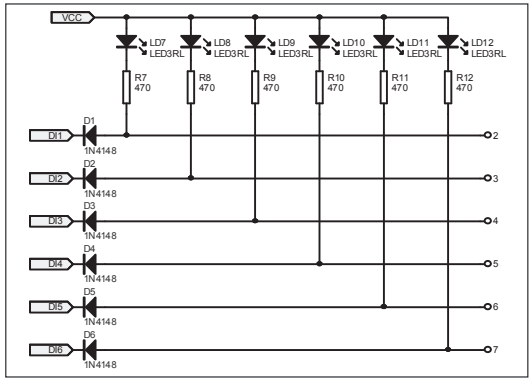


Fig.2 Digitial input section

ANALOGUE OUTPUTS (PWM):

Lines 3, 5 and 6 can be configured as analogue output (PWM, +5 V). With a value between 0 and 255, the duty cycle can vary between 0 and 100 %. Attention: The LED will have an inverse logic in this mode: 0 % duty cycle = LED on, 100 % duty cycle = LED off. All digital inputs have a common ground (GND).

ANALOGUE INPUT SECTION (FIG.3):

Each analogue input (A0..A5) features a series resistor and a protection diode.

The shield requires an external power supply (9-12 VDC).
Place jumper JP5V between the central pin and the PWR pin. In this way, the shield as the Arduino Yun are powered by their own power supply.
You can also use the shield with a classic Arduino board, which can be equipped with a power supply. Place the jumper between the central pin and 5 V pin. The Yun does not allow this because of the higher current absorption.

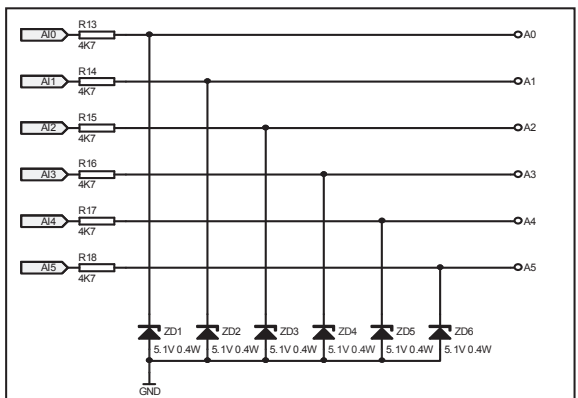
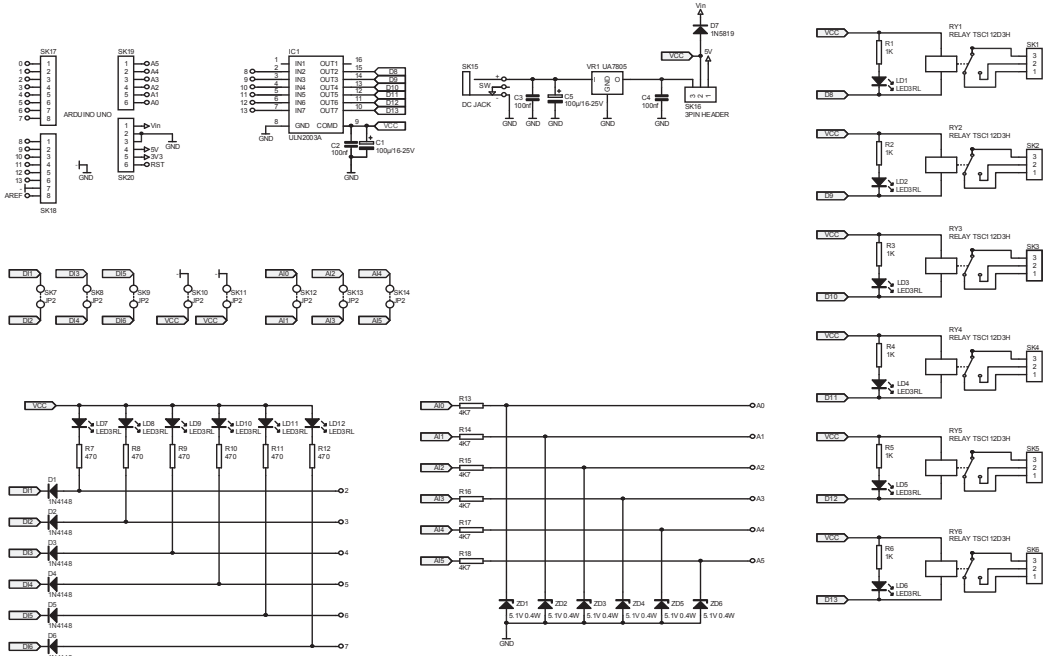
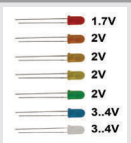


Fig.3 Analogue output section

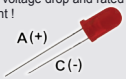

SK17
SK19
ARDUINO UNO
SK18
SK20
IC1
ULN2003A
SK15
DC JACK
SW1
VR1 UA7805
SK16
3PIN HEADER
D7
1N5819
Vin
5V
GND
VCC
RY1
RELAY TSC1 12D3H
RY2
RELAY TSC1 12D3H
RY3
RELAY TSC1 12D3H
RY4
RELAY TSC1 12D3H
RY5
RELAY TSC1 12D3H
RY6
RELAY TSC1 12D3H
SK7
SK8
SK9
SK10
SK11
SK12
SK13
SK14
SK1
SK2
SK3
SK4
SK5
SK6
LD7 LED3RL
LD8 LED3RL
LD9 LED3RL
LD10 LED3RL
LD11 LED3RL
LD12 LED3RL
R7 470
R8 470
R9 470
R10 470
R11 470
R12 470
1N4148
R13 4K7
R14 4K7
R15 4K7
R16 4K7
R17 4K7
R18 4K7
ZD1 5.1V 0.4W
ZD2 5.1V 0.4W
ZD3 5.1V 0.4W
ZD4 5.1V 0.4W
ZD5 5.1V 0.4W
ZD6 5.1V 0.4W

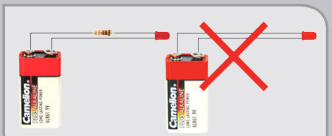
PKA08'1 IO SHIELD
WWW.VELLEMAN.EU
AREF GND 13 12 11 10 9 8
7 6 5 4 3 2 1 0
IC1
C2
VR1
C4
C3
C5
C1
SK16
PWR
5V
D7
ZD1 ZD2 ZD3 ZD4 ZD5 ZD6
PWR
MS
SK15
RST 3V3 5V GND GND Vin
A0 A1 A2 A3 A4 A5
D13 D12 D11 D10 D9 D8
COM RY1 C2 C1 NC NO
COM RY2 C2 C1 NC NO
COM RY3 C2 C1 NC NO
COM RY4 C2 C1 NC NO
COM RY5 C2 C1 NC NO
COM RY6 C2 C1 NC NO
LD1 R1
LD2 R2
LD3 R3
LD4 R4
LD5 R5
LD6 R6
LD7 LD8 LD9 LD10 LD11 LD12
R7 D1 R8 D2 R9 D3 R10 D4 R11 D5 R12 D6
R18 R17 R16 R15 R14 R13
A0 A1 A2 A3 A4 A5 ANALOG IN
GND 5V V-OUT
D2 D3 D4 D5 D6 D7 DIGITAL IN

Leds and how to use them

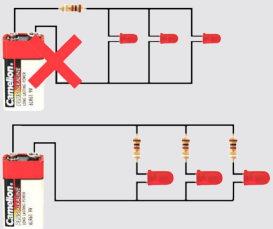


Leds feature a specific voltage drop, depending on type and colour. Check the datasheet for exact voltage drop and rated current !





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)

Supply voltage (V) - led voltage (V) / required current (A) = series resistance (ohms)

→ 9V - 1.7V / 0.005A = 1460 ohm

closest value : use a 1k5 resistor

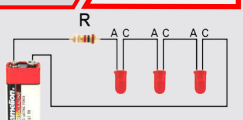
Required resistor power handling= voltage over resistor x current passed trough resistor

→ (9V - 1.7V) x 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)



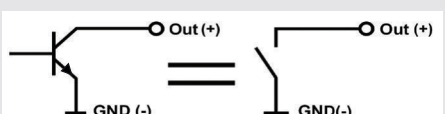
Supply voltage (V) - (number of leds x led voltage (V)) / required current (A) = series resistance (ohms)

→ 9V - (3 x1.7V) / 0.005A = 780 ohm

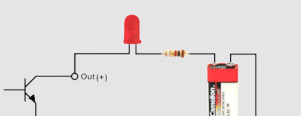
use an 820 ohm resistor

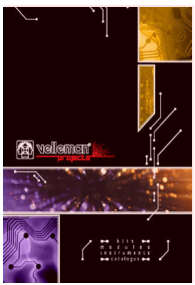
open collector outputs

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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