

Total solder points: 274

Difficulty level:

beginner 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☒ advanced

Touch screen keyboard

K8046

Features:

- ☒ LED status indication for each key/output
- ☒ Each key can be defined as toggle or momentary
- ☒ Soft touch, see-through touch panel with 8 keys
- ☒ Backlight with dim function
- ☒ Unique key-click feedback
- ☒ Optional infrared receiver module: IR38DM
- ☒ Optional BLUE BACKLIGHT: L-934MBC (8pcs required)
- ☒ 4 different functions (jumper selectable) :
 - Eight independent keys (toggle or momentary selectable)
 - Eight radio (rotary simulation) buttons
 - Four radio buttons and 4 independent keys
 - One key serves as a memory for 7 other keys or "clear all" key

Specifications:

- 8 open collector switches: max 50 Volt / 50mA (all outputs)
- Board to wire connectors: 20cm wire.
- Dimensions (including frame): 165x90x35 (depth)
- Usable temperature range: -5°C to +40°C
- Keyboard operating force: 40g. (with R0.8mm test point)
- Keyboard lifetime: 1.000.000 operations with R3mm rubber
- Power supply: 2 x 9VAC or 12VDC / 250mA max.





CAUTION:

**This kit is supplied with a GLASS type keyboard.
BE VERY GENTLE WITH THIS TYPE OF
KEYBOARD, THE SLIGHTEST BENDING WILL BREAK THE
GLASS AND COULD CAUSE
INJURY.**

**A BROKEN KEYBOARD IS NOT COVERED BY THE
WARRANTY, A NEW KEYBOARD CAN BE ORDERED AT YOUR DEALER.
ORDER CODE: KB020501**

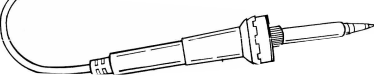
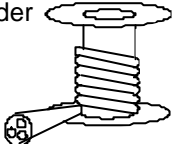
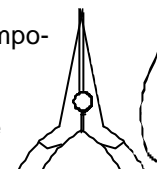
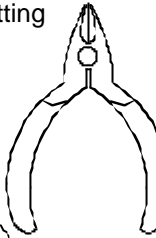
**IMPORTANT: Since this is a complex assembly with a lot of
possibilities, it is advisable to read through the complete in-
structions BEFORE starting the actual assembly.
BE WARNED !**

**VELLEMAN KIT NV
Legen Heirweg 33
9890 Gavere
Belgium
www.velleman.be
www.velleman-kit.com**

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

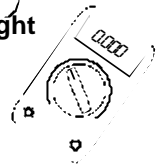
Ok, so we have your attention. These hints will help you to make this project successful. Read them carefully.

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 :

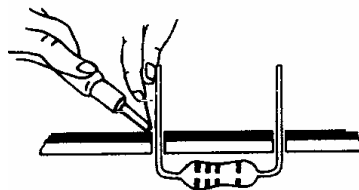
- ⇒ Make sure the skill level matches your experience, to avoid disappointments.
- ⇒ Follow the instructions carefully. Read and understand the entire step before you perform each operation.
- ⇒ Perform the assembly in the correct order as stated in this manual
- ⇒ Position all parts on the PCB (Printed Circuit Board) as shown on the drawings.
- ⇒ Values on the circuit diagram are subject to changes.
- ⇒ 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

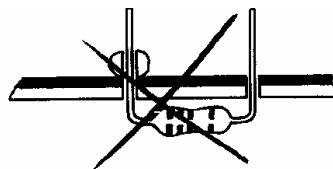
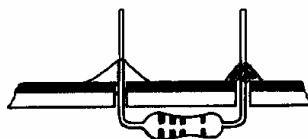
* Typographical inaccuracies excluded. Always look for possible last minute manual updates, indicated as 'NOTE' on a separate leaflet.

1.3 Soldering Hints :

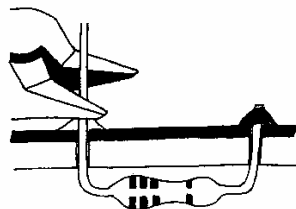
1- Mount the component against the PCB surface and carefully solder the leads



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

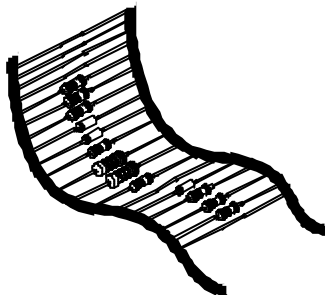


3- Trim excess leads as close as possible to the solder joint



AXIAL COMPONENTS ARE TAPED IN THE CORRECT MOUNTING SEQUENCE !

REMOVE THEM FROM THE TAPE ONE AT A TIME !



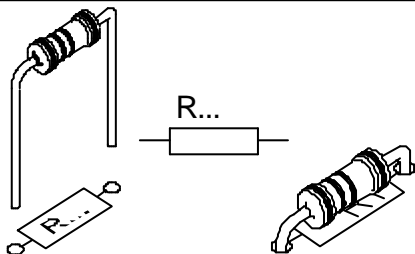
CONSTRUCTION

The unit consist out of two PCB's, one is the main PCB, P8046B and the other is the backlight PCB P8046L.

👉 Tip : The pictures on the packaging can be used as a guideline. However due to possible changes it is not 100% reliable.

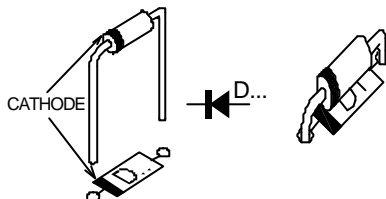
First we will assemble the P8046B.

1. Resistors



- ❑ R1 : 680E (6-8-1-B)
- ❑ R2 : 680E (6-8-1-B)
- ❑ R3 : 680E (6-8-1-B)
- ❑ R4 : 680E (6-8-1-B)
- ❑ R5 : 680E (6-8-1-B)
- ❑ R6 : 680E (6-8-1-B)
- ❑ R7 : 680E (6-8-1-B)
- ❑ R8 : 680E (6-8-1-B)
- ❑ R9 : 10K (1-0-3-B)
- ❑ R10 : 10K (1-0-3-B)
- ❑ R11 : 10K (1-0-2-B)
- ❑ R12 : 1K5 (1-5-2-B)
- ❑ R13 : 10K (1-0-3-B)
- ❑ R14 : 1K5 (1-5-2-B)
- ❑ R15 : 100K (1-0-4-B)
- ❑ R16 : 100K (1-0-4-B)
- ❑ R17 : 100K (1-0-4-B)
- ❑ R18 : 100K (1-0-4-B)
- ❑ R19 : 120E (1-2-1-B)
- ❑ R20 : 1K5 (1-5-2-B)

2. Diodes, check the polarity

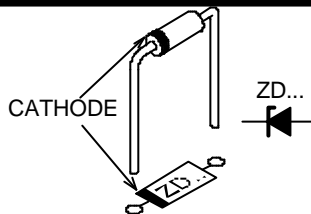


- ❑ D9 : 1N4148
- ❑ D10 : 1N4007
- ❑ D11 : 1N4007

Remark:

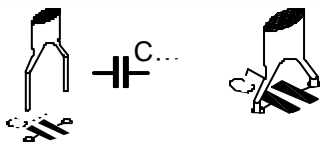
D1 to D8 are not mounted at this time.

3. Zenerdiodes



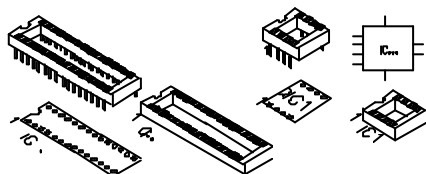
- ❑ ZD1 : 5V6 - 500mW
- ❑ ZD2 : 5V6 - 500mW
- ❑ ZD3 : 5V6 - 500mW
- ❑ ZD4 : 5V6 - 500mW
- ❑ ZD5 : 5V6 - 500mW
- ❑ ZD6 : 5V6 - 500mW

4. Ceramic Capacitors



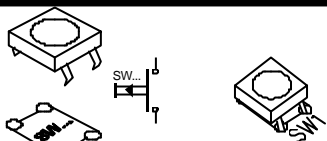
- ☐ C1 : 22pF (22)
- ☐ C2 : 22pF (22)
- ☐ C3 : 100nF (104, u1)
- ☐ C4 : 100nF (104, u1)
- ☐ C5 : 100nF (104, u1)

5. IC sockets. Watch the position of the notch!



- ☐ IC1 : 28p
- ☐ IC2 : 18p

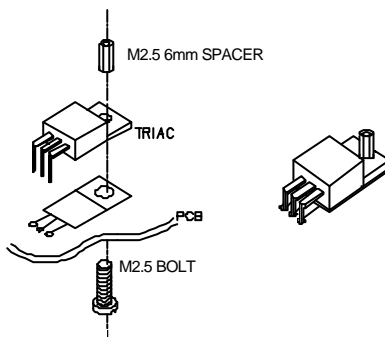
6. Push buttons



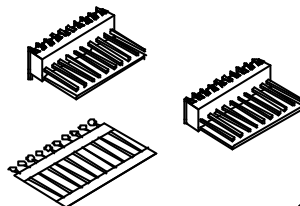
- ☐ SW1 : RESET
- ☐ SW2 : BACKLIGHT

Type : KRS1273

7. Voltage regulator

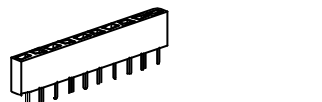


8. Connectors



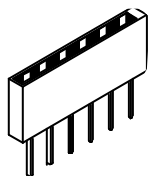
- ☐ SK3 : 3p
- ☐ SK5 : 10p

CUT BETWEEN PIN 11 & 12



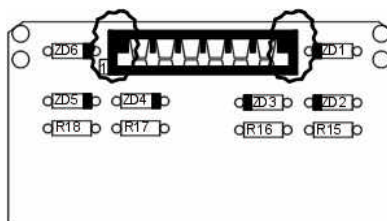
- ☐ SK8 : 10p

9. Conn. Printed cable

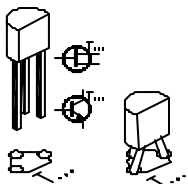


- ☐ SK4 : 6p

WATCH THE POSITION OF THE CONNECTOR !

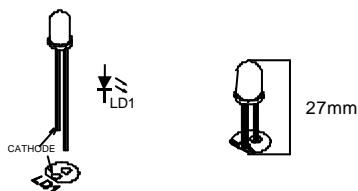


10. Transistors



- ☐ T1 : BC557
- ☐ T2 : BC547

11. LED. Watch the polarity!

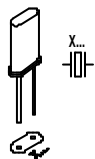


Power indication, make your choice as you prefer:

- ☐ LD17 : 3mm green clear
OR 3mm red

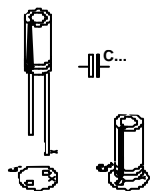
12. Quartz crystal

- ☐ X1 : 4MHz

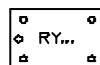
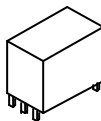


13. Electrolytic capacitors. Watch the polarity !

- ☐ C6 : 10 μ F
- ☐ C7 : 100 μ F

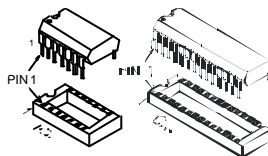


14. Relays



- ☐ RY1: VR15M121C

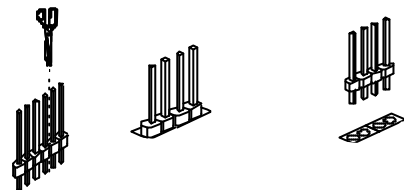
15. IC's. Watch the position of the notch!



- ☐ IC1: VK8046 Programmed
PIC16C55A-04 or equivalent

16. Header

- ☐ SK1 - SK2 : 4p



17. Keyboard set-up

Each key is function definable (moment or toggle) and backlit. It is even possible to simulate old fashioned “radio buttons” (only one output can be ON, just like a rotary switch).

One key can be defined as a pre-set memory or serve as “all clear”.

The K8046 features 4 operating modes, selectable with shunt SK1 or SK2.

1. Eight independent keys (toggle or momentary selectable).
2. Eight radio (Rotary simulation) buttons.
3. Four radio buttons and 4 independent keys.
4. One key is reserved as memory or “clear all” function.

| MODE | SHUNT SELECTION | |
|------|-----------------|-----|
| | SK1 | SK2 |
| 1 | OFF | OFF |
| 2 | OFF | ON |
| 3 | ON | OFF |
| 4 | ON | ON |

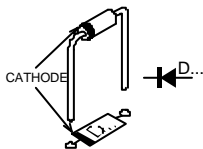
Momentary (push button-) function : Hold the key to activate the output and release the key to deactivate it.

Toggle function : Operates according to the principle of a classic switch, i.e. you have to press the key once to switch and press again to deactivate it.

For each output :

If a **momentary** output is needed, DO **NOT** mount a diode for the corresponding output D1 to D8.

If a **toggle** output is needed, **MOUNT** a diode for the corresponding output D1 to D8.

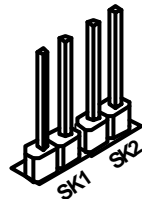


Diode type: 1N4148
Check the polarity !

JUMPER SELECTION

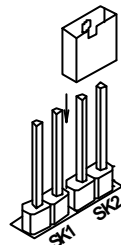
Different possibilities in conjunction with diode setup:

- 1- **Eight indepent keys** (no jumper is mounted) toggle or momentary selectable see previous page.



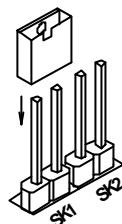
- 2- **Eight radio (Rotary simulation) buttons**, only one button (output) at a time can be ON. Again with possibility of momentary or toggle.

☞ Normally a toggle function will be used for this type of output.



- 3- **Four radio buttons and 4 independent keys.**

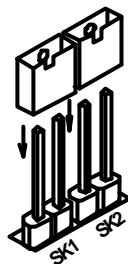
This is a combination of above. The first row (1 to4). Are independent buttons, the second row (5 to 8) have a rotary simulation.



- 4- **Key 8 is reserved as memory or 'Clear all' Function.**

If D8 is mounted this key will switch between all clear and memory of the previous keyboard setting.

If D8 is NOT mounted, this key will serve as all clear.



HINT: the separate CLEAR button can also be used as keyboard clear function. This key will actually reset the processor.

18. Optional IR detector

It is possible to use the keyboard together with a remote control (e.g. our K8049 & K8051). In this case an optional receiver module type **IR38DM** is available.

Position the module like in the drawing. Use some hot glue to hold the receiver in place on the relay (Fig 1.0)

Make the connections:

- Connect 1 with right side of R13
- Connect 2 with COM connection of the output connector
- Connect 3 with left connection of R20. See picture.

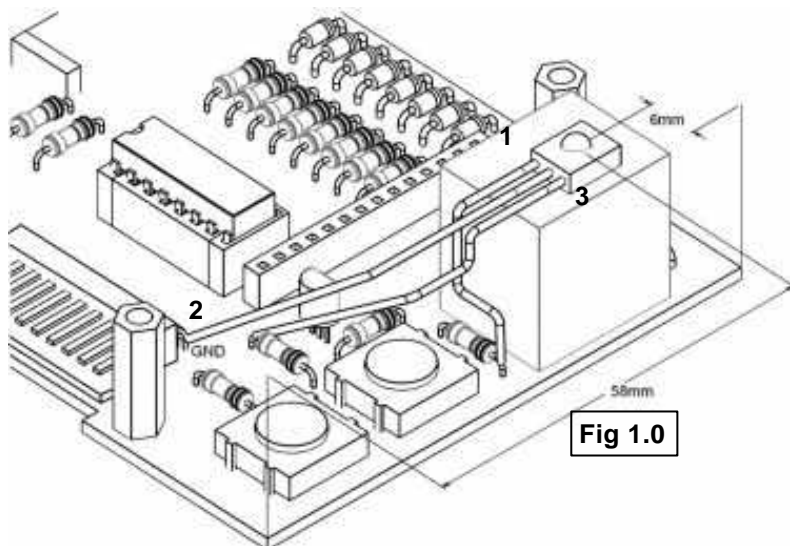
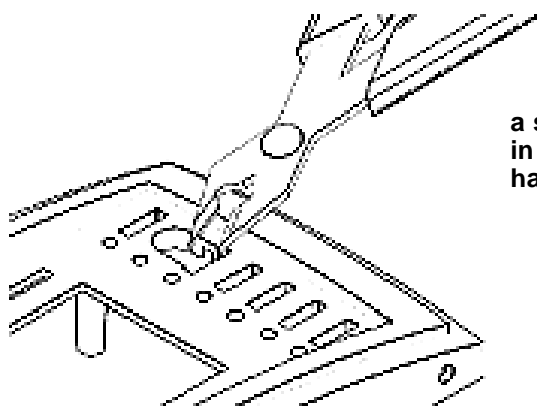


Fig 1.0



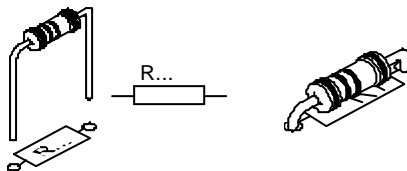
**a special cut-out
in the front panel
has to be made.**

Fig 2.0

P8046L Backlight PCB assembly

1. Resistors

- R21 : 180E (1-8-1-B)
- R22 : 180E (1-8-1-B)
- R23 : 180E (1-8-1-B)
- R24 : 180E (1-8-1-B)
- R25 : 180E (1-8-1-B)
- R26 : 180E (1-8-1-B)
- R27 : 180E (1-8-1-B)
- R28 : 180E (1-8-1-B)



2. Spacers for keyboard support

- Mount six 8mm M2,5 spacers at the indicated positions using six 6mm M2,5 screws (Fig 3.0).

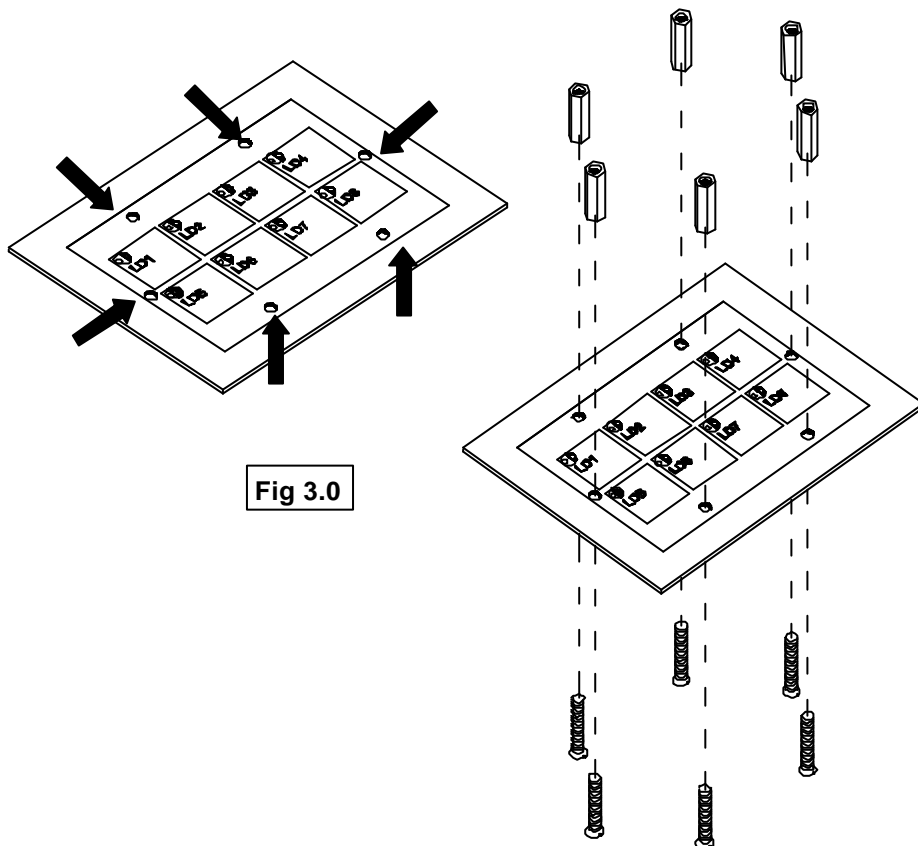
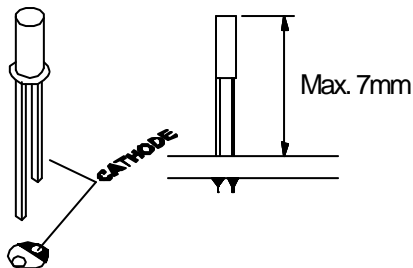
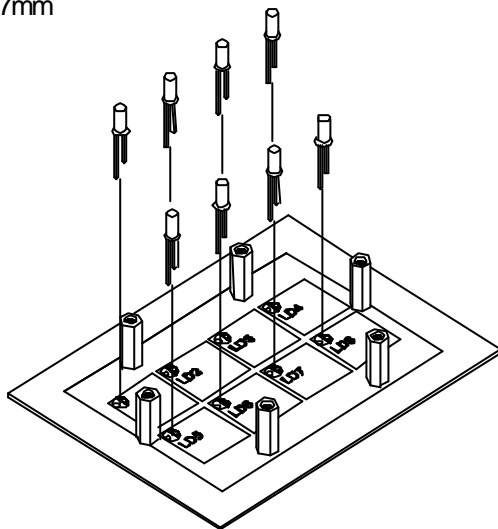



Fig 3.0

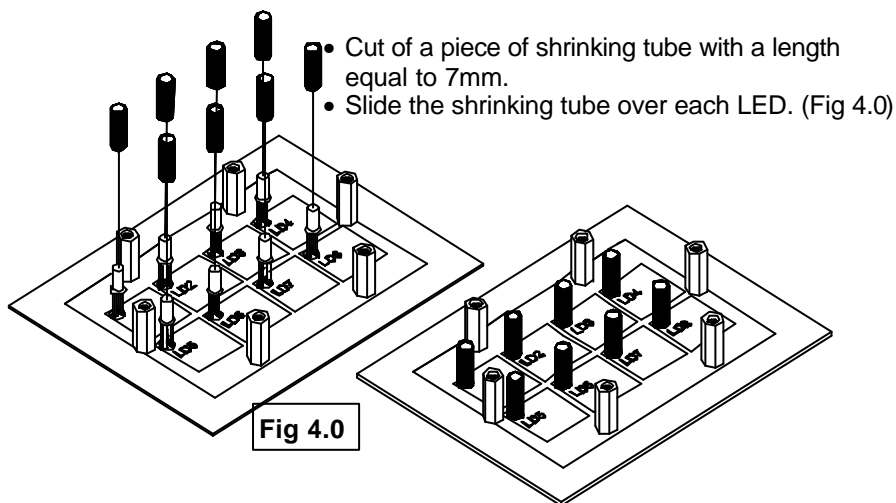
3. Output status indications



- LD1 : 3mm Red
- LD2 : 3mm Red
- LD3 : 3mm Red
- LD4 : 3mm Red
- LD5 : 3mm Red
- LD6 : 3mm Red
- LD7 : 3mm Red
- LD8 : 3mm Red



 **HINT:** if not all keys/outputs are used, do not mount a LED for the not used key/output.



4. LED's for backlight

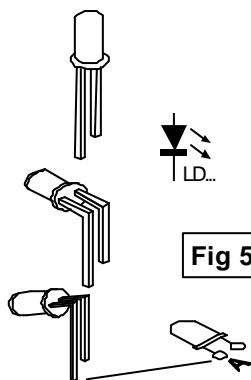


Fig 5.0

Anode

IMPORTANT

Mount these LED's exactly like in the drawings.

First: Bend the leads exactly like the drawing (Fig 5.0).

Next: Solder **one** lead, and check the position, if necessary correct by heating the soldering (Fig 6.0).

Last: Solder the second connection.

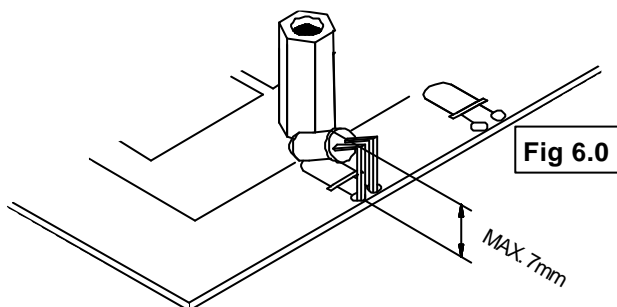


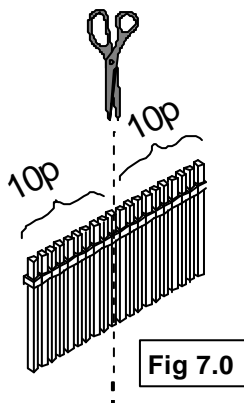
Fig 6.0

- LD9 : 3mm Green clear
- LD10 : 3mm Green clear
- LD11 : 3mm Green clear
- LD12 : 3mm Green clear
- LD13 : 3mm Green clear
- LD14 : 3mm Green clear
- LD15 : 3mm Green clear
- LD16 : 3mm Green clear

TIP

Blue backlight is possible using special LED's (8pcs required).
Ordernr. : L-934MBC

5. Header for backlight PCB connection



First cut the header into two headers with each 10 contacts (Fig 7.0)

Then place one 10p at position SK9 (Fig 8.0).

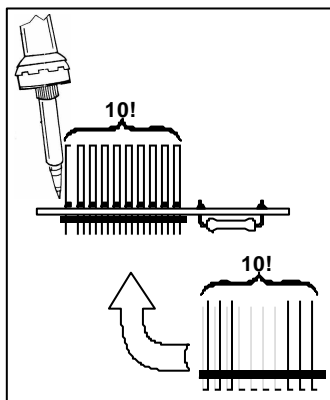
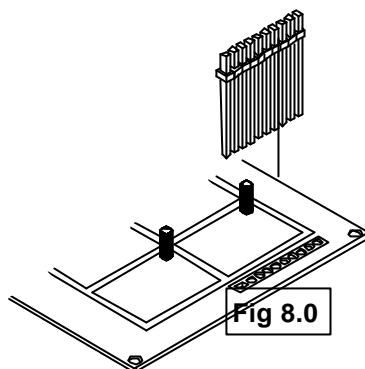
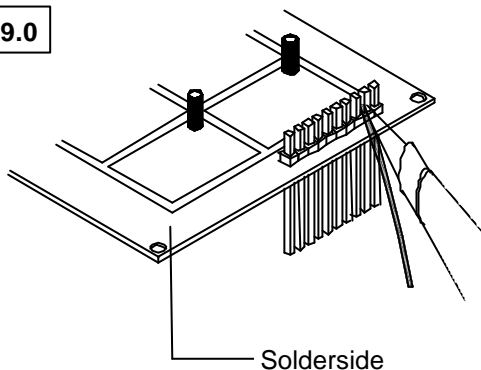


Fig 9.0

Last solder the header (see fig 9.0)

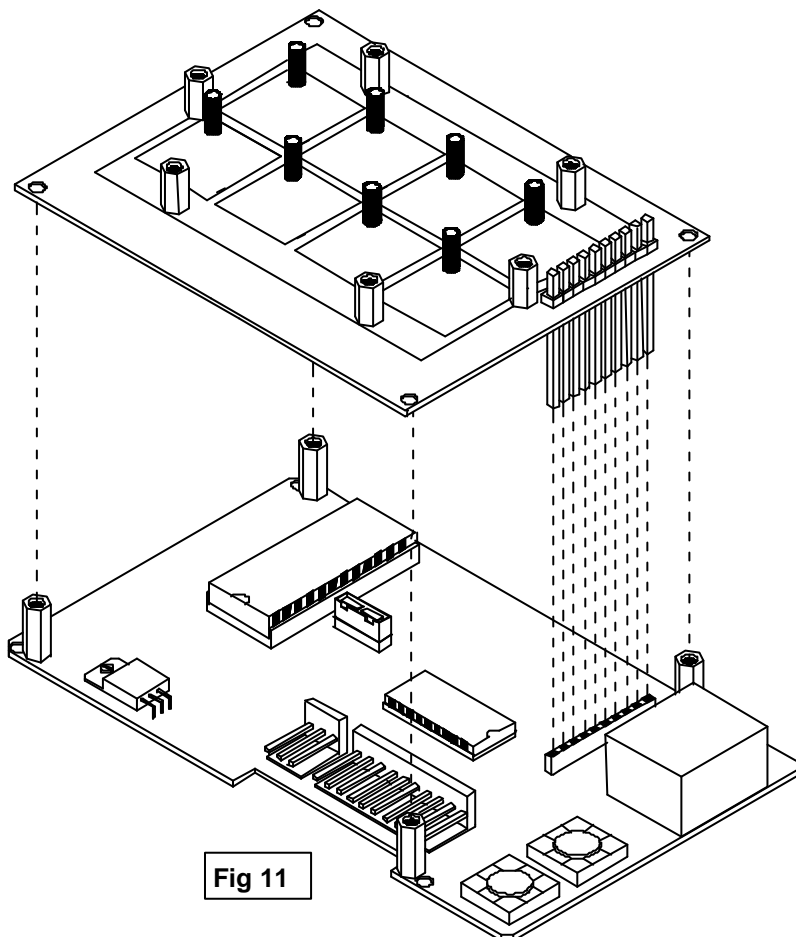
□ SK9 : Pin header



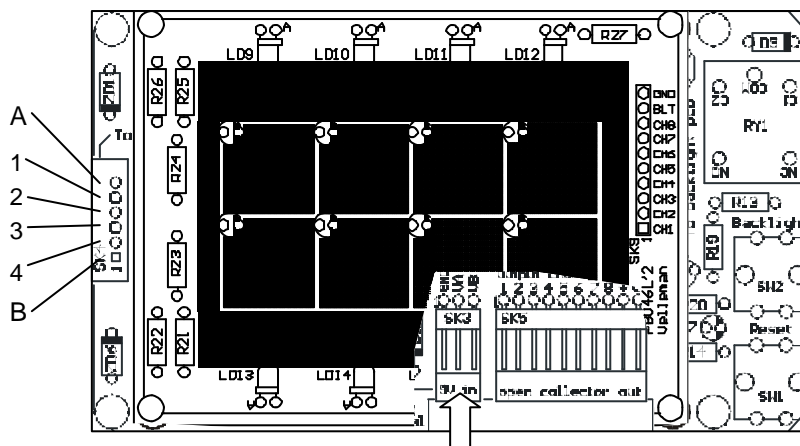
- Fit the touch screen pcb at the component side of the base PCB (Fig 11)

☞ **Do not fix yet !**

☞ Make sure that the connector is correctly inserted when you mount the backlight onto the spacers.



7. Testing the circuit



Connect 9 to 12Vdc / 300mA, between GND (-) and VA or VB

Before making a final assembly we will test the circuit:

Supply the power to the circuit (use the supplied wired connector, brown (-) and red (+) wire).

Normally the relay should “click” and the backlight should lit. If not; try “reset” SW1.

Now test the keyboard input (keyboard connector SK4):

Using a small piece of wire, make a shunt between point A and point 1, one of the output LED's should lit.

Now test the other points A+2, A+3 and A+4.

All the top row output LED's should have lit one by one.

Perform the same test using point B as common, all the bottom row output LED's should lit one by one.

The circuit is now ready for final assembly.

REMOVE THE BACKLIGHT PCB !

8. Creating your printed keyboard

The big advantage of this kit is that it is possible to create your own keyboard lay-out using a computer and printer.

Use transparent foil suitable for your printer

As an example a few standard lay-outs are supplied, these can be used as a guide to create your own. Please cut-out the desired layout before use.

On our web site a template can be downloaded to start making you own design, your imagination is the limit, just keep in mind the position of the keys and position of the output indications LED's. (see drawing 12)

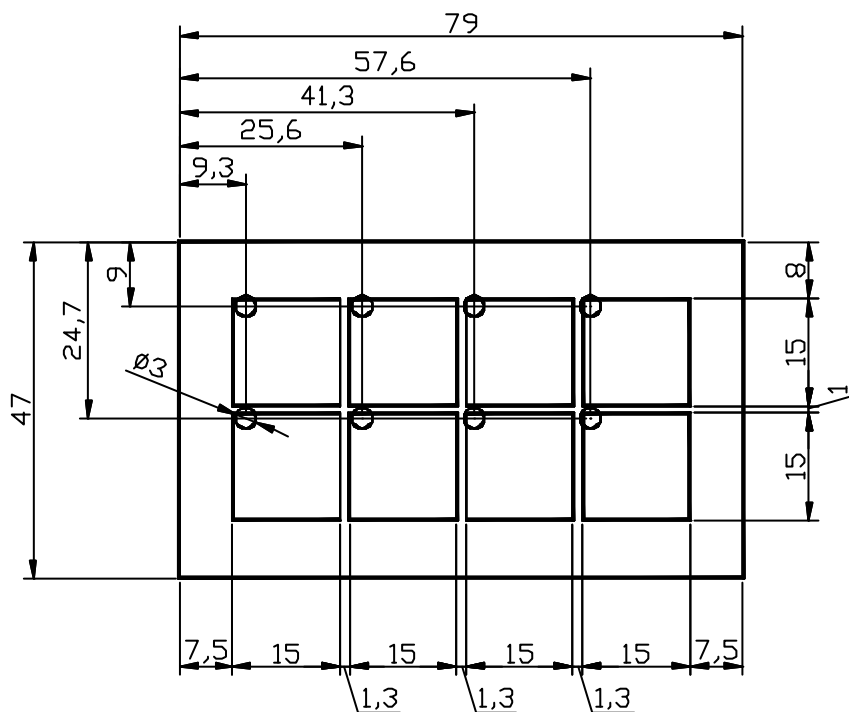
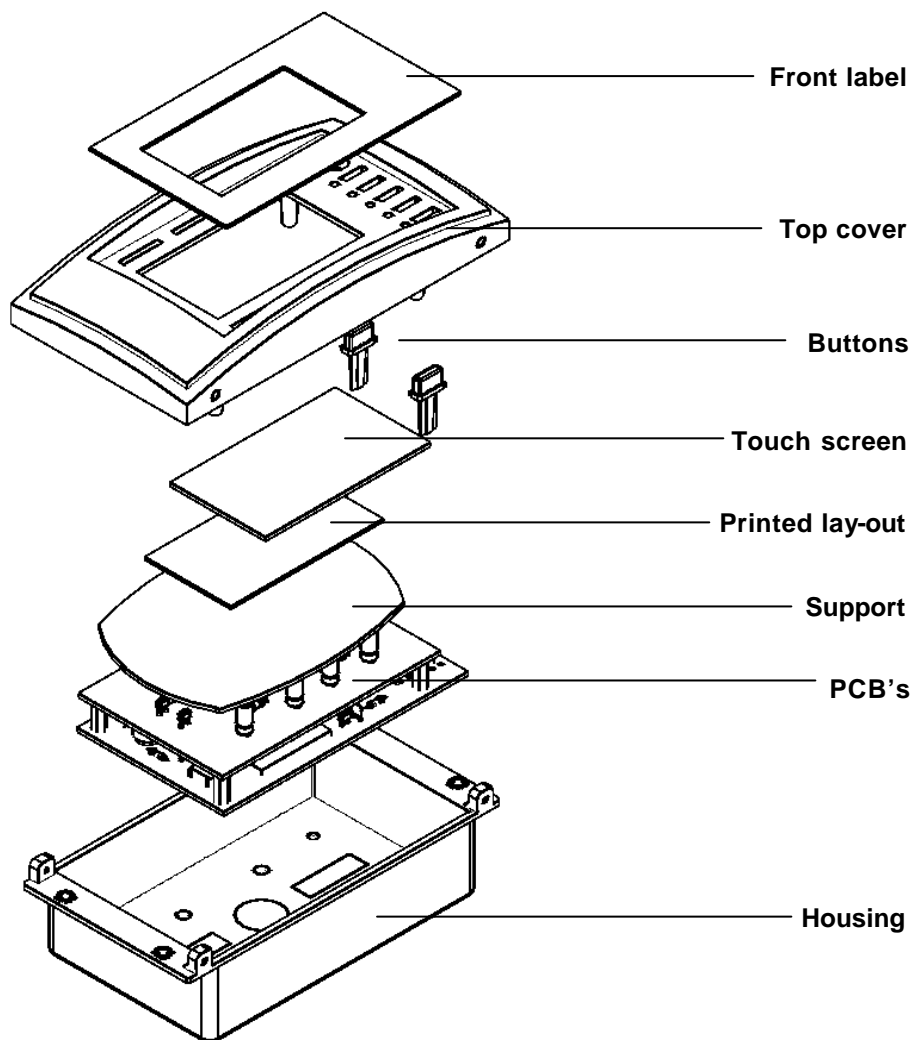


Fig 12

* Measurements are in mm !

9. Mounting order overview



**FOLLOW THE ASSEMBLY STEPS EXACTLY
LIKE ON THE NEXT PAGES !!**

10. Final assembly

IMPORTANT:

Remove all impurities (e.g. dust, solder) between the various elements prior to assembly (between window & on-screen keys, on-screen keys & touchscreen).

STEP1

Gently remove the protective foil from the glass keyboard & support

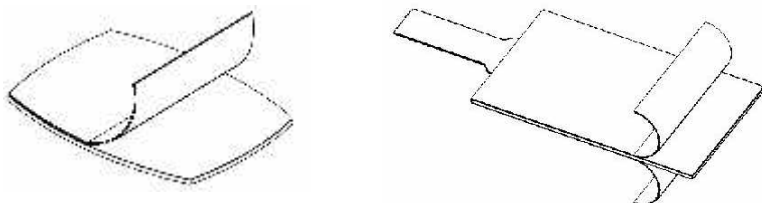


Fig 13

STEP2

Check the touch sensitive side of the keyboard.
See the position of the connector.

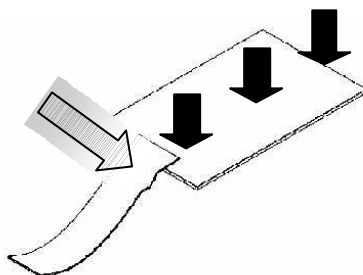


Fig 14

STEP 3

Position the keyboard gently into the frame between the 4 edge positioners.
Check the position of the connector and check that the touch sensitive side is downwards.

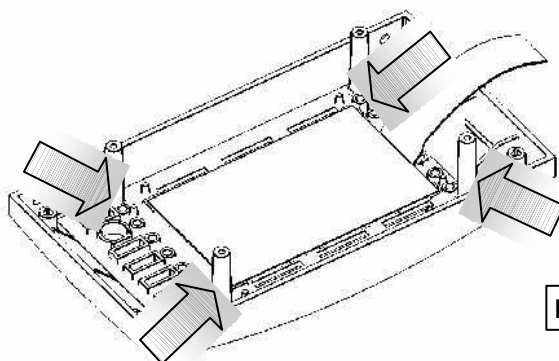


Fig 15

STEP 4

Position your lay-out onto the keyboard.

Make sure the lay-out is positioned in the centre and in the correct surface/ position.

Fix the lay-out using two pcs of clear tape

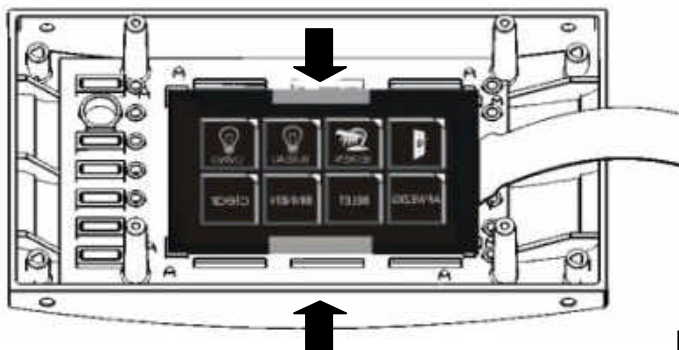


Fig 16

STEP 5

Position the keyboard support like in the drawing, between the provided studs, there is only 1 way.

HINT: to make the backlight more even and to prevent seeing the backlight PCB, it is advisable to diffuse the support plastic using some fine "sanding paper"

Again fix the plastic support using two pcs of tape.

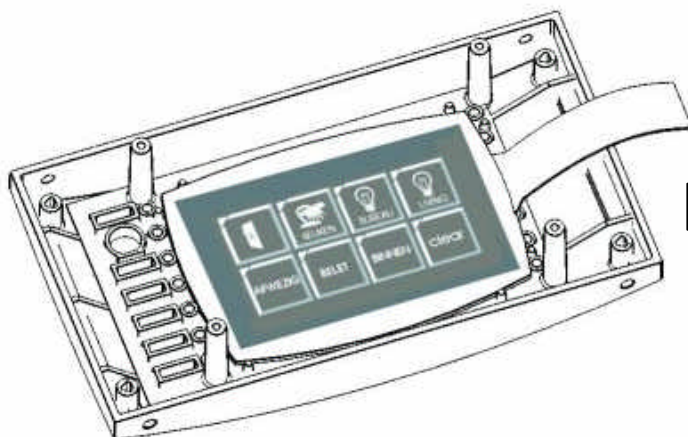


Fig 17

STEP 6

Connect the keyboard connector with the base PCB.

- ☞ Take great care to not damage the printed cable. This cable is composed by a plastic base with silver ink and shielded by a protective coating

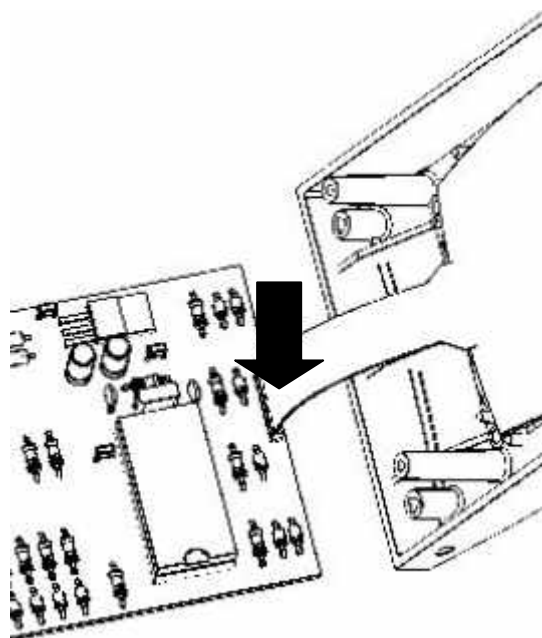
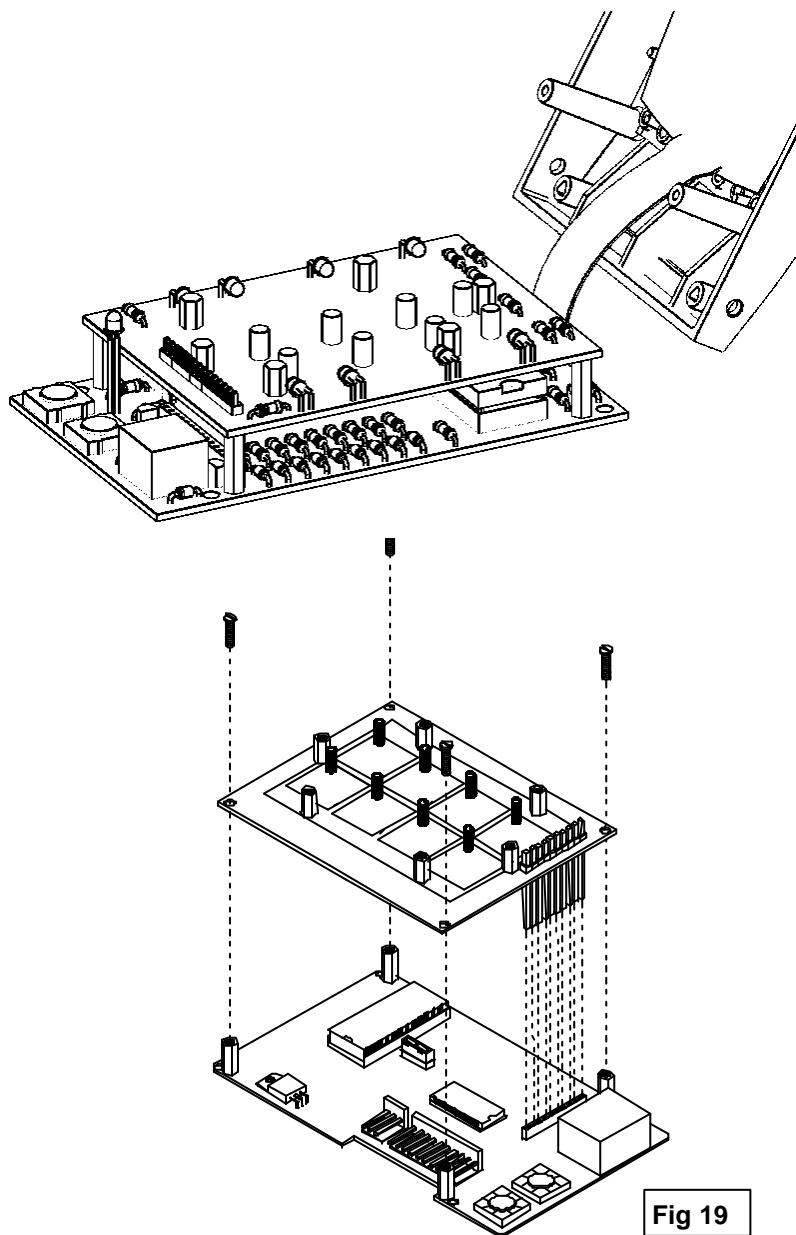


Fig 18

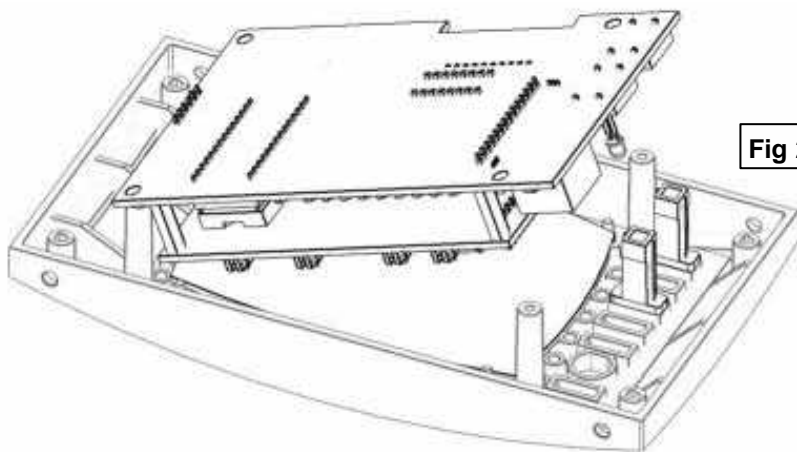
STEP 7

Mount the backlight PCB onto the base PCB, fix the PCB using four 2.5mm screws (Fig 19)

**Fig 19**

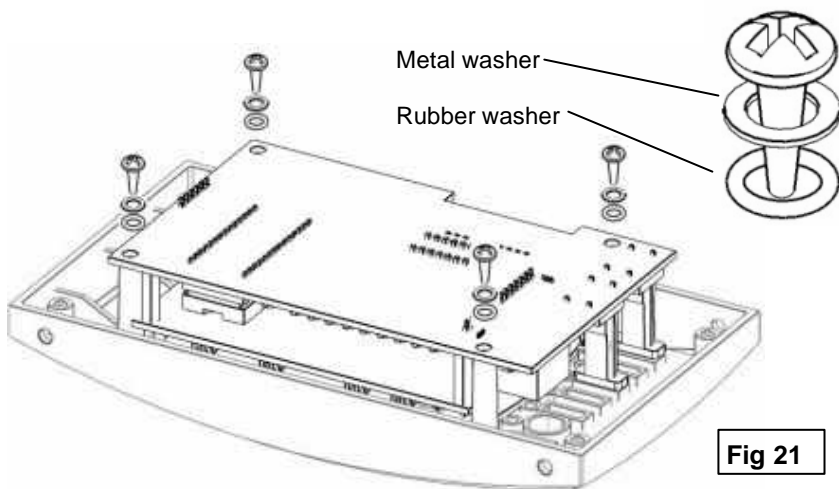
STEP 8

Now the complete unit can be mounted into the frame.
Insert also the two push-button actuators at the correct place.

**Fig 20****STEP 9**

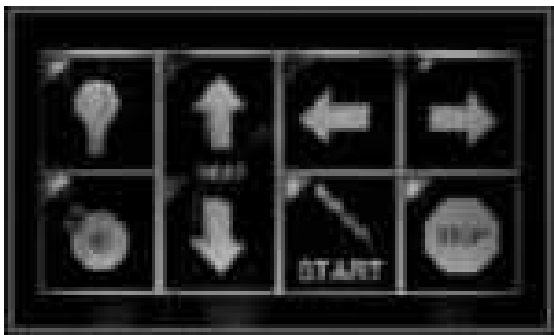
Fix the PCB using 4 self tapping screws + four metal washers and four rubber washers.

Be gentle tot to tighten too much, this can damage the glas touch screen!!

**Fig 21**

STEP 10

Make sure that the output LED's correspond to your keyboard lay-out. If not you will have to disassemble the unit and reposition the lay-out.

**Fig 22****STEP 11****Demo mode**

To test the keyboard functions automatically, a demo mode is integrated.

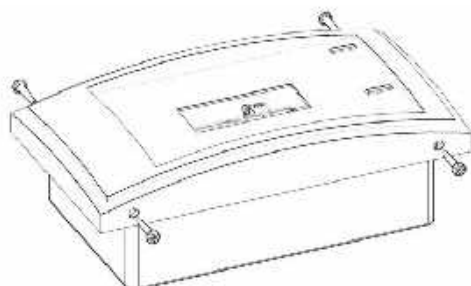
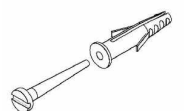
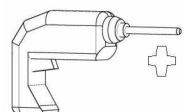
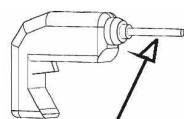
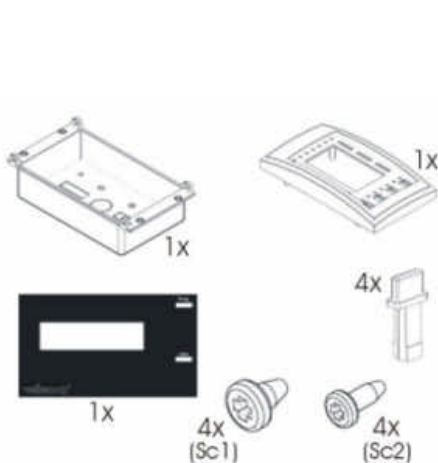
1. **Press and hold** the backlight switch
2. **Press clear** briefly
3. **Release** the backlight switch, now the keyboard will show a demo of outputs and backlight dim.

Note: Before starting the “demo”, the output LED's will indicate the “toggle” keys, this can be convenient to check the keyboard set-up.

CAUTION:

During demo mode the “real” outputs are also activated.

11. Mounting the keyboard



**PREVENT THE ENCLOSURE FOR POSSIBLE TORSION, THIS CAN DESTROY / BREAK THE GLASS KEYBOARD.
PREVENT THE KEYBOARD TO DIRECT SUNLIGHT EXPOSION**

 **The warranty does NOT cover a broken screen.**

Protect the device against direct sunlight during assembly.

WALL MOUNTED

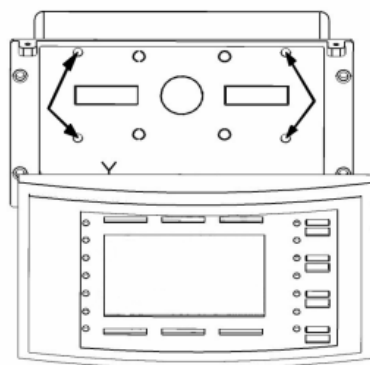
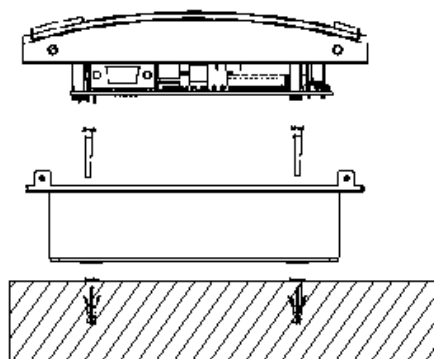
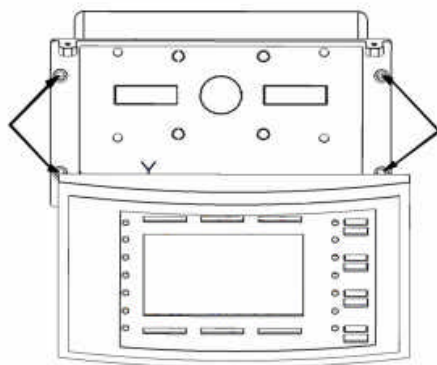
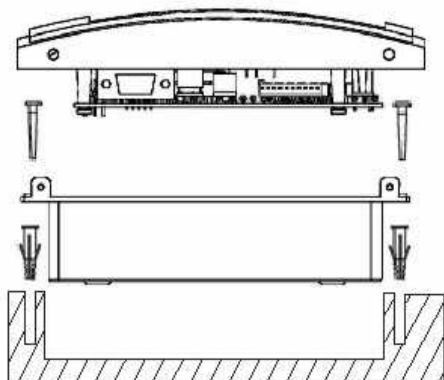


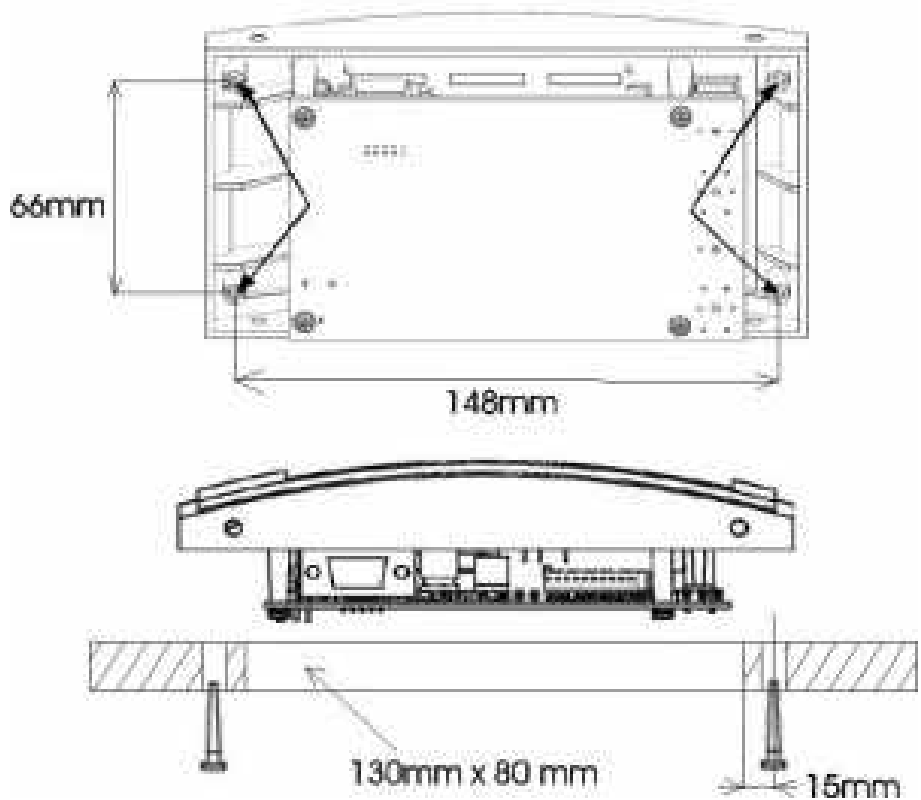
Fig 23

FLUSH MOUNTED



- Max. diameter 8mm
- 138mm x 85mm x min. 40mm / 5,4" x 3,3" x 1,6"

Fig 24

PANEL MOUNTED**Fig 25**

12. Use of the keyboard

Connect the open collector outputs of the keyboard with your application. An open collector output is similar to a switch contact but keep in mind that a polarity must be respected.

If all outputs are used the maximum current can not exceed 50mA with a maximum of 50Vdc

REMEMBER: There is **NO** voltage coming **OUT** of the outputs



See next pages for connection examples.

Keyboard operation:

Gently press the key on the glass keyboard, an output action should occur and the relay should give a keyboard click feeling.

If an output is set as a toggle, the corresponding output LED will be activated/deactivated with each press.

If an output is set as momentary, the corresponding output LED will be activated only during the key-press.

Backlight operation:

Each press of the backlight button will toggle between dim and regular backlight.



HINT: the dim backlight level can be decreased by increasing the resistor value of R19.

Remote control:

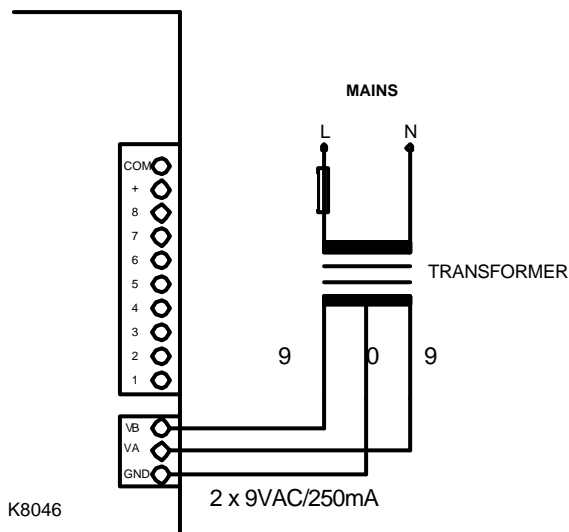
If a remote option is chosen, please set the remote K8049 & K8051 in mode 1 to make it compatible with the keyboard (see remote control manual)

The keys 1 to 8 on the remote will simulate the keyboard keys 1 to 4 (top row) and 5 to 8 (bottom row).

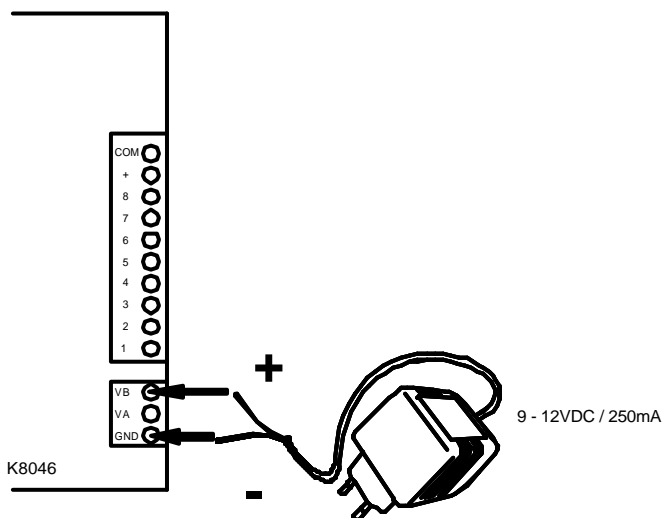
The clear function of the remote (Shift + key 16) will clear the outputs (same function as the "Clear" button).

13. Power supply connection

1. Hook-up when using a transformer :



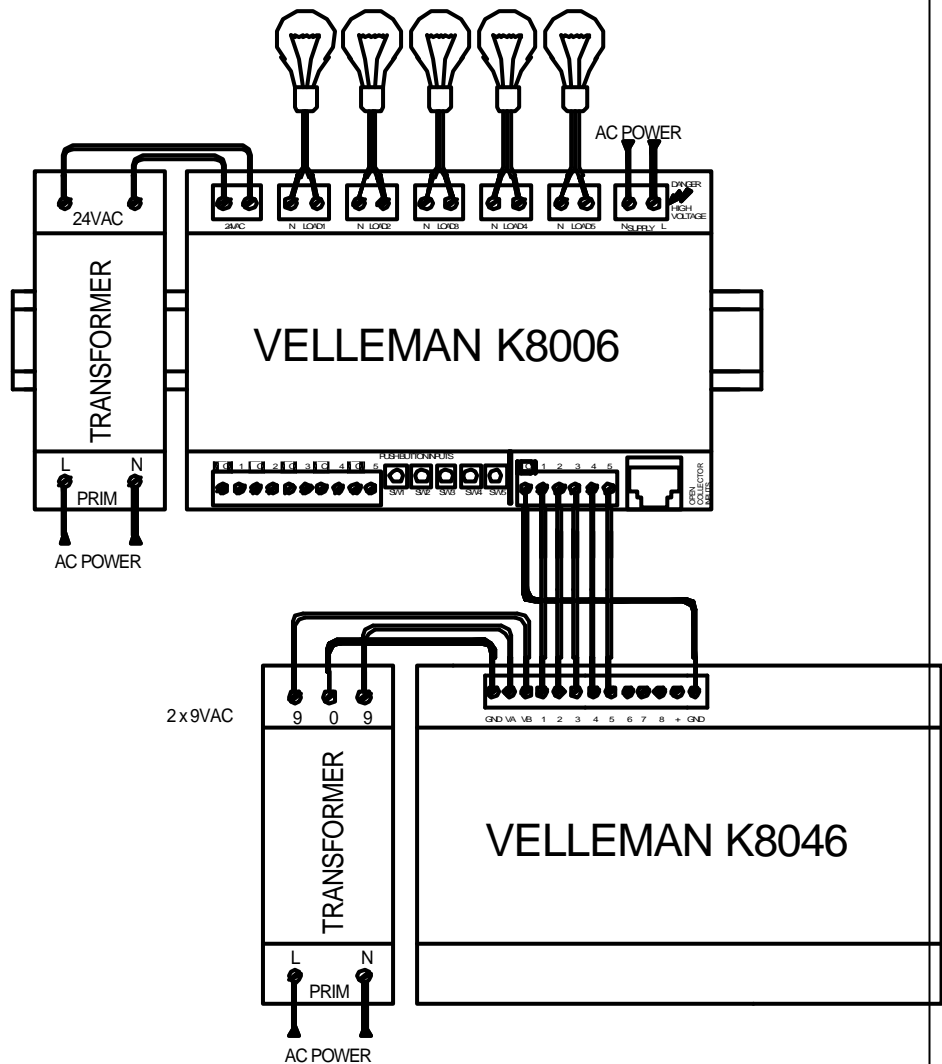
2. Hook-up when using an adapter or dc source :



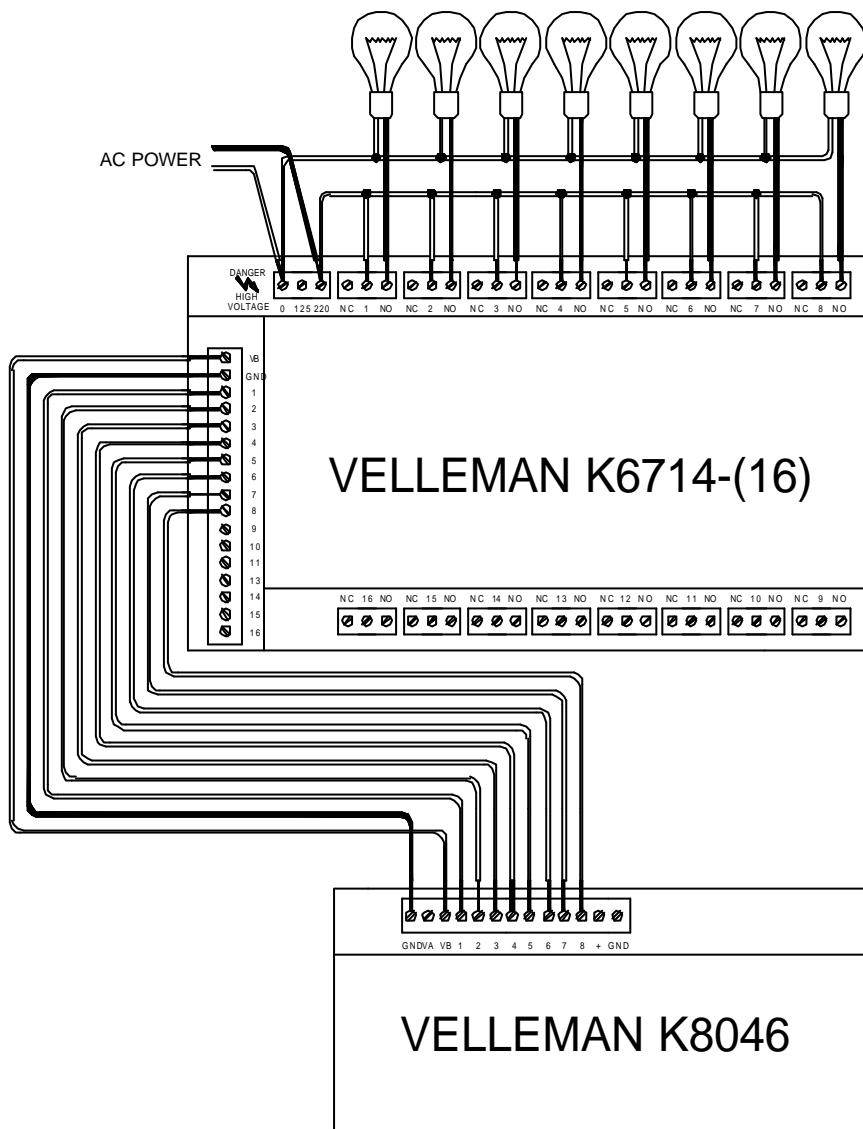
14. Example with K8006

The outputs can easily be connected to your own application or to several of our kits; our K8045 LCD message board, K6714 relay card, K8006 light system bus unit , K8000 computer interface, K2633 or K2634 power cards, K8023 two wire remote.

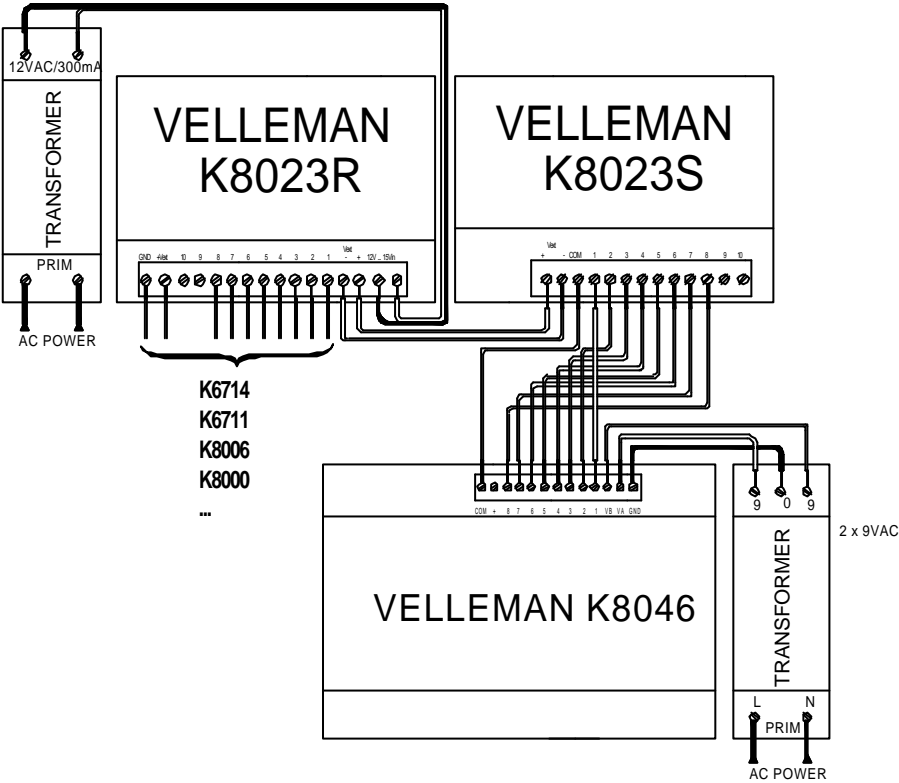
For further connections of the K8006 look at the illustrated part list of the K8006.



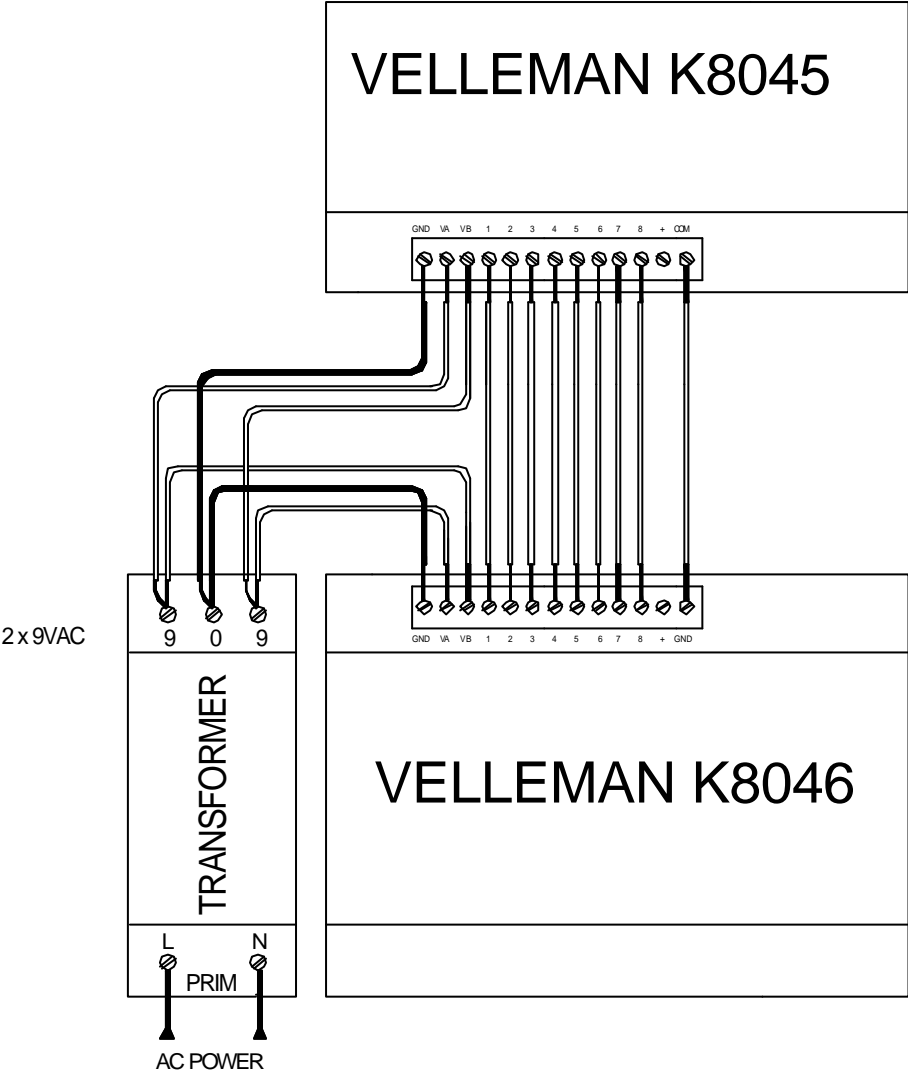
Example with K6714



Example with K8023

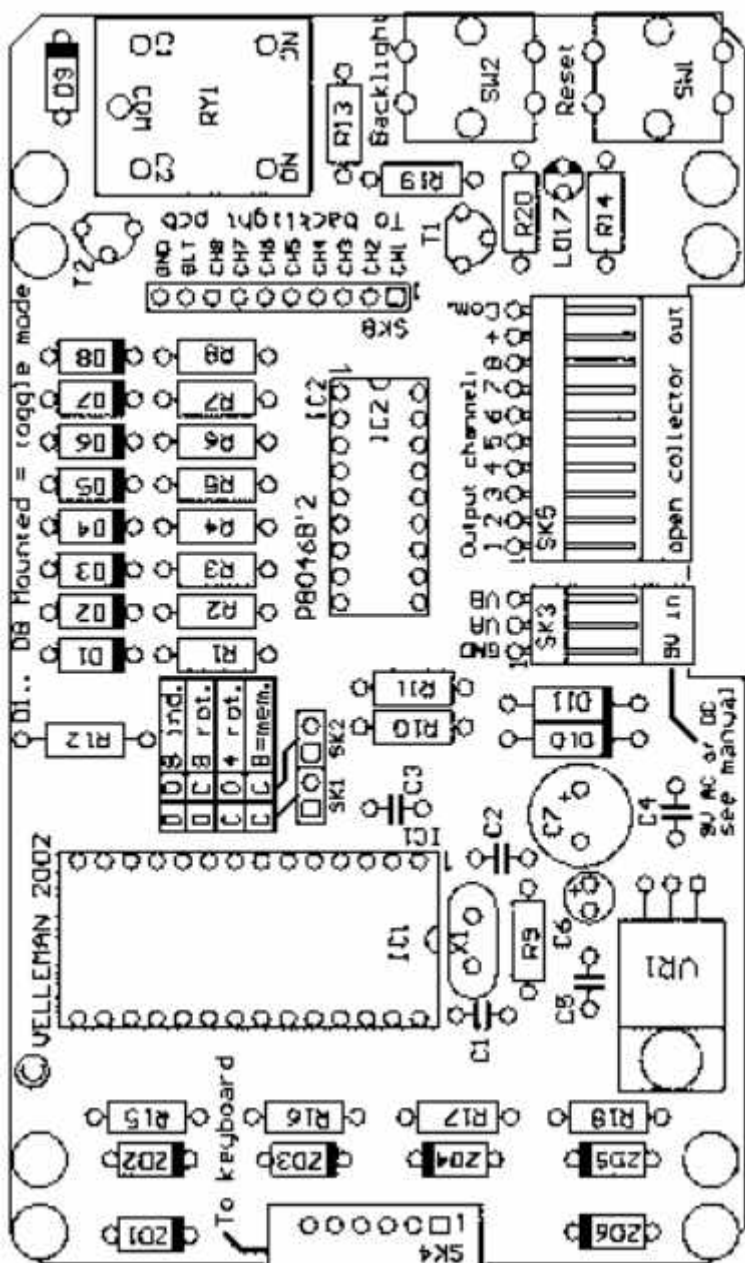


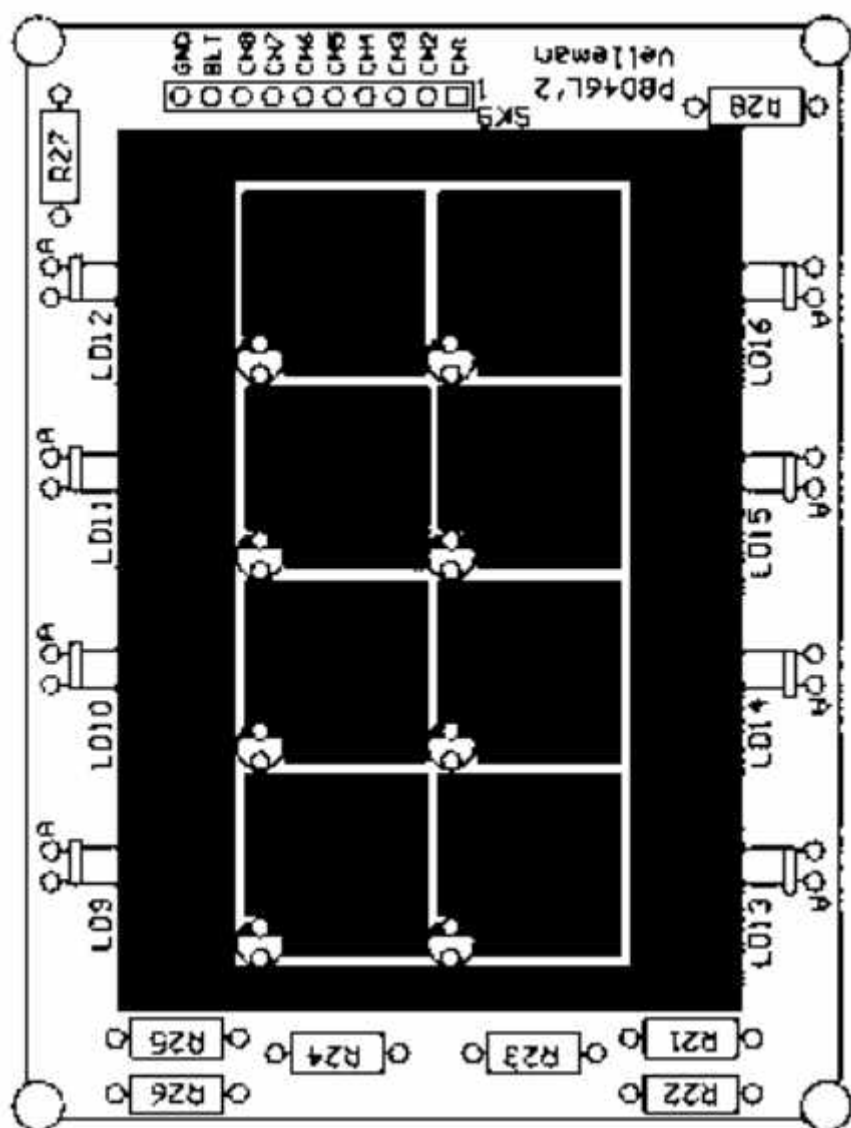
Example with K8045



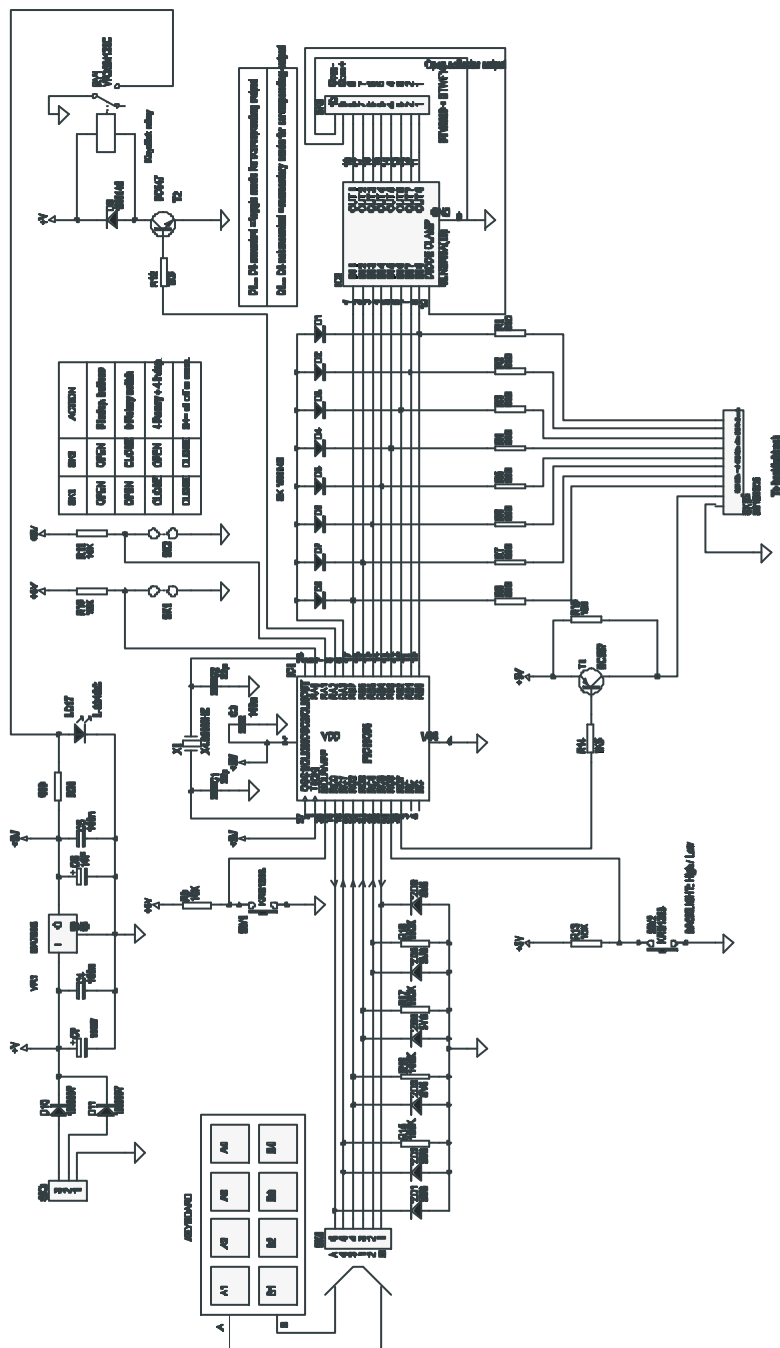
PCB & DIAGRAM

15. PCB layout.





16. Schematic diagram.



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