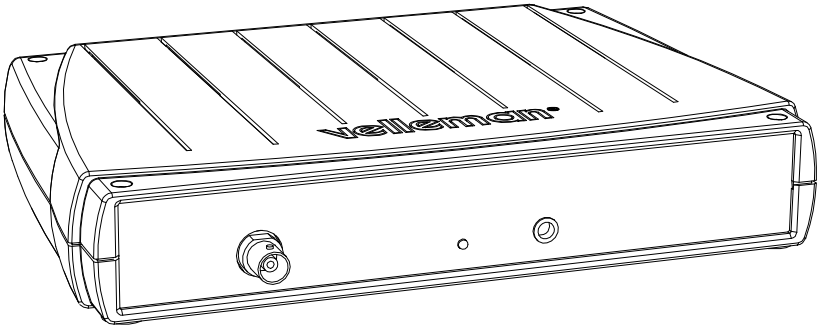
Total solder points: 625
Difficulty level:
beginner 1☐ 2☐ 3☐ 4☐ 5☑ *advanced*

DIGITAL PC SCOPE

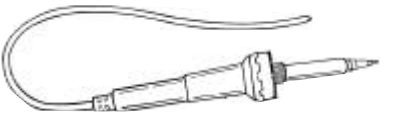
K8031



VELLEMAN COMPONENTS NV
Legen Heirweg 33
9890 Gavere
Belgium
http://www.velleman.be

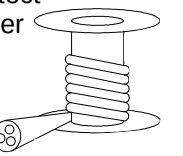
1. Assembly (Skipping this can lead to troubles !)
Ok, so we have your attention. These hints will help you to make this project successful. Read them carefully.

1.1 Make sure you have the right tools:



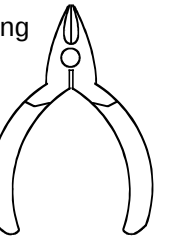
- A good quality soldering iron (25-40W) with a small tip.

- 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.

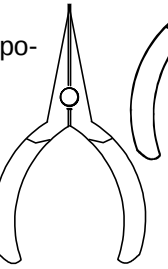


- Thin raisin-core solder. Do not use any flux or grease.

- A diagonal cutter to trim excess wires. To avoid injury when cutting excess leads, hold the lead so they cannot fly towards the eyes.

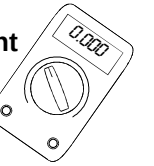


- Needle nose pliers, for bending leads, or to hold components in place.



- 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 :

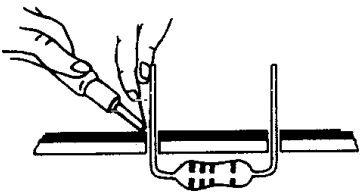
⇒ Make sure the skill level matches your experience, to avoid disappointments.
⇒ Follow the instructions carefully. Read and understand the entire step before you perform each operation.
⇒ Perform the assembly in the correct order as stated in this manual
⇒ Position all parts on the PCB (Printed Circuit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

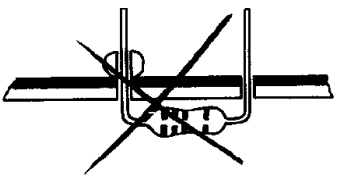
* Typographical inaccuracies excluded. Always look for possible last minute manual updates, indicated as 'NOTE' on a separate leaflet.

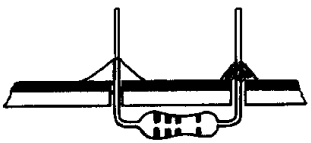
1.3 Soldering Hints :

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

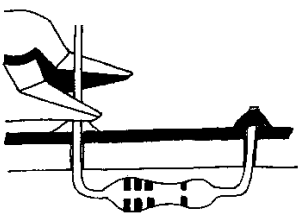


2- Make sure the solder joints are cone-shaped and shiny



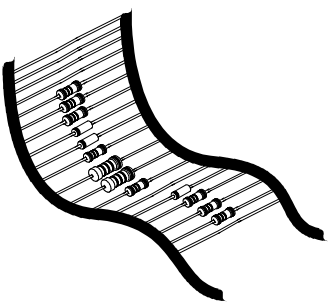


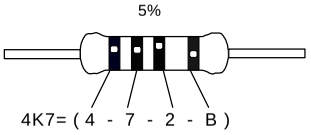
3- Trim excess leads as close as possible to the solder joint

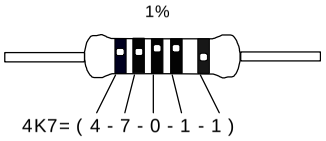


AXIAL COMPONENTS ARE TAPED IN THE CORRECT MOUNTING SEQUENCE !

REMOVE THEM FROM THE TAPE ONE AT A TIME !







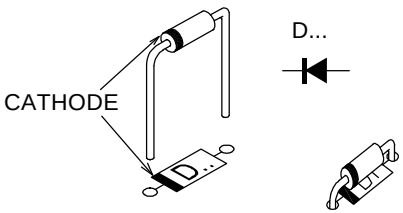
CODE	I	P	E	SF	S	DK	N	D	GB	F	NL	CODE
	CODICE COLORE	*CODIGO DE CORES*	*CODIGO DE COLORES*	*VÄRI KOODI*	*FÄRG SCHEMA*	*FARVE-KODE*	*FARGE-KODE*	*FARB KODE*	*COLOUR CODE*	*CODIFI-CATION DES COU-*	*KLEUR KODE*	
0	Nero	Preto	Negro	Musta	Svart	Sort	Sort	Schwarz	Black	Noir	Zwart	0
1	Marrone	Castanho	Marrón	Ruskea	Brun	Brun	Brun	Braun	Brown	Brun	Bruin	1
2	Rosso	Encar-nado	Rojo	Punainen	Röd	Rød	Rød	Rot	Red	Rouge	Rood	2
3	Aran-ciato	Laranja	Naran-jado	Oranssi	Orange	Orange	Orange	Orange	Orange	Orange	Oranje	3
4	Giallo	Amarelo	Amarillo	Keltainen	Gul	Gul	Gul	Gelb	Yellow	Jaune	Geel	4
5	Verde	Verde	Verde	Vihreä	Grön	Grøn	Grønn	Grün	Green	Vert	Groen	5
6	Blu	Azul	Azul	Sininen	Blå	Blå	Blå	Blau	Blue	Bleu	Blauw	6
7	Viola	Violeta	Morado	Purppura	Lila	Violet	Violet	Violet	Purple	Violet	Paars	7
8	Grigio	Cinzento	Gris	Harmaa	Grå	Grå	Grå	Grau	Grey	Gris	Grijs	8
9	Bianco	Branco	Blanco	Valkoinen	Vit	Hvid	Hvidt	Weiss	White	Blanc	Wit	9
A	Argento	Prateado	Plata	Hopea	Silver	Sølv	Sølv	Silber	Silver	Argent	Zilver	A
B	Oro	Dourado	Oro	Kulta	Guld	Guld	Guldl	Gold	Gold	Or	Goud	B

CONSTRUCTION

Mount the components in the order described :

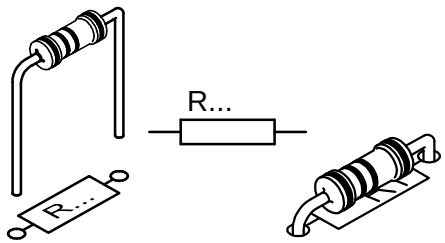
☞ Tip: The pictures on the packaging can be used as a guideline. However, due to possible changes it is not 100% reliable.

1. Diodes (check the polarity)



- ❑ D1: BAS45A
- ❑ D2: BAS45A
- ❑ D3: 1N4148
- ❑ D4: 1N4148
- ❑ D5: 1N4148
- ❑ D6: 1N4148
- ❑ D7: 1N4148
- ❑ D8: 1N4148
- ❑ D9: 1N4148
- ❑ D10: 1N4148
- ❑ D11: 1N4148
- ❑ D12: 1N4148
- ❑ D13: 1N4148
- ❑ D14: 1N4148
- ❑ D15: 1N4148
- ❑ D16: 1N4007

2. Resistors (check the color code)



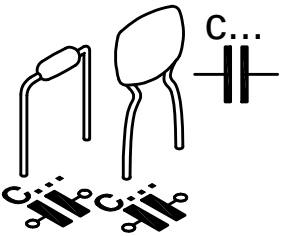
- ❑ R1: 150R (1-5-1)
- ❑ R2: 470R (4-7-1)
- ❑ R3: 150R (1-5-1)
- ❑ R4: 47R (4-7-0)
- ❑ R5: 150R (1-5-1)
- ❑ R6: 91K (9-1-0-2) 1%
- ❑ R7: 10K (1-0-0-2) 1%
- ❑ R8: 91K (9-1-0-2) 1%
- ❑ R9: 3R3 (3-3)
- ❑ R10: 910K (9-1-0-3) 1%
- ❑ R11: 820R (8-2-0-0) 1%
- ❑ R12: 2K2 (2-2-2)
- ❑ R13: 820R (8-2-0-0) 1%
- ❑ R14: 820R (8-2-0-0) 1%
- ❑ R15: 820R (8-2-0-0) 1%
- ❑ R16: 1K8 (1-8-2)
- ❑ R17: 2K2 (2-2-2)
- ❑ R18: 820R (8-2-0-0) 1%
- ❑ R19: 10K (1-0-0-2) 1%

- ❑ R20: 10K (1-0-0-2) 1%
- ❑ R21: 10K (1-0-0-2) 1%
- ❑ R22: 10K (1-0-0-2) 1%
- ❑ R23: 10K (1-0-0-2) 1%
- ❑ R24: 10K (1-0-0-2) 1%
- ❑ R25: 10K (1-0-0-2) 1%

- ❑ R26: 20K (2-0-0-2) 1%
- ❑ R27: 20K (2-0-0-2) 1%
- ❑ R28: 20K (2-0-0-2) 1%
- ❑ R29: 20K (2-0-0-2) 1%
- ❑ R30: 20K (2-0-0-2) 1%
- ❑ R31: 20K (2-0-0-2) 1%
- ❑ R32: 20K (2-0-0-2) 1%
- ❑ R33: 20K (2-0-0-2) 1%
- ❑ R34: 20K (2-0-0-2) 1%

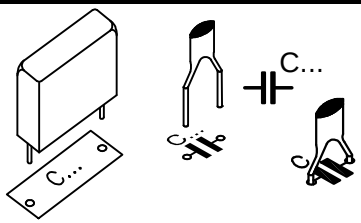
- ❑ R35: 470R (4-7-1)
- ❑ R36: 2K2 (2-2-2)
- ❑ R37: 2K2 (2-2-2)
- ❑ R38: 2K2 (2-2-2)
- ❑ R39: 100R (1-0-1)
- ❑ R40: 150R (1-5-1)
- ❑ R41: 2K2 (2-2-2)
- ❑ R42: 2K2 (2-2-2)
- ❑ R43: 10K (1-0-0-2) 1%
- ❑ R44: 2K2 (2-2-2)
- ❑ R45: 820R (8-2-0-0) 1%
- ❑ R46: 1K8 (1-8-2)
- ❑ R47: 100R (1-0-1)
- ❑ R48: 100R (1-0-1)
- ❑ R49: 100R (1-0-1)
- ❑ R50: 470R (4-7-1)
- ❑ R51: 470R (4-7-1)
- ❑ R52: 470R (4-7-1)
- ❑ R53: 3R3 (3-3) / 1W

3. Capacitors



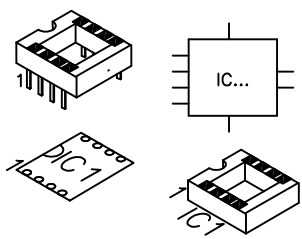
- ❑ C1: 100n (104, 0.1, u1)
- ❑ C3: 100n (104, 0.1, u1)
- ❑ C6: 100n (104, 0.1, u1)
- ❑ C8: 100n (104, 0.1, u1)
- ❑ C9: 100n (104, 0.1, u1)
- ❑ C12: 100n (104, 0.1, u1)
- ❑ C13: 100n (104, 0.1, u1)
- ❑ C18: 100n (104, 0.1, u1)
- ❑ C19: 100n (104, 0.1, u1)
- ❑ C21: 100n (104, 0.1, u1)
- ❑ C24: 100n (104, 0.1, u1)
- ❑ C25: 100n (104, 0.1, u1)
- ❑ C27: 100n (104, 0.1, u1)
- ❑ C28: 100n (104, 0.1, u1)
- ❑ C29: 100n (104, 0.1, u1)
- ❑ C30: 100n (104, 0.1, u1)
- ❑ C31: 100n (104, 0.1, u1)
- ❑ C32: 100n (104, 0.1, u1)
- ❑ C33: 100n (104, 0.1, u1)
- ❑ C34: 100n (104, 0.1, u1)
- ❑ C36: 100n (104, 0.1, u1)
- ❑ C38: 100n (104, 0.1, u1)
- ❑ C39: 100n (104, 0.1, u1)
- ❑ C40: 100n (104, 0.1, u1)
- ❑ C41: 100n (104, 0.1, u1)
- ❑ C45: 100n (104, 0.1, u1)
- ❑ C47: 100n (104, 0.1, u1)
- ❑ C48: 100n (104, 0.1, u1)

4. Capacitors



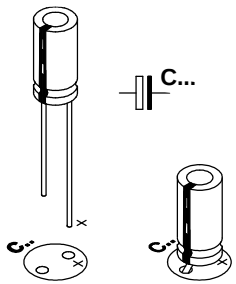
- ❑ C17: 100p (101)
- ❑ C26: 100p (101)
- ❑ C10: 220p (221)
- ❑ C15: 22p
- ❑ C16: 22p
- ❑ C22: 22p
- ❑ C42: 22p
- ❑ C4: 2n2 /100V (222, 2200)
- ❑ C20: 2n2 / 100V (222, 2200)
- ❑ C14: 2n7 (272, 2700)
- ❑ C5: 47n/250V (0.047, 473)

5. IC sockets



- ❑ IC1: 16P
- ❑ IC3: 8P
- ❑ IC4: 24P
- ❑ IC5: 28P
- ❑ IC6: 16P
- ❑ IC7: 16P
- ❑ IC8: 16P
- ❑ IC9: 16P
- ❑ IC10: 16P
- ❑ IC11: 16P
- ❑ IC12: 16P
- ❑ IC13: 24P
- ❑ IC14: 16P
- ❑ IC16: 14P
- ❑ IC17: 16P
- ❑ IC18: 8P
- ❑ IC19: 8P
- ❑ IC20: 8P
- ❑ IC21: 8P
- ❑ IC22: 8P

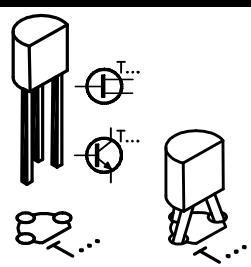
6. Electrolytic capacitors. Check the polarity !



- ❑ C2: 4µ7
- ❑ C7: 4µ7
- ❑ C11: 4µ7
- ❑ C35: 4µ7
- ❑ C37: 4µ7
- ❑ C44: 4µ7

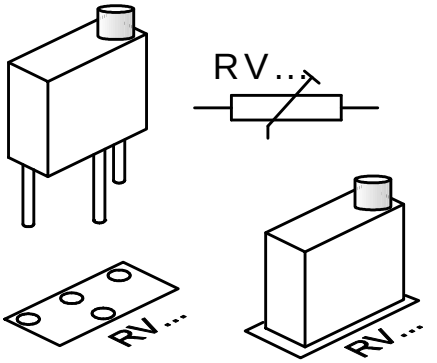
- ❑ C23: 100µF
- ❑ C43: 100µF
- ❑ C46: 100µF

7. Transistors



- ❑ T1: BC327

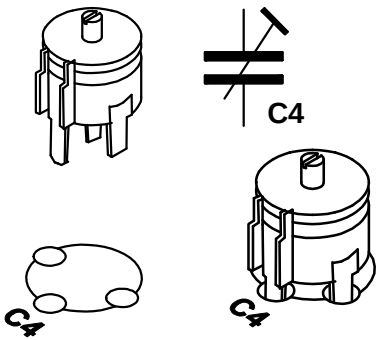
8. Multiturn trimmer



- ❑ RV1: 50R (R50, W500)
- ❑ RV2: 500R (R500, W501)

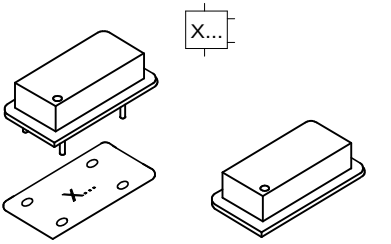
In doubt, measure using an ohm meter between the two outer connections.

9. Trimmer capacitors



- ❑ CV1: 22p (small type)
- ❑ CV2: 50p

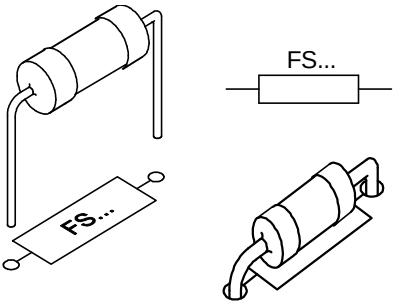
10. Oscillator



- ❑ X1: 32MHz

Check the position, refer to the PCB lay out.

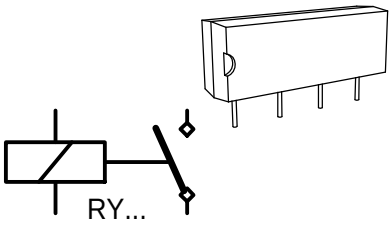
11. Pico fuse



- ❑ FS1: 1A pico

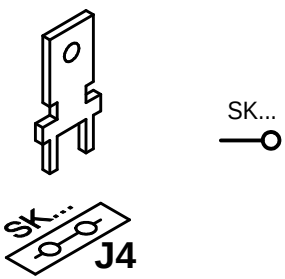
One spare fuse is also supplied

12. Reed relays (check the position of the notch)



- ❑ RY1: VR05R051AS
- ❑ RY2: VR05R051AS
- ❑ RY3: VR05R051AS
- ❑ RY4: VR05R051AS
- ❑ RY5: VR05R051AS

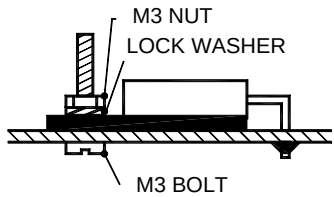
13. PCB tab



- ❑ J4: PCB tab

This tab serves as square wave output test signal.

14. Voltage regulator.

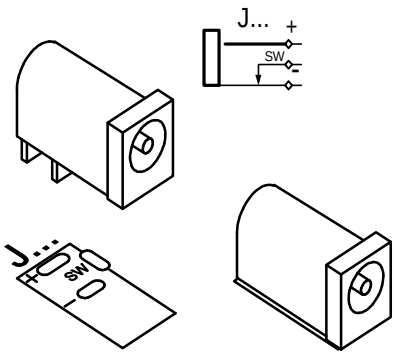


- ❑ IC15: UA7805

Mount the regulator like in the drawing.

First fix the regulator, then solder the connections

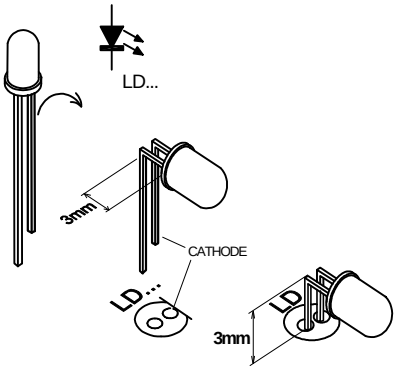
15. DC jack



- ❑ J2: DJ-005

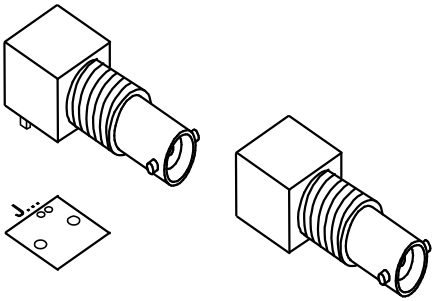
16. Power indication LED, check the polarity!

IMPORTANT
Mount this LED exactly like in the drawing, otherwise the LED will not fit correctly in the front panel.



❑ LD1: 3mm LED

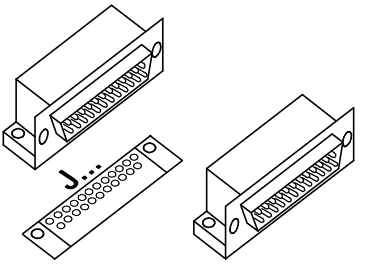
17. BNC connector



❑ J1: BNC

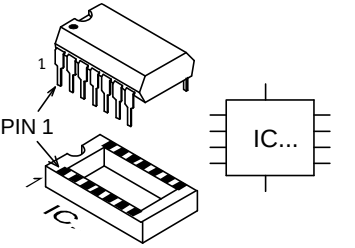
Carefully solder the connections.

18. 25P sub D connector



❑ J6: 25P sub D male.

19. IC's check the position !



❑ IC1: 74F161
❑ IC3: OPA2350PA
❑ IC4: TDA8703
❑ IC5: 6264 ; CY7C199.....EQ
❑ IC6: 74HC153
❑ IC7: 74F161
❑ IC8: 74F161
❑ IC9: 74HC595
❑ IC10: 74HC85
❑ IC11: 74HC595
❑ IC12: 74HC595
❑ IC13: VK8031 (PAL22V10)
❑ IC14: 74HC390
❑ IC16: 74HC14
❑ IC17: 74HC390
❑ IC18: 6N136
❑ IC19: 6N136
❑ IC20: 6N136
❑ IC21: 6N136
❑ IC22: 6N136

20. Screen foil preparation

Cut the screening foil like in the drawing.

☞ **Make sure the conductive side is faced downwards !!**

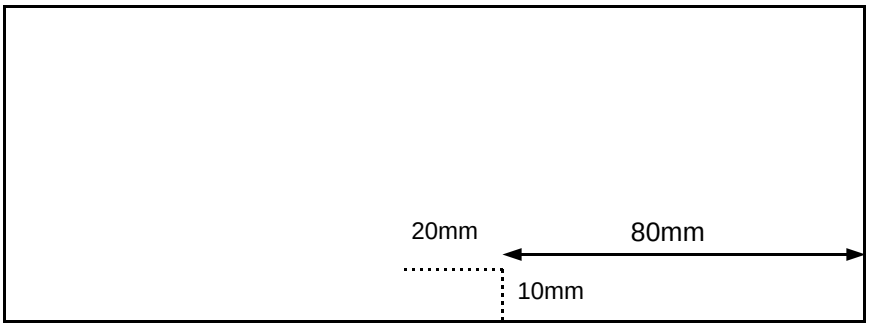


Fig. 1

Position the screen foil into the bottom enclosure.
Use some adhesive tape to fix the screen foil

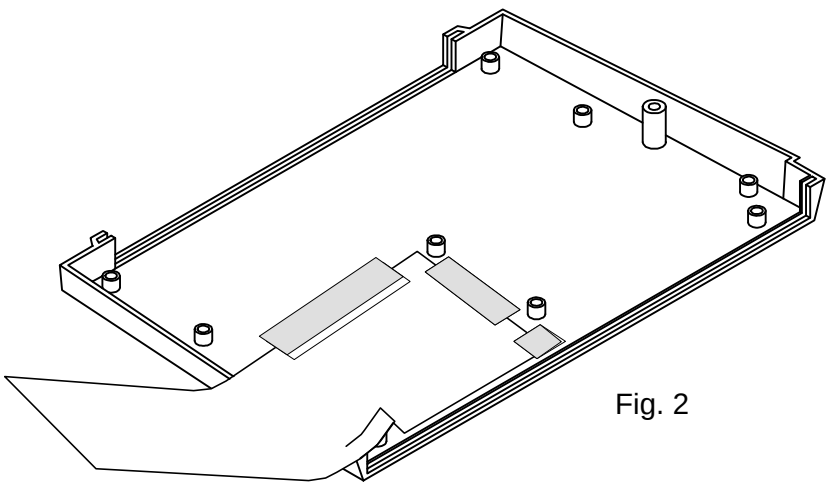


Fig. 2

☞ **Make sure the conductive side is faced downwards !!**

21. Voltage regulator and PCB assembly

❑ IC23: 7805 (UA7805P)

This regulator must be isolated plastic type !

Mount the voltage regulator on the rear panel and fasten it with the supplied M3 bolt, washer and nut as shown on the drawing. **Make sure to remove the protective foil from the front and rear panel !**

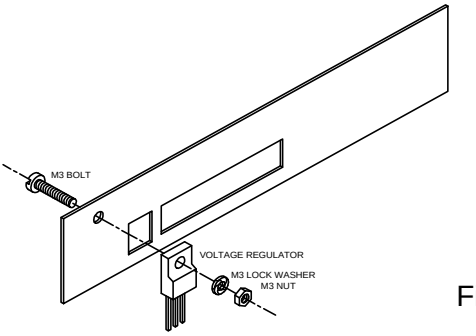


Fig. 1

Assemble the enclosure as following:

Position the PCB together with the front and rear panel in the bottom half of the enclosure. Fasten the PCB in the enclosure.

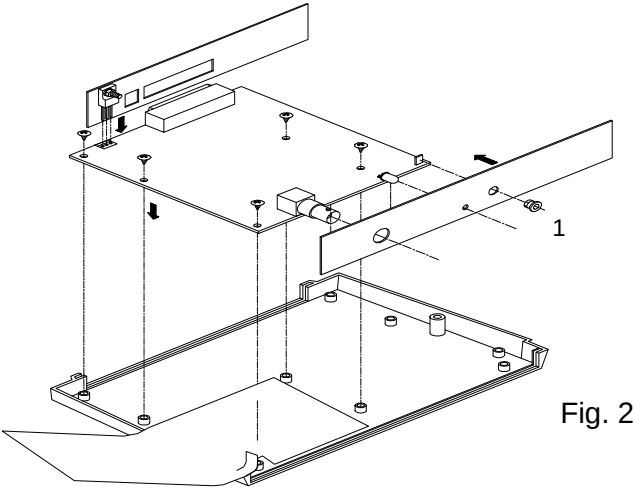


Fig. 2

Now the voltage regulator can be soldered at the **component** side of the PCB, **not** at the solder side.

Mount a LED clip into the test signal hole (1).

☞ **See next page for screen foil fixation and position**

22. PCB and screen foil fixation

☞ **Make sure the conductive side is faced downwards !**

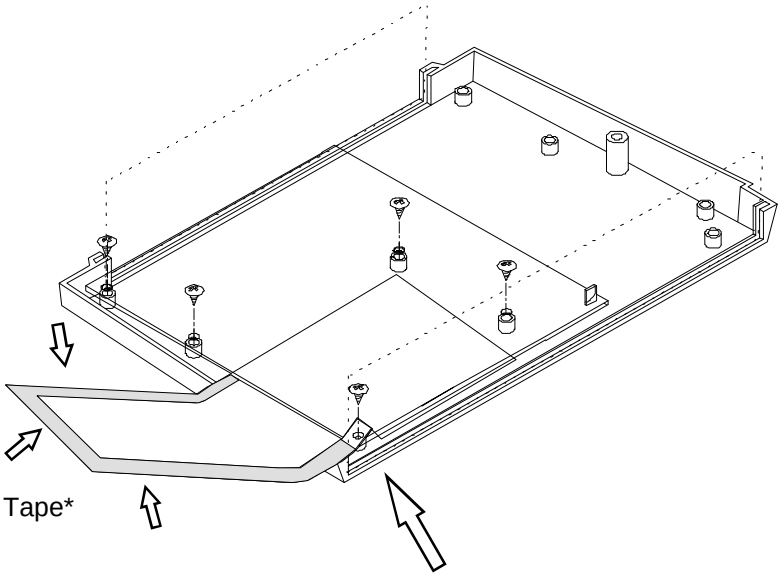
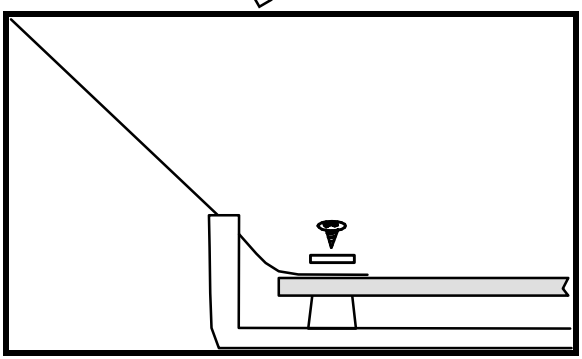


Fig. 1



Fix the screen foil using a washer and screw. (Push the screw through the foil)
The conductive side must make contact with the PCB surface.

☞ * Please note that you should tape both front and back of the three visible edges in order to avoid all contact between the screening foil and the components.

ATTENTION ! : Make sure that the screening foil does not make any electrical contact with the front panel while you are fixing the screening foil to the PCB.

23. Test and adjustment

- Install the PC-Lab2000 software (see getting started manual).
- Connect the unit using a parallel cable to the computer LPT port.
- Connect a 9V/500mA power supply to the unit. (check the polarity). The LED on the front panel should lid.
- Start the PC-Lab2000 software and select K8031 hardware and the appropriate port.
- Short circuit the input using an appropriate probe or connection.
- Press the RUN button.

☞ For all adjustment select DC input and Trigger off.

Offset adjustment:
- Make sure that the Y position slider is in the centre position.
- Switch always between 1V/div and 3V/div setting.
- Adjust RV1 until the signal remains stable on the screen.

Transient adjustment and calibration:
- Select 1V/div.
- Connect the input to test point J4.
- Adjust CV1 until the signal top is as flat as possible.

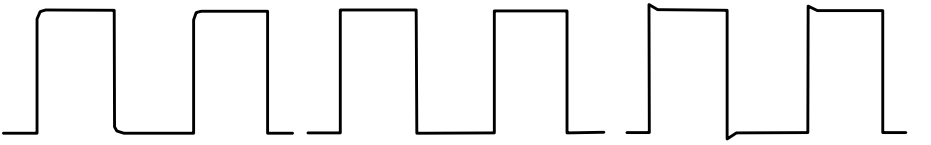


Fig. 1 **NG** **OK** **NG**

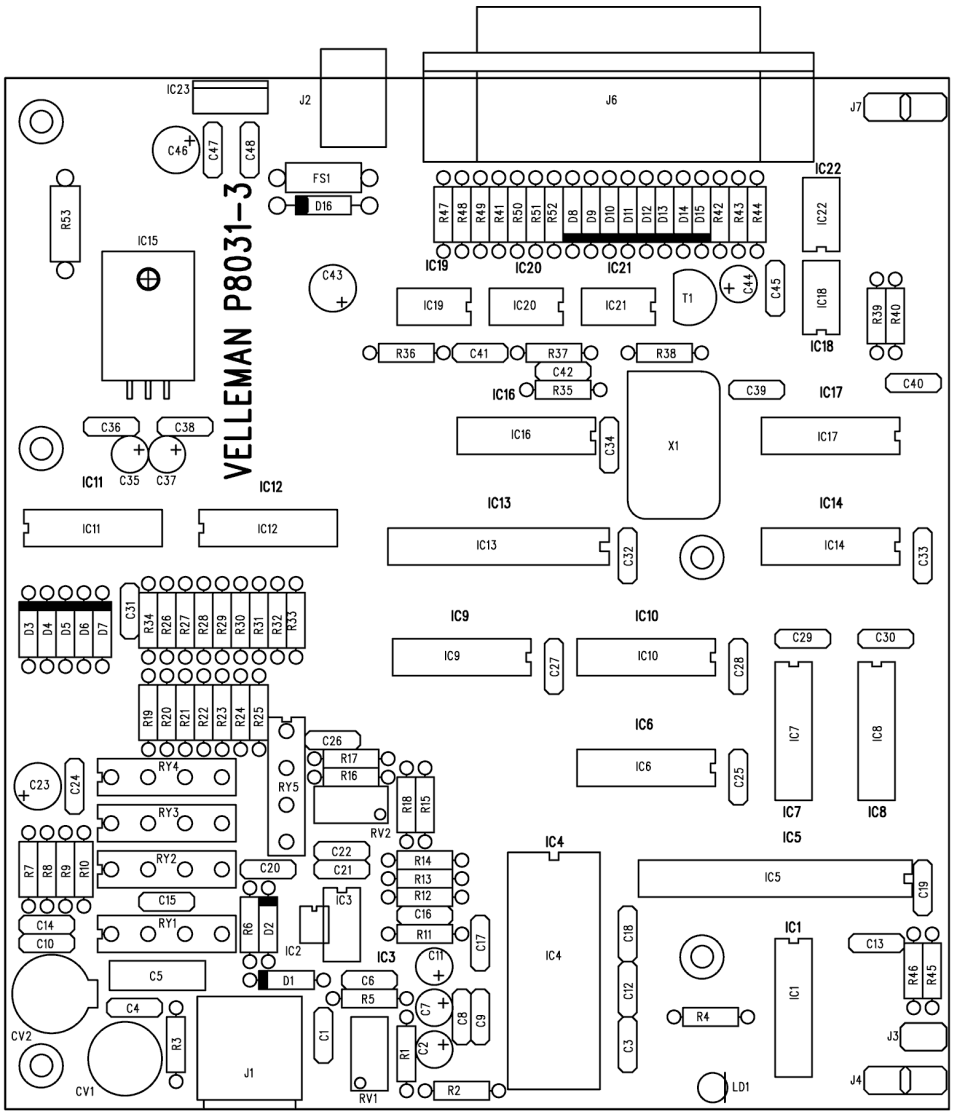
- In the VIEW menu select “RMS value”.
- Adjust RV2 until the signal is 2.5Vrms.
- Select 0.3V/div.
- Connect the input to test point J3.
- Using the Y position slider set the signal in the centre of the screen.
- Adjust CV2 until the signal top is as flat as possible.

Repeat the transient adjustment and calibration at least once.

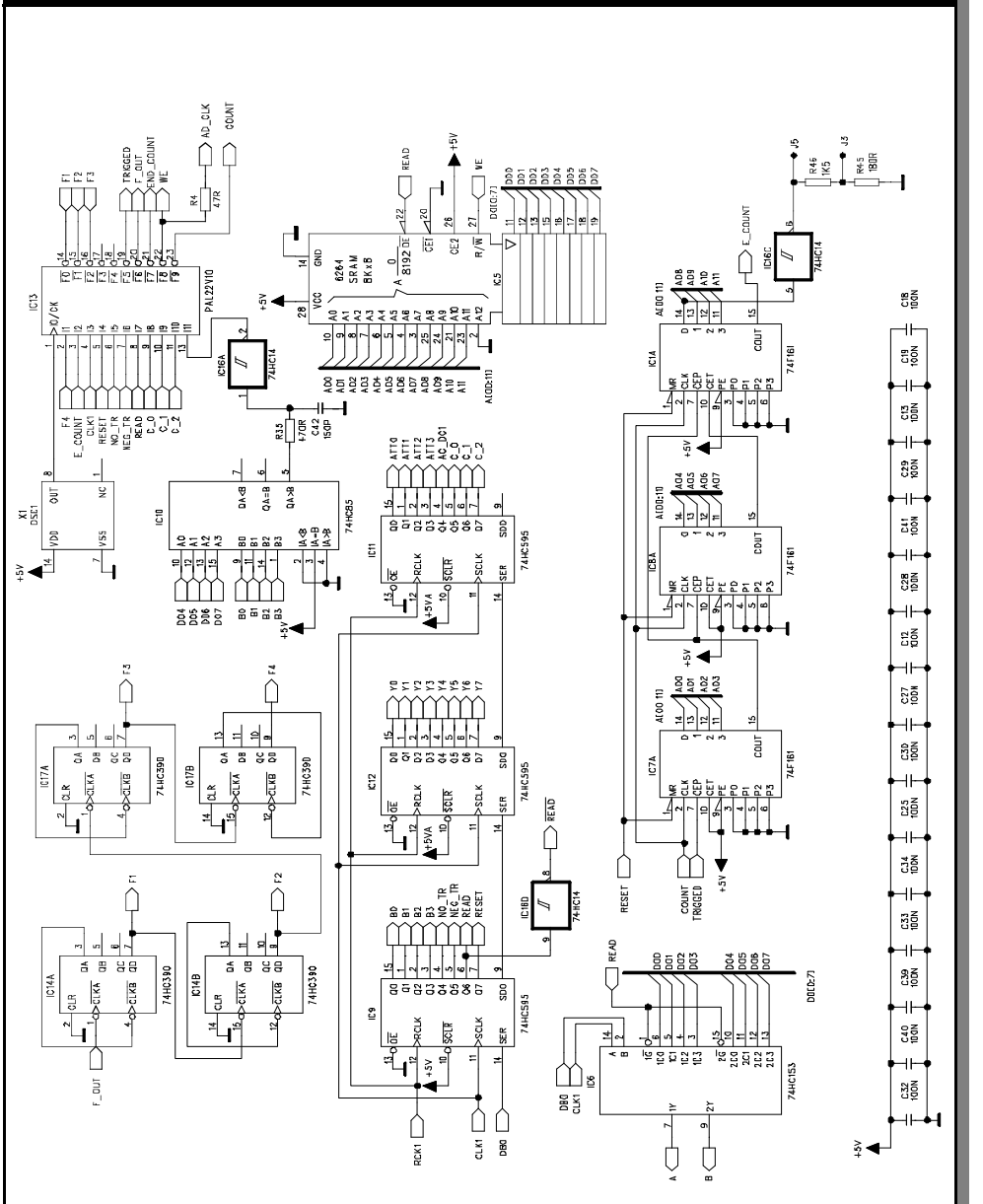
Finally use the calibrate and exit option in the File menu to complete the calibration.
Mount the cover onto the enclosure (fold the screen foil).

The unit is now ready for use. Check the CD for more information.

24. PCB

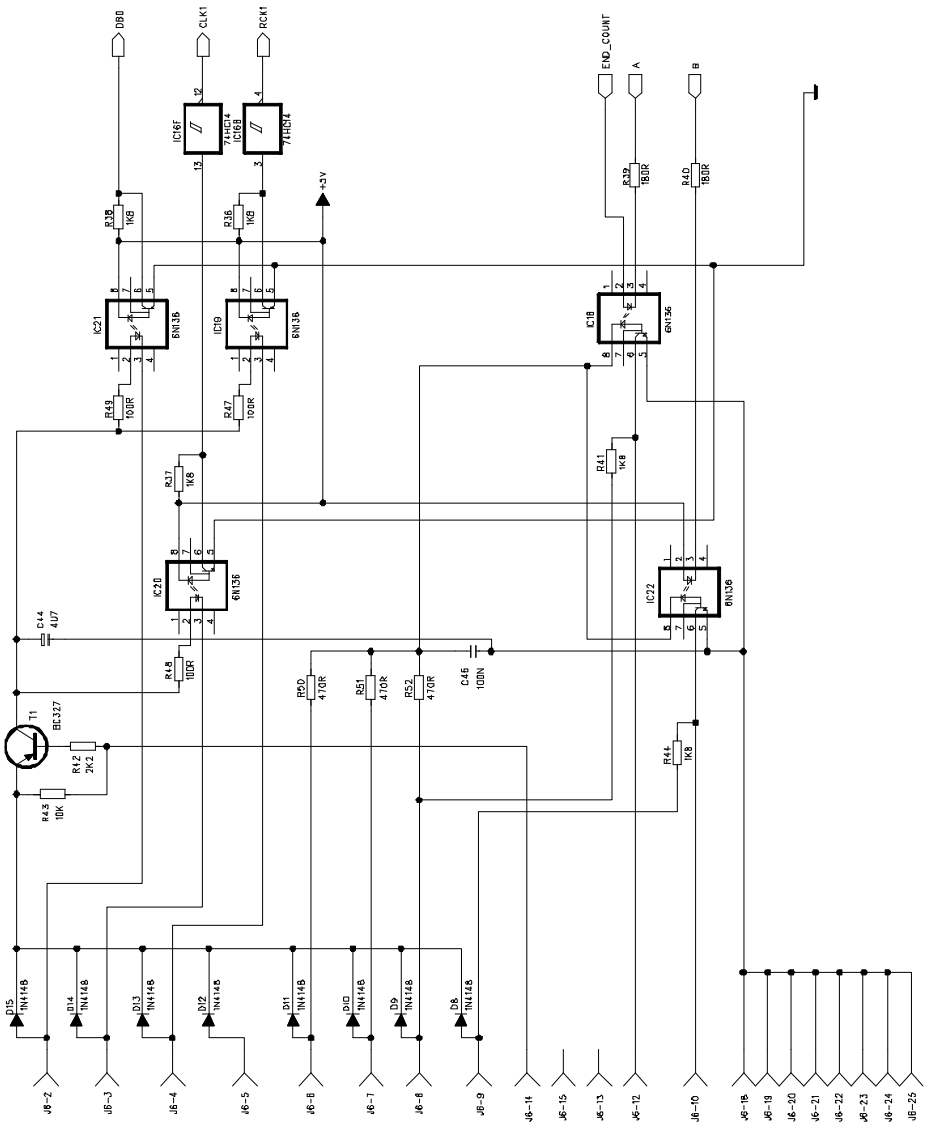

VELLEMAN P8031-3
IC23
J2
J6
J7
C46
C47
C48
FS1
D16
R53
IC15
C43
IC22
IC19
IC20
IC21
T1
C44
C45
IC18
R39
R40
R36
C41
R37
R38
C42
IC16
R35
C39
IC17
C40
C36
C38
C35
C37
IC11
IC12
IC16
C34
X1
IC17
IC13
IC14
IC11
IC12
IC13
C32
IC14
C33
D3
D4
D5
D6
D7
C31
R34
R26
R27
R28
R29
R30
R31
R32
R33
IC9
IC10
C29
C30
IC9
C27
IC10
C28
R19
R20
R21
R22
R23
R24
R25
IC6
C26
R17
R16
IC6
C25
IC7
IC8
RY4
RY5
C23
C24
RY3
R18
R15
RV2
IC7
IC8
IC5
R7
R8
R9
R10
RY2
C22
C21
R14
R13
R12
C16
R11
IC4
C20
IC5
C19
C15
RY1
IC3
C14
C10
R6
D2
IC2
C17
IC4
C18
IC1
C13
C11
IC3
C5
D1
C6
R5
C12
R4
IC1
R46
R45
C4
C7
C8
C9
C3
CV2
R3
C1
J3
C5
J1
R1
C2
RV1
R2
CV1
LD1
J4

25. Digital Section



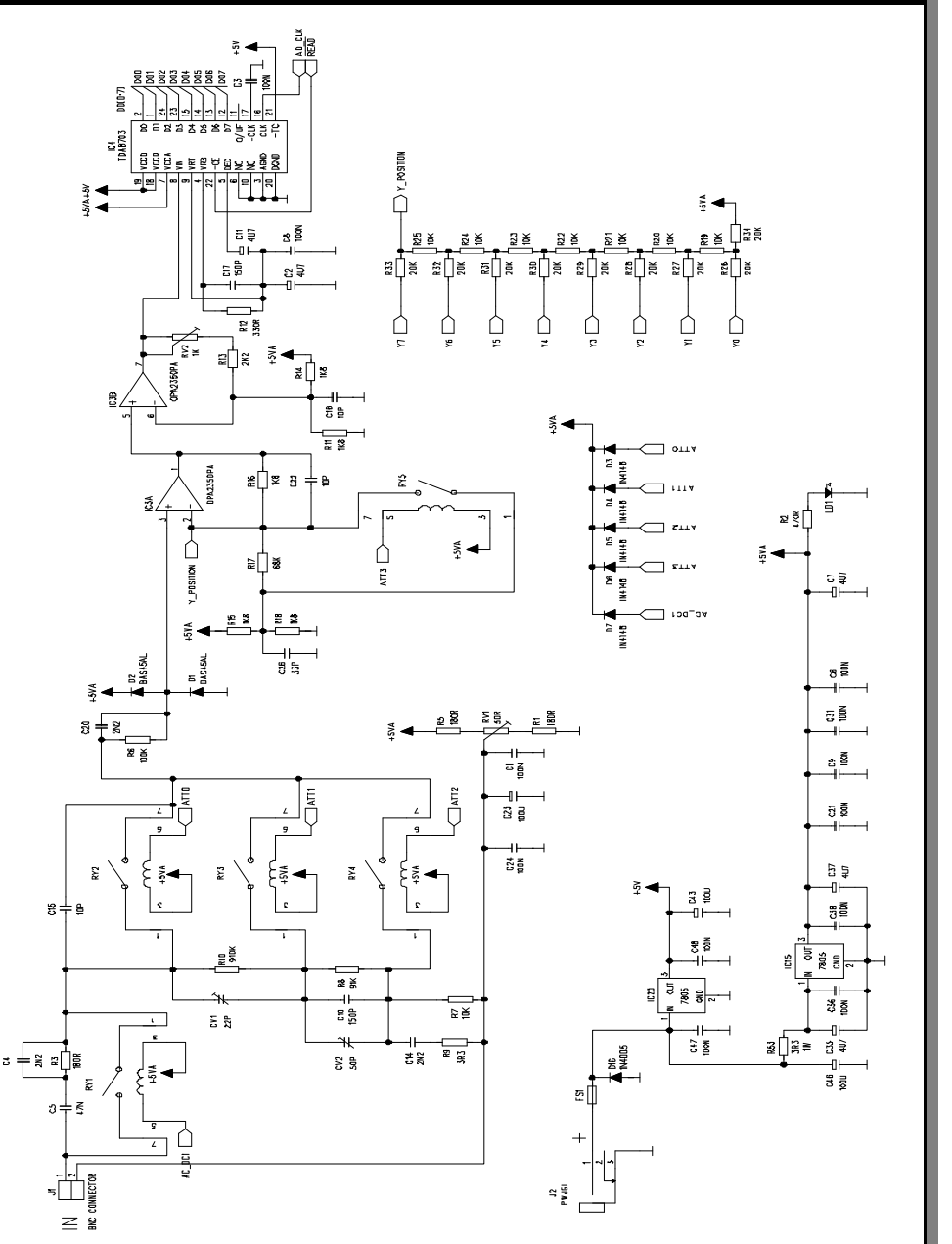
Values are for reference only

26. Opto Coupler section



 Values are for reference only

27. Input Section



 Values are for reference only

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