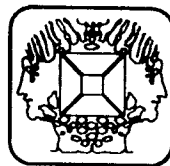


velleman-**kit** ^{HIGH-Q}

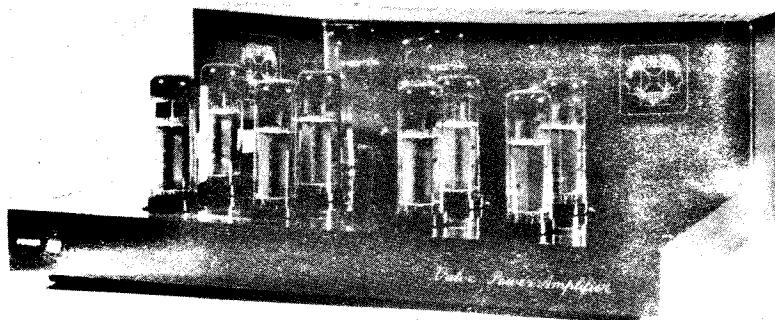


K4000

2 X 200W VALVE AMPLIFIER

- Output power: 2x200W music / 2X95WRMS / 2X15W class A
- Output impedance: 4 or 8 ohm
- Ultra-linear output transformers
- Frequency response: 4 - 100KHz (-3dB ref. 1W)
- Harmonic distortion: 0.08% (1KHz /1W)
- Signal/noise ratio: >102dB (A weighted with respect to 95W)
- Input sensitivity: 0dB (0.775V RMS) for 95W

modifications reserved



H4000-ED4

2 X 200W VALVE AMPLIFIER

Thank you for buying this wonderful amplifier.

Most of us cannot afford a high power amplifier with 'valves'. This kit changes that, so that now everybody can enjoy the sublime "valve sound". The sound of valves could not be surpassed up till now, neither by transistors nor by FET's. While developing this amplifier we gave special attention to the housing. Indeed, we decided to not hide these expensive valves, so that your eyes also have something to enjoy.

Technical data (*)

Output power:

- 2 X 200W music power.
- 2 X 95WRMS in class AB.
- 2 X 15W in class A.

Output impedance 4 or 8 ohm.

Ultra-linear output transformers.

Switching-on delay, as protection for the output valves: ± 1 min.

Power bandwidth (max. output): 10 - 60KHz (-3dB)

Frequency band: 4 - 100KHz (-3dB ref. 1W)

Harmonic distortion:

- 0.08% (1KHz / 1W)
- 0.63% (1KHz / 95W)

Signal-to-noise ratio: >102dB (A weighted with respect to 95W)

Channel separation: >67dB with respect to 95W

Input impedance: 100K ohm.

Input sensitivity: 0dB (0.775mV RMS) for 95W.

Damping factor: 20

* modifications reserved

Assembly:

ATTENTION: FOLLOW THE ASSEMBLY INSTRUCTIONS CAREFULLY, - BECAUSE WE HAVE HERE A DEVICE THAT WORKS UNDER HIGH - VOLTAGE.

A: Assembly of the power supply module P4000PS:

Fit the wire jumpers marked J on the pcb.

Attention: for the wire jumper between C7 and C8, use 1.5mm wire.

Fit the diodes:

- D1, 1N4148 type small signal diode or equivalent. Pay attention to the polarity!
- D2 through D5, diodes from the 1N4000 series. Pay attention to the polarity!
- D6 through D9, 1N5408 type diode. Pay attention to the polarity!

Fit the resistors:

- R1 and R2, 22K (red, red, orange)

Fit the following 1W resistors about 5mm above the pcb.

- R3 through R5, 680K (blue, grey, yellow)
- R6 and R7, 15K (brown, green, orange)

Fit the three fuse holders for F1 through F3.

Fit the eight pcb-pins for:

+V1, +V3, -V and GND (2X)

Fit the two six-pole screw connectors at the places marked J1 and J2.

Fit capacitor C1, 1uF MKM.

Fit the following electrolytic capacitors: Pay attention to the polarity!

- C2 and C3, 47uF/100V or higher
- C4, 100uF/100V or higher
- C5 and C6, 100uF/400V or higher
- C7 through C10, 200 or 220uF/450V or higher

VERY IMPORTANT:

Solder a thick wire (minimum 2.5mm) along the tinned lead between the points GND at the left side of the pcb and the point GND at the right side of the pcb. Also apply an extra tick layer of tin to the rest of the tinned surface. Don't be avaricious with tin!

B: assembly of the pre-amplifier module P4000PR:

Fit the resistors:

- R57L and R57R, 100K (brown, black, yellow)
- R58L and R58R, 8K2 (grey, red, red)
- R59L and R59R, 47K 1/2W (yellow, violet, orange)
- R60L and R60R, 100K 1/2W (brown, black, yellow)

Fit the tube socket V6.

Fit the 12 pcb-pins for (IN, OUT, GND, V3 and f1/f2)

Fit the capacitors:

- C19L and C19R, 22pF ceramic
- C20L and C20R, 470nF MKM (sometimes marked u47)
- C21L and C21R, 10 or 22uF/350V electrolytic capacitor. Pay attention to the polarity!

C: assembly of the switching-on delay P4000SW:

Mount the resistors:

- R1 and R2, 220K (red, red, yellow)
- R3, R4 and R5, 2K2 (red, red, red)
- R6, 12ohm / 1/2W (brown, red, black, white)

Mount the diodes (watch the polarity!):

- D1, 1N4148
- D2 to D6, 1N4000 . . . 1N4007

Mount the zener diode (watch the polarity!):

- ZD1, 3V9

Mount the board pins for f1 and f2

Mount the electrolytic capacitors:

Watch the polarity!

- C1, 4.7μF
- C2, 470μF horizontal
- C3, 470μF

Mount the transistors:

- T1, BC337
- T2, BC516

Mount the screw connector J1

Mount the relays RY1 and RY2

D: assembly of the amplifier module P4000A: (to be done 2 X)

Fit the wire jumpers marked J on the pcb.

Fit the resistors:

- R8, 1Mohm (brown, black, green)
- R9, 22K (red, red, orange)
- R10, 820 ohm (grey, red, brown)
- R11, 180 ohm (brown, grey, brown)
- R12, 1M ohm (brown, black, green)
- R13, 1K5 (brown, green, red)
- R14 through R17, 10K (brown, black, orange)

- R18 through R21, 100K (brown, black, yellow)
 - R22 through R25, 220K (red, red, yellow)
 - R28 through R35, 47K (yellow, violet, orange)
 - R36 through R51, 39 ohm (orange, white, black)
- Fit the following resistors about 2mm above the pcb.
- R26 and R27, 220 ohm 1/2W (red, red, brown)
 - R52, 390K 1W (orange, white, yellow)
 - R53 through R56, 180 ohm 1W (brown, grey, brown)

Fit the trimming potentiometers:

- RV1 through RV4, 100K

Fit the capacitors:

- C11, 2n2 ceramic
- C12, 18nF MKM
- C13, 47nF MKM
- C14, 47uF electrolytic capacitor. Pay attention to the polarity!
- C15 through C18, 22nF/630V or higher.

Fit the 13 pcb-pins for: +V1, +V3, -V, GND(4X), LS, IN and TP1 through TP4.

Fit a six-pole screw connector for J5 and a four-pole screw connector for J4.

Fit the valve socket for V5

Fitting the four octal valve sockets for V1 through V4:

Pass the valve sockets through the opening in the pcb, (connections at the solder side) so that the metal part is at the component side and the notch corresponds with the overprint on the pcb (see fig. 12). Now provisionally screw the tube socket home using a 25 X 3mm bolt, so that the nut is on the solder side. (see fig. 1)

Now connect the valve socket connections 1, 3, 4, 5 and 8 to the corresponding solder islands on the pcb, using a piece of uninsulated wire. Take care that the connection wires are not too tight and that they are bended at an angle of about 90 degrees. (see fig. 2)

Connecting the 6.3V filament voltage :

The 6.3V has to be connected to the terminals 7 and 2 of the valve sockets V1 through V4.

Make the connections in accordance with fig. 3a and 3b, using insulated 1,5mm wire (DO NOT USE THINNER WIRE!). Use the 2 holes in the valve socket connections to make the through connections. Also take care to not make short-circuits when passing the wire through the connection eyes. The 6.3V is then branched off at connector J4, at the solder side (terminals marked f1 and f2 at the component side).

After having wired all the sockets, you may loose the fixation screws.

To be quite on the save side, it is advisable to check with an ohmmeter that the two 6.3V terminals are not short-circuited.

CHECK THE COMPLETE ASSEMBLY THOROUGHLY ONCE MORE, BECAUSE, AFTER THE PCB'S HAVE BEEN MOUNTED IN THE HOUSING, THE SOLDERINGS ARE NOT ACCESSIBLE ANY MORE!

Assembly in the housing:

- Fit the rubber supports in the four corners of the bottom of the housing, using 10mm M3 bolts.

- Fit the mains connector in the hole marked MAINS using two sunk m3 bolts.

- Fit the two cinch connectors to the back-panel (at the place marked INPUT).

Remark: to make good contact with the metal housing, it is necessary to remove the paint at the inside, at the place where the connectors are being installed.

- Fit the six screw terminals for the loudspeaker connections (1 black terminal for the "0" connection).

- Mount an 8mm and 10mm spacer together with a 12mm M3 bolt at the holes circled in fig. 4.

REMARK: One must mount a 10mm spacer together with a 4mm M3 bolt at the two framed holes.

- Pass the mains switch and the LED-holder through the opening in the front - panel. Then insert the LED into the holder so that it is flush with the front-side. Then fix the holder by means of the pinch-ring. Then the mains switch can be connected to the mains connector (two outer terminals) using 0.5 - 0.75mm wire. In general, for safety, one will use the switch as a two-pole one, therefore connect mains to either the two upper or the two bottom contacts.

ATTENTION: The terminals of the mains switch should not be soldered, instead, use the cable shoes supplied with the kit.

Fixing the two amplifier modules:

Fit the amplifier modules onto the thread spacer provided for that purpose and then fix the module using 11 screws.

Fit the pre-amplifier module onto the thread spacer provided for that purpose (at the back right of the housing, nearest to the cinch connectors)

Mount the switching-on delay PCB at the foreseen threaded bushes (at the rear left of the case).

Make the following connections with the pre-amplifier module: (see fig. 5)

- Connect the cinch connectors with the inputs (marked IN and GND) of the pre-amplifier-pcb using a screened flex. The pre-amplifier module is divided into the two parts LEFT and RIGHT by means of a dotted line. Take this into account when making connections.

At the side of the connectors, the screens must be connected to each other.
- Connect the outputs (left and right) to the inputs (marked IN and GND) of the respective amplifier modules, using a screened flex.

ATTENTION: The earth connection of the cinch connectors is the only place - where the housing may be connected to the earth of the amplifier!

Fitting the output transformers: (see fig. 6)

Fit the ZD043 type output transformers to the right and the left of the back panel. To do so, proceed as follows:

Pass the fixing bolt through the back panel and fit it with the supplied rubber insulating mat, then slip the transformer on the bolt, so that the connection wires are at the underside and point towards the amplifier-pcb's. After that fix the transformer by means of a second rubber mat and a metal fixing plate, screwed home by means of a ring and a nut.

Now make the following connections (to be done for each channel): (see fig. 7)

- Connect the thick blue wire of the output transformer to the red screw terminal marked 8 ohm on the backside.
- Connect the thick red wire to the black terminal marked 0.
- Connect the double thick yellow wire to the other red terminal marked 4 ohm.
- Connect the orange wire of the output transformer to the corresponding terminal on the amplifier-pcb (terminal J5 marked ORANGE)
- Connect the two black wires to the connecting terminals marked BLACK.
- Connect the violet wire to the connecting terminal marked VIOLET.
- Connect the brown and green wires of the output transformer to the terminals marked BROWN and GREEN respectively.
- Make a wire connection (ordinary 0.5mm wiring wire) between the output - terminal marked 0 (red wire of the output transformer) and the soldering point marked GND (terminal between IN and LS) of the amplifier-pcb.
- Make an analogue wire connection between the output terminal marked 8 ohm (blue wire of the output transformer) and the soldering point marked LS of the - amplifier-pcb.

CHECK THE WIRING THOROUGHLY ONCE MORE, BECAUSE AFTER THE NEXT MOUNTING STEP, IT WON'T BE ACCESSIBLE ANY MORE.

Now you can fit the power supply transformer 8D002 in the centre of the back - panel, in the same way as you fitted the output transformers.

Make the following connections: (fig. 8)

- Connect both the green and the violet thick wire of the power supply transformer to terminal J4 marked 6.3VAC of the left amplifier-pcb.
- Connect both the blue and the grey thick wire to the terminal J4 marked 6.3VAC of the right amplifier-pcb. Also connect the terminals f1 and f2 of the right-hand amplification PCB with the solder pins f1 and f2 of the

preamplification PCB (this can be done with 0.5mm wire). Similarly connect the terminals f1 and f2 of the switching-on delay PCB with the terminals f1 and f2 of the lefthand amplification PCB.

Fitting the power supply module:

ATTENTION: first put the already connected wires in such a way that they - cannot make contact with the underside of the 'power supply'-pcb and then fix them by means of the supplied binders using the holes made for that purpose. (fig. 9)

IMPORTANT: The connection wires of the right output transformer should pass under the power supply module and not under the pre-amplifier module.

Fit the power supply module onto the thread spacers provided for that purpose and fix it using five m3 nuts. (see fig. 4)

Make the following connections: (fig. 10)

- Connect the red wires of the power supply transformer to the terminals marked RED of the 'power supply'-pcb.
- Also connect the yellow wires of the power supply transformer to the terminals marked YELLOW of the 'power supply'-pcb.
- The mains connection depends on the type (110V, 220V, 240V); see fig.11 for connection of the correct voltage. Connect the correct wires with the PINK terminals (insulate wire which might not have been used).
- Connect the mains switch (middle terminals) to the terminals marked MAINS of the 'power supply'-pcb. If the switch is used as a two-pole one, then a through connection must be made between the terminals SW1 of the power supply module.
- Connect the mains voltage indication LED to the terminal marked LD of the - 'power supply'-pcb. The longest wire of the LED has to be connected to the terminal A and the shortest wire of the LED has to be connected to the terminal C.

Now it is time to check the supply voltages.

ATTENTION: MANY POINTS OF THE PCB's CARRY VOLTAGES OF MORE THAN 400V!!

- Fit fuse holder F1 with a 5 or 6A fuse .

Connect the mains connector to the power-point via a flex.

Switch the mains switch on and check whether the mains voltage indication LED lights.

Now check the following voltages using a voltmeter:

- About 6.3VAC at the terminals marked 6.3VAC of every amplifier-pcb.
- This same voltage should also be present at the following points of every valve socket and of every amplifier-pcb : (see fig. 12 for the valve socket

numbering)

For V5 (and V6 on the pre-amplifier pcb) between the terminals 5 and 9.

For V1 through V4 between the terminals 2 and 7.

After about one minute the high-voltage will also be applied (one will hear the relay close), measure the following voltages:

- About 430VDC against earth (GND) at one of the terminals of the fuse holders F2 and F3 on the 'power supply'-pcb.

In case everything turned out well up till now, you can now make the remaining connections.

FIRST SWITCH OFF THE MAINS SWITCH AND PULL THE POWER CORD OUT OF THE POWER POINT. WAIT A COUPLE OF MINUTES UNTIL THE DANGEROUS VOLTAGE DISAPPEARED FROM THE ELECTROLYTIC CAPACITORS OF THE POWER SUPPLY. (You better measure the above-mentioned high voltage points again).

- Connect the points marked +V, +V3, -V and GND of every amplifier-pcb with the corresponding points on the 'power supply'-pcb (using the uninsulated wire supplied with the kit). The GND connection must be connected through using a piece of wire of at least 1.5mm. (fig. 10)

- Connect the points V3 (left and right) of the pre-amplifier module to the points V3 of the amplifier modules using 0.5mm wire (observe the channels) (fig. 10)

Test and adjustment

a) right channel:

REMARK: ALL OF THE FOLLOWING VOLTAGES ARE TO BE MEASURED AGAINST EARTH (MARKED "GND" ON THE PCB).

Fit fuse holder F3 with a 1A fuse. Short-circuit the pre-amplifier inputs using a wire jumper.

Fit valve socket V6 of the pre-amplifier module with an ECC82 (or 12AU7, CV491) type valve.

Fit valve socket V5 with an ECC83 (or 12AX7, CV492) type valve. Pay attention to the position of the connections! (you may have to push hard).

Connect the mains and, after switching on the power, check the following voltages:

- At point +V1: about 430VDC.

- At point +V3: about 350VDC.

- At point -V: about -50VDC. (Pay attention to the polarity when using an analog meter).

- At point 3 of every tube socket V1 through V4: about 430VDC.

Switch the mains back off.

Turn all the trimming potentiometers RV1 through RV4 completely to the left (counter clockwise).

Insert the four EL34 (or C6A7, CV1741) type valves into their sockets (pay attention to the position of the notch!).

IMPORTANT: Connect an 8 ohm 5W resistor **between the output terminals** (0 and 8 Ohm), since the output of a valve amplifier must always be terminated!

Quiescent current adjustment

Switch the mains on and adjust the following voltages:
(first wait a couple of minutes for the tubes to become warm)

ATTENTION: The following voltages serve as a reference for the quiescent current through the power valves. So, be very careful when adjusting. Also observe the adjusting sequence.

Select the measuring range of the measuring apparatus around 1VDC.
Measure the voltage at test point TP3 and carefully adjust it to 0.2V using RV3.
Measure the voltage at test point TP1 and carefully adjust it to 0.2V using RV1.
Repeat this procedure for TP4 and TP2 respectively.
Now wait about 10 minutes and repeat the foregoing adjustment, but this time adjust to 0.4V instead of 0.2V.

Wait another 10 minutes and repeat the foregoing adjustment to 0.4V.

At 0.4V the current of every valve equals $0.4/(39/4)=41\text{mA}$.
This is sufficient to supply about 15W in class A.

Now fit fuse holder F2 with a 1A fuse and repeat paragraph a for the left channel. (attention: first switch the mains off!)

The short-circuits at the inputs may be removed now.

Before fitting the covers, check both the power supply and the amplifier modules for too high mounted components.

Now you can complete the housing: first fit the cover of the power supply and of the transformers by means of screws on the side and at the upper side. After that fit the cover of the amplifier modules by means of screws at the upper side.

Usage.

In case everything turned out well, you can now test the amplifier together with the loudspeakers, but take care that the impedance of the connected loudspeakers is in accordance with the terminals connected.

Never connect loudspeakers to both the 8 and 4 ohm outputs **at the same time**.
A valve amplifier should never be used without loudspeakers.

It is normal that the valves and the housing become very warm. Therefore

install the amplifier at a well ventilated place, and certainly not inside a closed cabinet or bin.

Be carefull with children!

It is advisable to check the closed-circuit adjustment a couple of times a year, certainly when the valves are new.

We wish you much listening pleasure.

Tips for troubleshooting

1) No high-voltage

- Check the wiring of the switching-on delay

2) An irregular crackling sound in the loudspeaker

- Replace R52 of the respective channel

3) A continuous humming tone in the loudspeaker (continual oscillation of the amplifier)

- Place a 10nF capacitor (Cx) in parallel with R11 of the respective channel and/or
- Increase the value of R13, eg 1K8 or 2K2 at both channels!

4) Crackling sound can be heard during the bass peaks (oscillation during drive)

- Place a 22pF capacitor (Cy) between pin 7 of V5 (grid) and the ground.

If the input sensitivity is not as desired it can be adjusted by changing the value of R58L and R58R (on the preamplification PCB). Decreasing this value results in increased amplification, eg 4K7; increasing it results in decreased amplification, eg 12K.

IMPORTANT: Adaptations 3 and 4 may NOT be performed as preventive measures during assembly of the amplifier.

ATTENTION: Should the amplifier not work, just send it to us so that we can check it (please find the address in the enclosed general note).

