Total solder points: 150
Skill level :
Beginner 1☐ 2☐ 3☑ 4☐ 5☐ *Advanced*

INTELLIGENT LEAD ACID BATTERY CHARGER

K8012

Features:

☑ Suitable for 6V and 12V sealed and open lead-acid batteries
☑ Fully automatic charge and maintenance cycle
☑ Status indicators for charge, float and end-of-charge
☑ Protected against polarity reversal
☑ Simply connect and forget

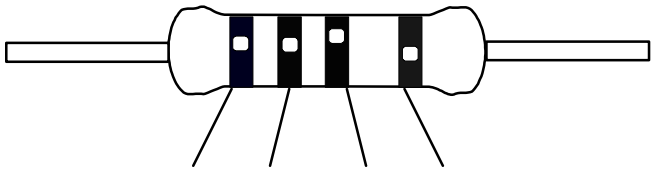
Specifications :

☑ Charge current : 0.3 or 1A selectable
☑ Power supply : 2x9V/25VA (our type 2090250MST)
☑ Dimensions (wxdxh): 97 x 140 x40mm / 3.8”x 5.5”x1.6”
☑ Not suitable for non-rechargeable or NiCd/NiMH batteries
modifications reserved

Options :

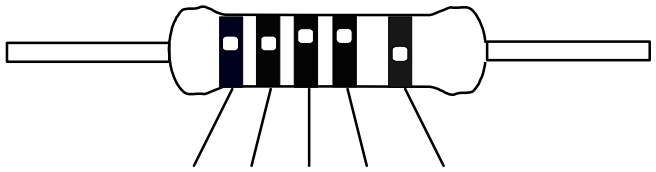
☑ Transformer prim. 230V - sec. 2x9V/25VA: 2090250MST
☑ Enclosure: TKAUS22G
☑ Power cord: NETSNOER

5%



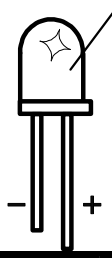
4K7= (4 - 7 - 2 - B)

1%



4K7= (4 - 7 - 0 - 1 - 1)

COLOR= 2… 5

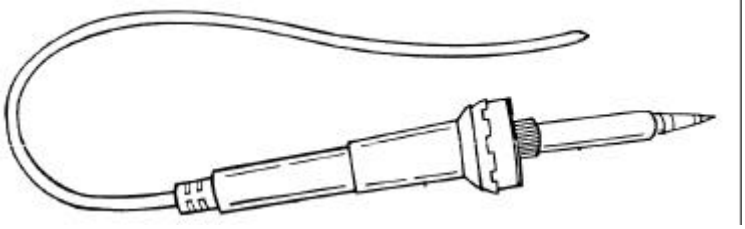


CODE	I *CODICE COLORE*	P *CODIGO DE CORES*	E *CODIGO DE COL-ORES*	SF *VÄRI KOODI*	S *FÄRG SCHEMA*	DK *FARVE KODE*	N *FARGE KODE*	D *FARB KODE*	GB *COLOUR CODE*	F *CODIFI-CATION DES COU-LEURS*	NL *KLEUR KODE*	CODE
0	Nero	Preto	Negro	Musta	Svart	Sort	Sort	Schwarz	Black	Noir	Zwart	**0**
1	Marrone	Castanho	Marrón	Ruskea	Brun	Brun	Brun	Braun	Brown	Brun	Bruin	**1**
2	Rosso	Encarnado	Rojo	Punainen	Röd	Rød	Rød	Rot	Red	Rouge	Rood	**2**
3	Aranciato	Laranja	Naranjado	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	Blue	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**

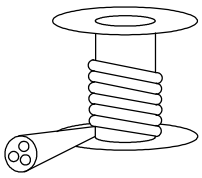
1. Assembly (Skipping this can lead to troubles !)

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

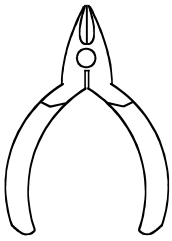
1.1 Make sure you have the right tools:

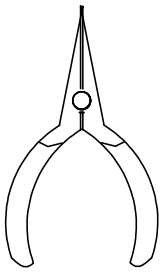


- A good quality soldering iron (25-40W) with a small tip.
- Wipe it often on a wet sponge or cloth, to keep it clean; then apply solder to the tip, to give it a wet look. This is called 'thinning' and will protect the tip, and enables you to make good connections. When solder rolls off the tip, it needs cleaning.



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

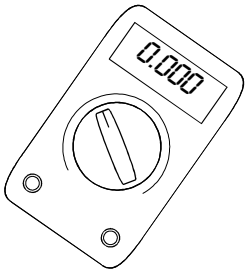




- A diagonal cutter to trim excess wires. To avoid injury when cutting excess leads, hold the lead so they cannot fly towards the eyes.

- 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

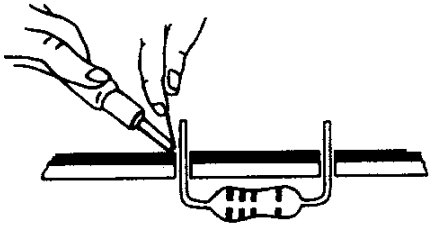


1.2 Assembly Hints :

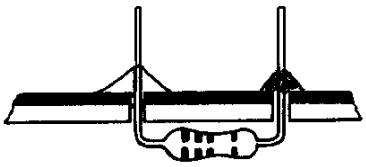
⇨ Make sure the skill level matches your experience, to avoid disappointments.
⇨ Follow the instructions carefully. Read and understand the entire step before you perform each operation.
⇨ Perform the assembly in the correct order as stated in this manual
⇨ Position all parts on the PCB (Printed Circuit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

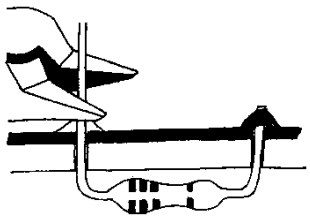
1.3 Soldering Hints :



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

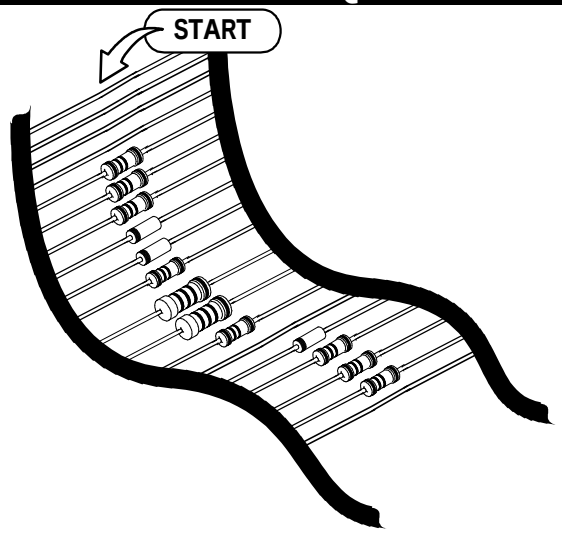


Make sure the solder joints are cone-shaped and shiny



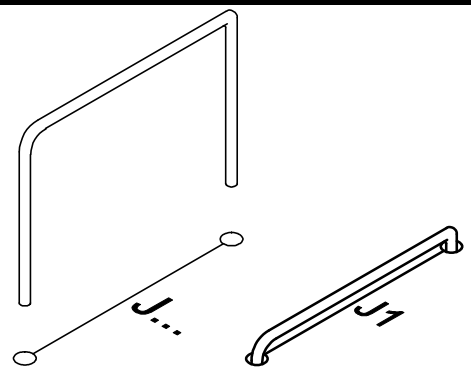
Trim excess leads as close as possible to the solder joint

AXIAL COMPONENTS ARE TAPED IN THE CORRECT MOUNTING SEQUENCE !



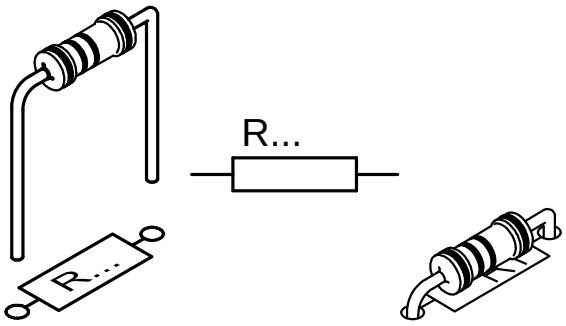
REMOVE THEM FROM THE TAPE ONE AT A TIME !

1. JUMPER WIRES



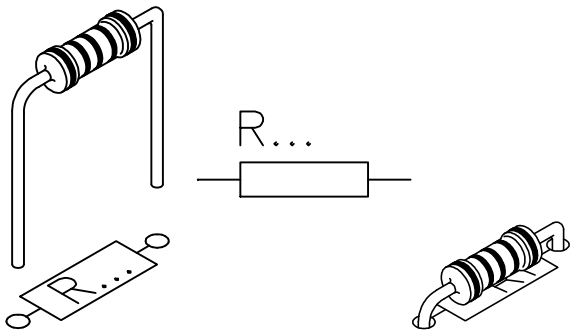
- ❑ J1
- ❑ J2
- ❑ J3

2. ¼W RESISTORS



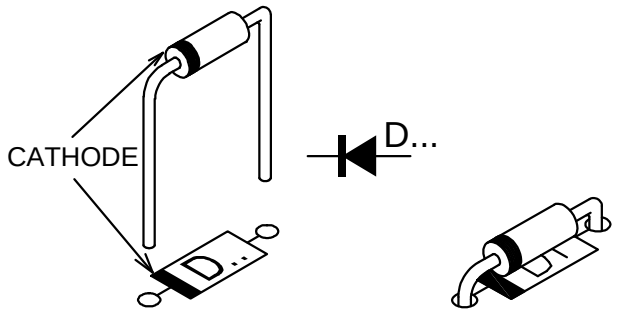
- ❑ R1: 47K (4 - 7 - 0 - 2 - 1)
- ❑ R2: 27K (2 - 7 - 0 - 2 - 1)
- ❑ R3: 120K (1 - 2 - 0 - 3 - 1)
- ❑ R4: 180K (1 - 8 - 0 - 3 - 1)
- ❑ R5: 10K (1 - 0 - 3 - B)
- ❑ R6: 270K (2 - 7 - 0 - 3 - 1)
- ❑ R7: 10K (1 - 0 - 3 - B)
- ❑ R8: 1K5 (1 - 5 - 2 - B)
- ❑ R9: 1K (1 - 0 - 2 - B)
- ❑ R10: 10K (1 - 0 - 3 - B)
- ❑ R11: 4K7 (4 - 7 - 2 - B)
- ❑ R12: 1K (1 - 0 - 2 - B)
- ❑ R13: 10K (1 - 0 - 3 - B)
- ❑ R14: 10K (1 - 0 - 3 - B)
- ❑ R15: 33K (3 - 3 - 3 - B)
- ❑ R16: 10K (1 - 0 - 3 - B)
- ❑ R17: 1M (1 - 0 - 5 - B)
- ❑ R18: 680 (6 - 8 - 1 - B)
- ❑ R19: 15K (1 - 5 - 3 - B)
- ❑ R20: 10K (1 - 0 - 3 - B)
- ❑ R21: 10K (1 - 0 - 3 - B)
- ❑ R22: 220K (2 - 2 - 4 - B)
- ❑ R23: 2K2 (2 - 2 - 2 - B)
- ❑ R24: 2K2 (2 - 2 - 2 - B)
- ❑ R25: 12K (1 - 2 - 3 - B)
- ❑ R26: 1M (1 - 0 - 5 - B)
- ❑ R27: 1K (1 - 0 - 2 - B)
- ❑ R28: 2K2 (2 - 2 - 2 - B)

3. ½W RESISTORS



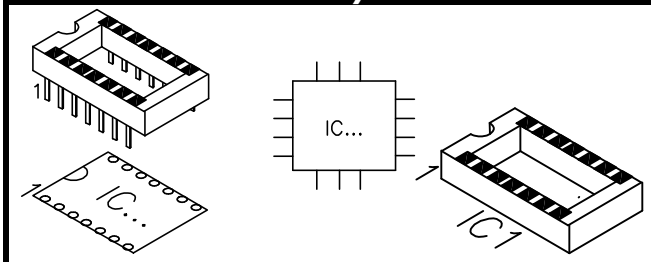
- ❑ R29: 1.5 (1 - 5 - B - B - 9)
- ❑ R30: 1.8 (1 - 8 - B - B - 9)
- ❑ R31: 2.2 (2 - 2 - B - B - 9)

4. DIODES (Watch the polarity!)



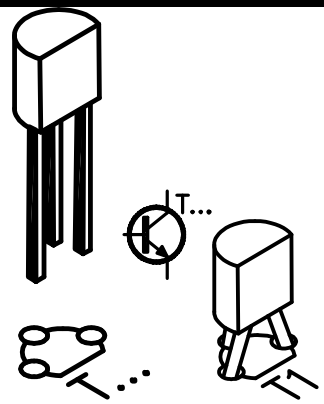
- ❑ D1: 1N4148
- ❑ D2: 1N4148
- ❑ D3: 1N4148
- ❑ D4: 1N5400 …1N5408
- ❑ D5: 1N5400 …1N5408
- ❑ D6: 1N5400 …1N5408
- ❑ D7: 1N5400 …1N5408
- ❑ D8: 1N5400 …1N5408

5. IC SOCKET (Watch the position of the notch !)



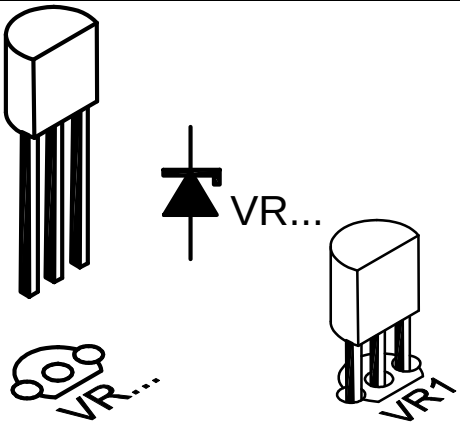
- ❑ IC1 : 14P

6. TRANSISTORS



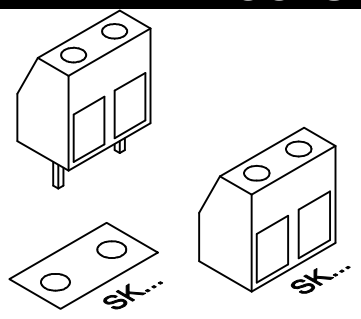
- ❑ T1: BC547
- ❑ T2: BC547
- ❑ T3: BC547
- ❑ T4: BC547
- ❑ T5: BC547
- ❑ T6: BC557

7. VOLTAGE REFERENCE



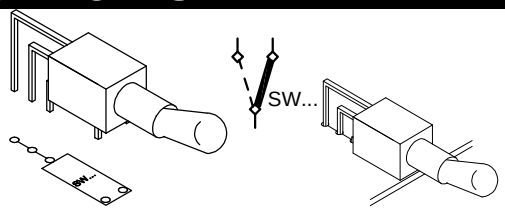
- ❑ VR1: LM385Z2.5

8. TERMINAL BLOCKS



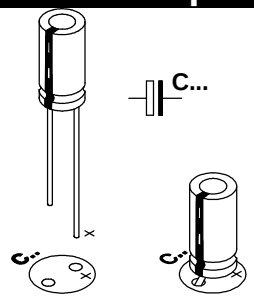
- ❑ SK1: 2P
- ❑ SK2: 2P

9. SWITCHES



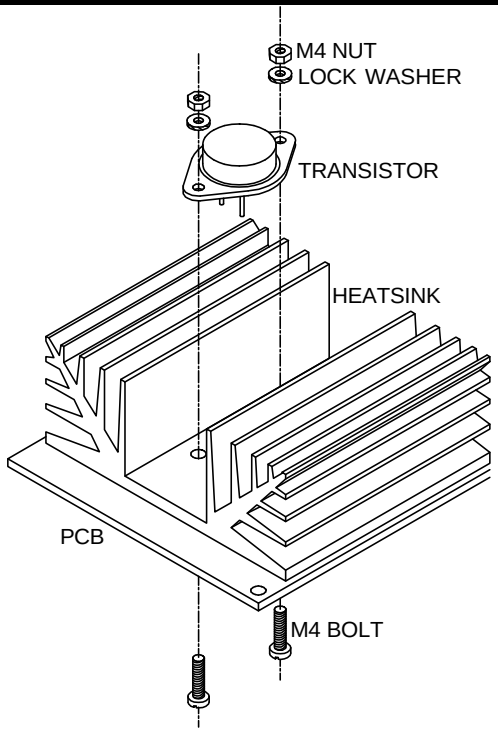
- ❑ SW1: SINGLE POLE (ON-ON)
- ❑ SW2: SINGLE POLE (ON-ON)

10. ELECTROLYTIC CAPACITORS (Watch the polarity!)



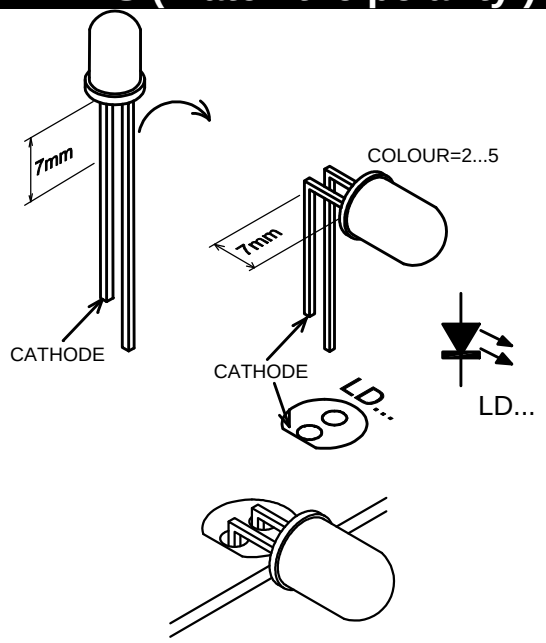
- ❑ C1: 2µ2
- ❑ C2: 4700µ/35V

11. POWER TRANSISTOR



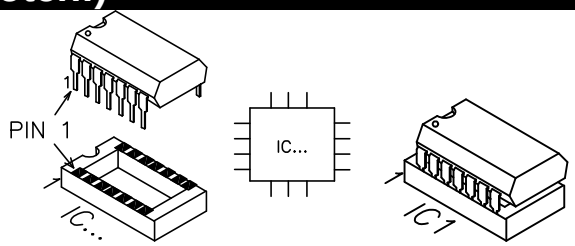
- ❑ T7: MJ3001, MJ4035, BDX87, 2N6057, 2N6058, 2N6059, 2N6283, 2N6284 or EQ.

12. LEDS (Watch the polarity!)



- ❑ LD1: 3mm LED RED (2)
- ❑ LD2: 3mm LED RED (2)
- ❑ LD3: 3mm LED YELLOW (4)
- ❑ LD4: 3mm LED GREEN (5)

13. IC (Watch the position of the notch!)



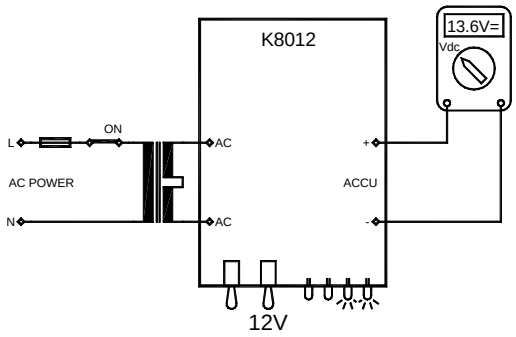
- ❑ IC1: LM324, LM224

14. CONNECTION, TESTING AND USE

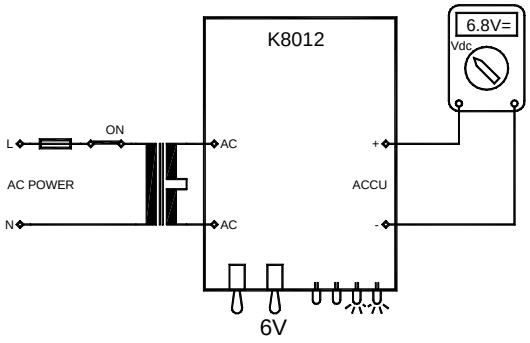
Connection : The unit can be connected as shown on drawing 15.
Make sure your assembly complies with the local safety regulations. For improved safety, use a non-conductive enclosure.

Enclosure :
Drawing 17 provides a drill pattern for our optional enclosure (ref. TKAUS22G). The included adhesive front panel label can be used to mark the position of the holes to be drilled. Position the label on the front panel and fix it temporary with tape. Mark the center of the holes with a center punch. Remove the label and drill the holes. Pay attention to the correct diameter. Make sure all holes are free of burrs. Degrease the front panel before sticking the label onto it. The label edges will need to be trimmed with a sharp cutter. Drawing 16 provides an internal view of the finished unit. Whatever enclosure you use, make sure it is well ventilated, as the heatsink might run hot during charging.

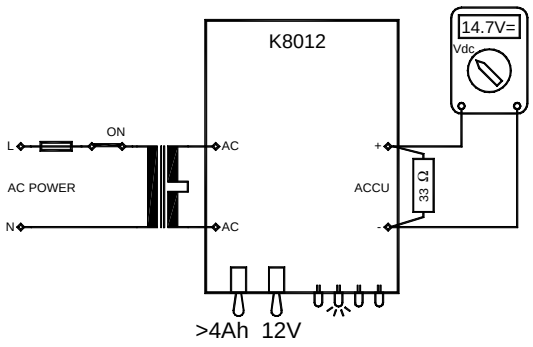
Testing :
Perform all tests as shown below, before the first use of the unit. It allows you to check every function of your charger kit. Use the supplied 5W dummy load resistors and a reliable multi-meter.



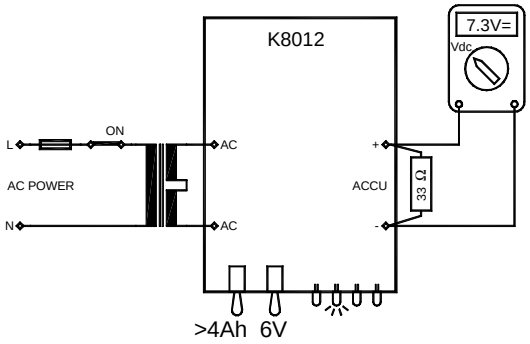
Put SW2 in the 12V position. Measure the voltage across the output terminals. Output voltage should be 13.6V +/- 0.2V.



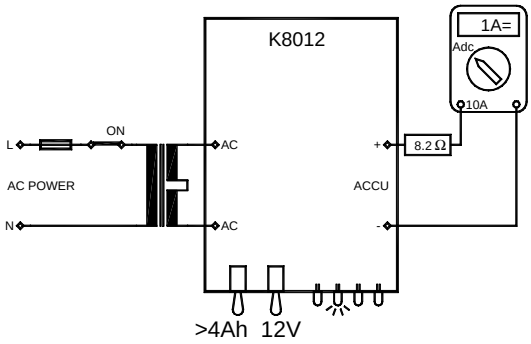
Put SW2 in the 6V position. Measure the voltage across the output terminals. Output voltage should be 6.8V +/- 0.2V



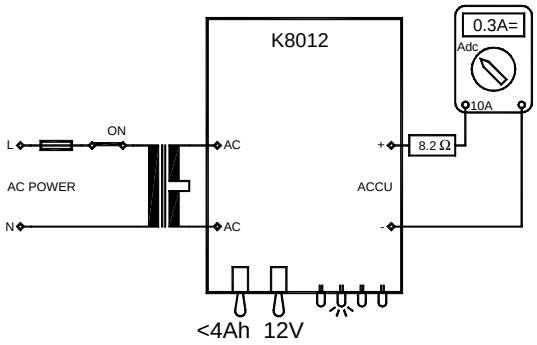
Put SW2 in the 12V position, put SW1 in the >4Ah position. Connect the supplied 33Ω/5W resistor to the output terminals. Measure the voltage across the resistor. It should read 14.7V +/- 0.2V



Put SW2 in the 6V position, put SW1 in the >4Ah position. Connect the supplied 33Ω/5W resistor to the output terminals. Measure the voltage across the resistor. It should read 7.3V +/- 0.2V



Put SW2 in the 12V position, put SW1 in the >4Ah position. Connect the supplied 8.2Ω resistor in series with the multi-meter. Switch the multi-meter to the '10A DC' -position. It should read 1A +/- 0.1A.



Put SW2 in the 12V position, put SW1 in the <4Ah position. Connect the supplied 8.2Ω resistor in series with the multi-meter. Switch the multi-meter to the '10A DC' -position. It should read 0.3A +/- 0.03A.

If any of the measurements show a considerable difference with the reference values, please recheck the entire assembly, and pay special attention to resistor values.

Use :

Perform the necessary settings before you hook-up the battery to the unit :
Select the appropriate charge current and voltage according to the capacity of the battery.
Batteries < 4Ah : 0.3A charge current
Batteries > 4Ah : 1A charge current

You can easily estimate the charging time with the following formula :

Approx. charging time (hours) = (battery capacity (Ah) / charging current (A)) x 1.2

Pay attention to the polarity when you hook-up a battery to the charger.

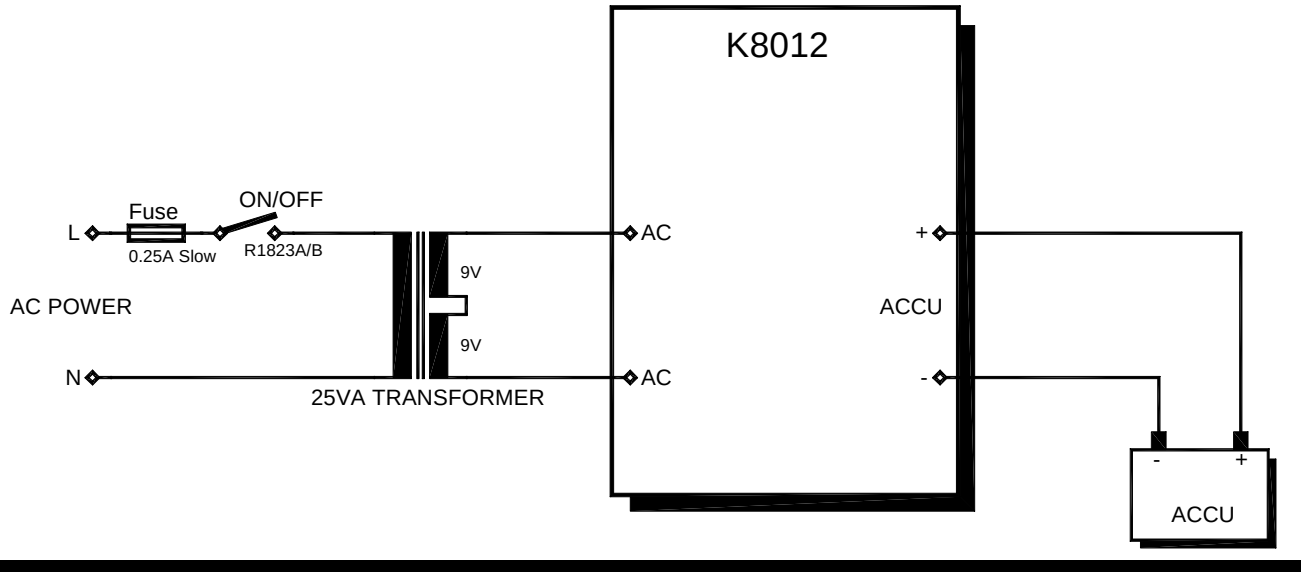
Switch on the unit, to start the charging cycle. Batteries should be charged in a well ventilated area, because of the possible emission of gases. Do not cover the unit during charging, as it might result in overheating or even fire.

Operation :
When a discharged battery is connected to the unit, it starts charging it with the maximum current (0.3A for batteries <4Ah, 1A for batteries >4Ah), until the battery voltage reaches 14.7V (7.35V for a 6V battery). Once this voltage is established, the charger adjusts the charge current, in order to keep this voltage steady. At the end of the charging cycle, when the charge current has dropped significantly, the output voltage is dropped to 13.6V (6.85V for a 6V battery). This allows the battery to remain hooked-up to the charger without any risk for an indefinite time. Should the battery discharge, then the charge cycle will restart automatically.

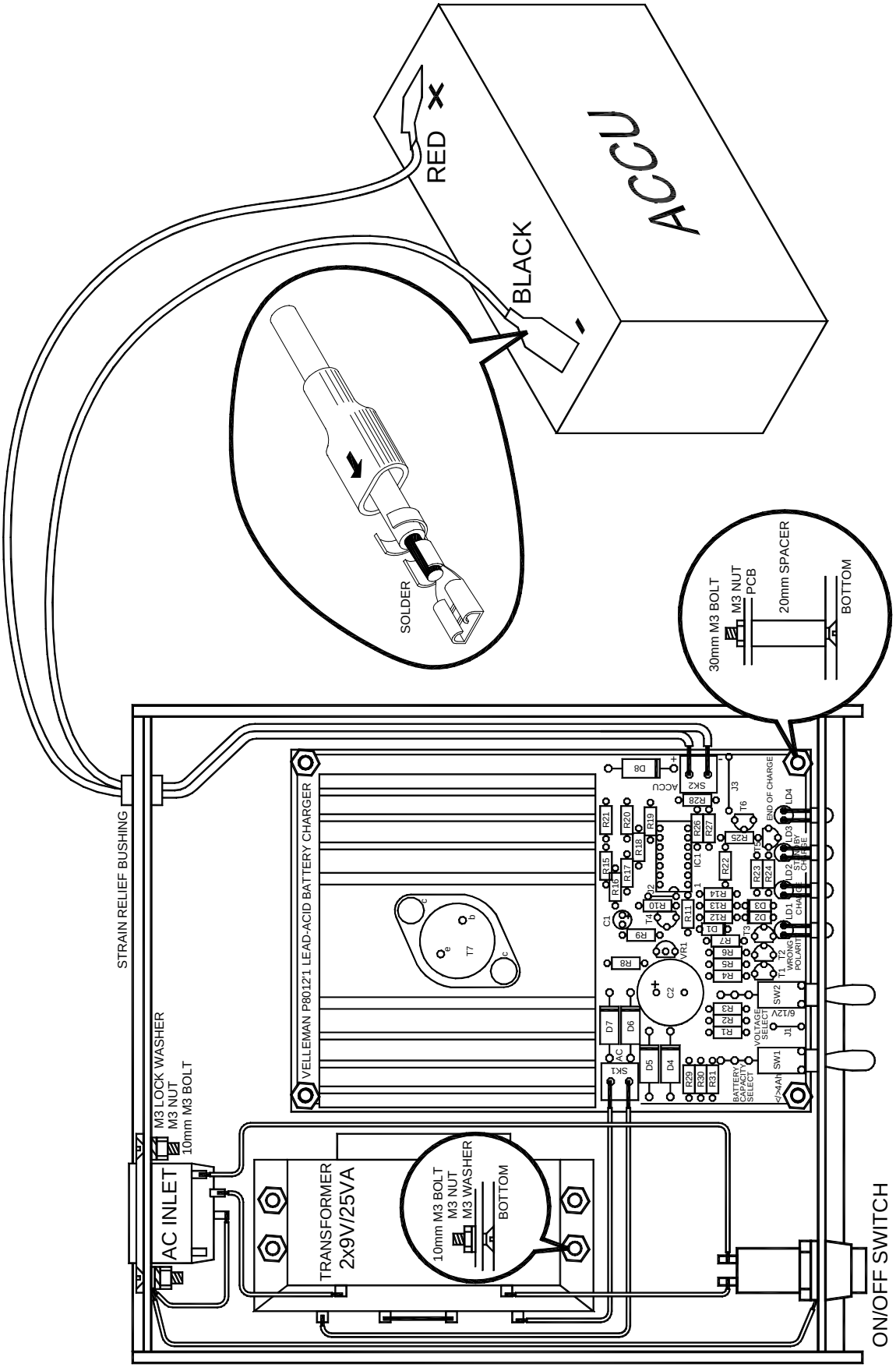
Troubleshooting :

If you have successfully completed the above tests, there is not much that can go wrong.
If the unit never leaves the 'charge' cycle, this could point to either a defective battery, a too low charge current setting, or a battery with a too large capacity.

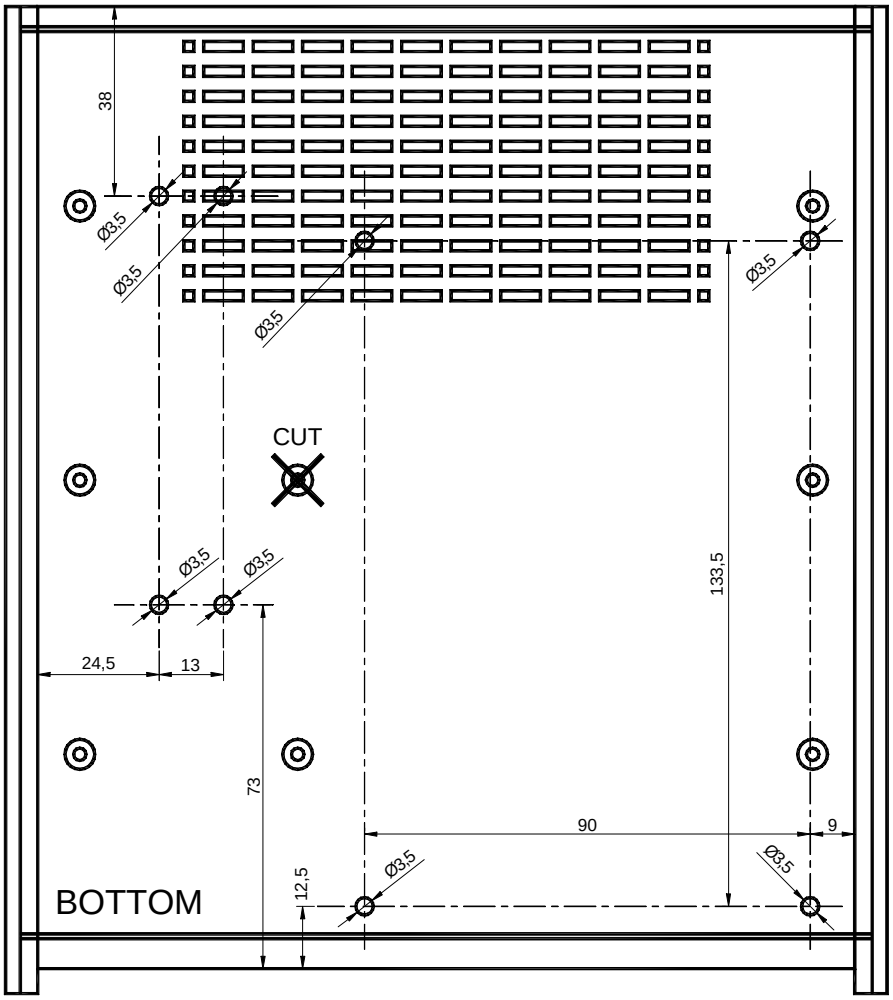
15. CONNECTION DIAGRAM

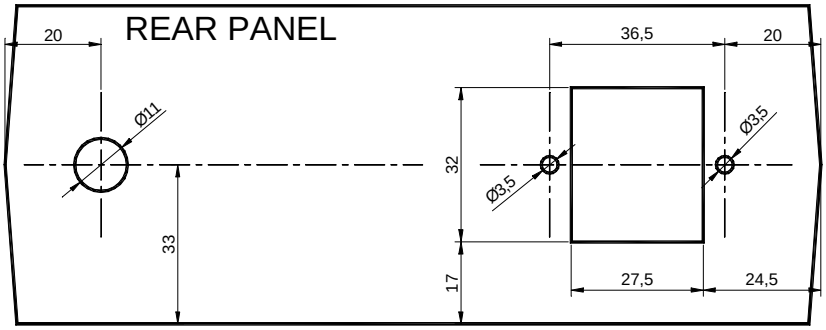


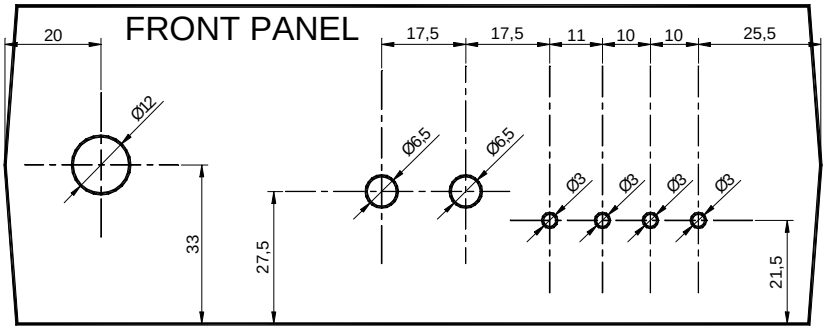
16. ASSEMBLING



17. DRILL PATTERN ENCLOSURE 'TKAUS22G'

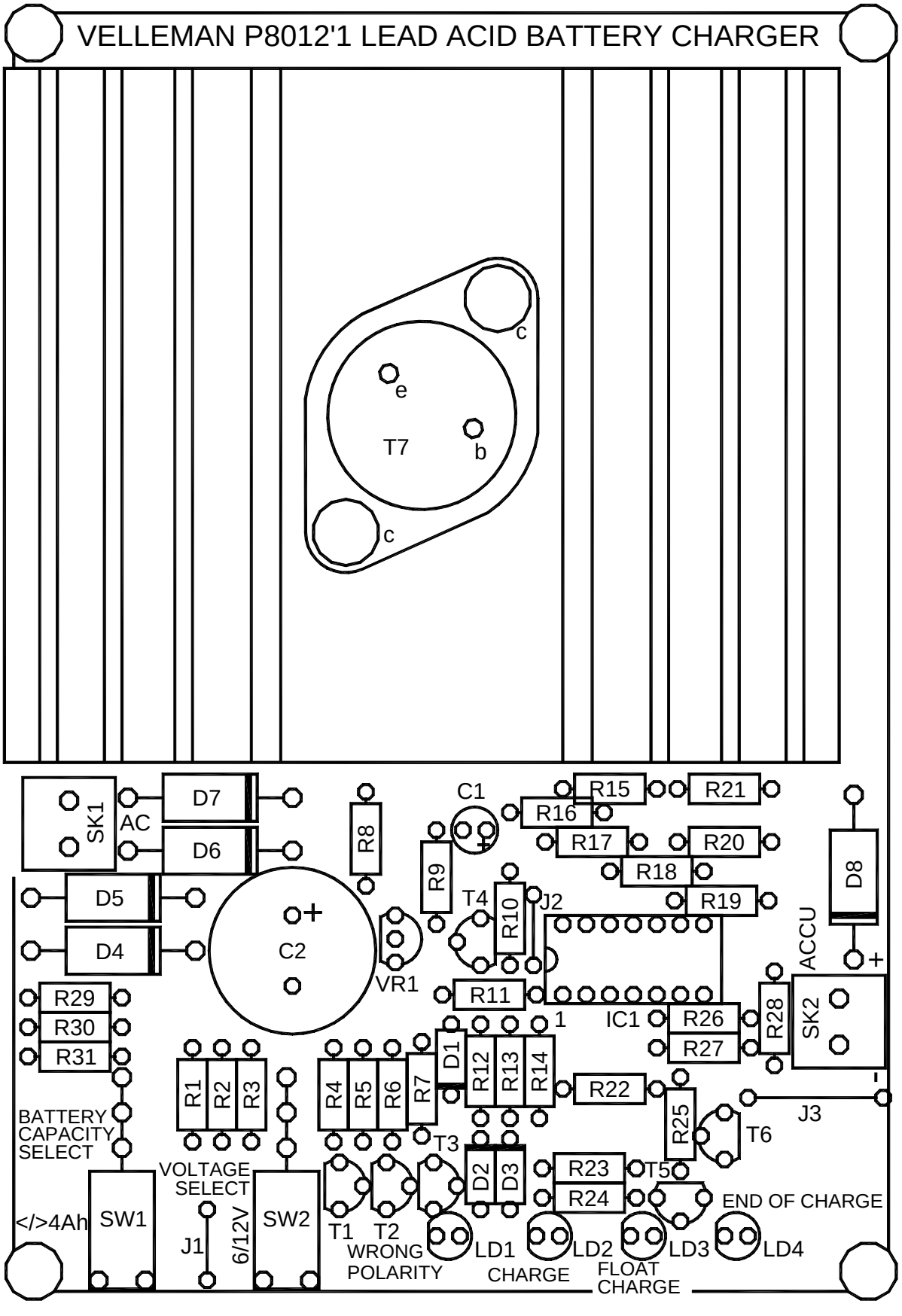




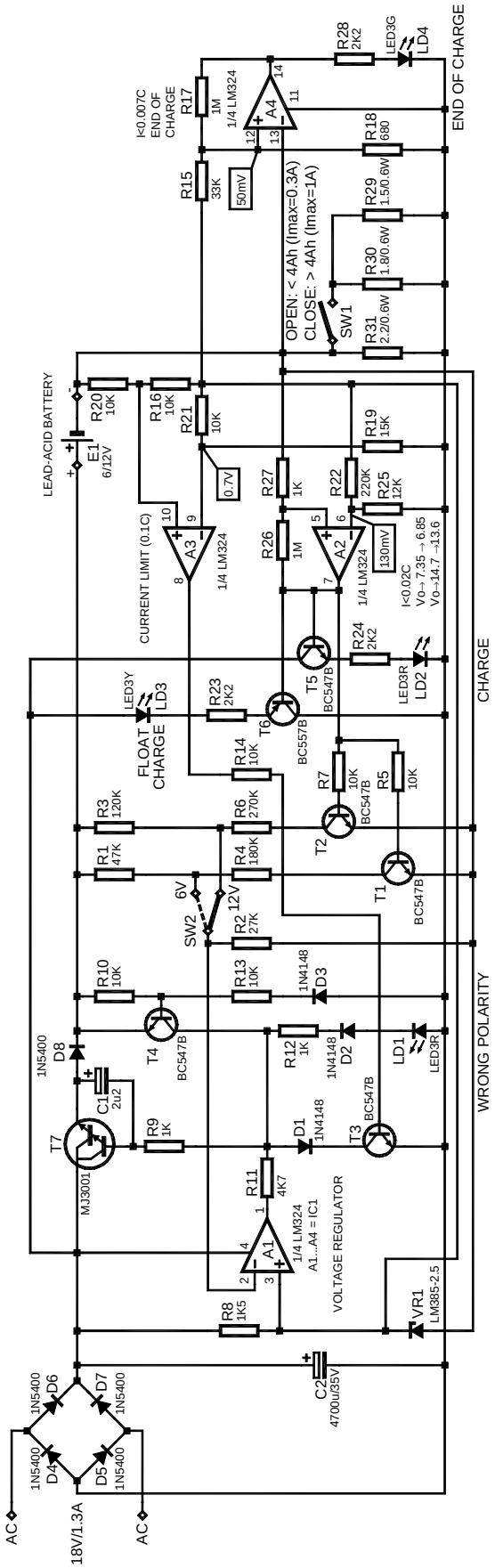


All distances are expressed in mm

18. PCB LAYOUT



19. DIAGRAM


END OF CHARGE
CHARGE
WRONG POLARITY
I<0.007C END OF CHARGE
OPEN: < 4Ah (Imax=0.3A)
CLOSE: > 4Ah (Imax=1A)
LEAD-ACID BATTERY
E1 6/12V
CURRENT LIMIT (0.1C)
I<0.02C
Vo→ 7.35 → 6.85
Vo→14.7 →13.6
FLOAT CHARGE
6V
12V
VOLTAGE REGULATOR
A1...A4 = IC1
1/4 LM324
1/4 LM324
LM385-2.5
MJ3001
BC547B
BC557B
1N4148
1N5400
LED3G
LED3R
LED3Y
50mV
0.7V
130mV
4700u/35V
18V/1.3A
AC
AC