STEP BY STEP

CONSTRUCTION MANUAL

FOR

THE

UL40-S2

VALVE AUDIO AMPLIFIER

By: Menno van der Veen and Amplimo BV

GENERAL INFORMATION

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SUPPLIER
Amplimo b.v. is the official supplier of the UL40-S2 kit in Europe. Amplimo b.v. also handles all contacts with the customers and users of the UL40-S2.

CONSTUCTION MANUAL
This manual is not available in bookshops; it is only available with the UL40-S2 construction kit.

SERVICE
Service from Amplimo b.v. consists of two elements:
a) Answering of questions by telephone, fax or email.
b) Checking and adjustment of the buyer's constructed amplifier for a charge of € 95 incl. VAT but excl. shipping charges. Please ensure that the amplifier is well packed before sending it to: AMPLIMO b.v.; Industrieweg 14; NL-7161 BX NEEDE, The Netherlands.
After inspection and repair, the amplifier will be returned, cash on delivery (shipping charges plus € 95.00) or after a prepayment. Shipping is at risk of the customer. Inspection and repair will take a maximum of two weeks. The customer will be notified if it takes longer.

GUARANTEE
1) Guarantee conditions and terms of delivery are defined in the "Algemene Voorwaarden voor de Instrumentenbranche".
2) The guarantee period is a total of 6 months from the date of purchase, (see below).
3) All elements of the construction kit fall under these guarantee conditions. The guarantee does not cover destruction or damage by misuse. This is determined exclusively at the discretion of Amplimo b.v.

The following example clarifies this:
Every output transformer is checked completely before delivery. If it is found that the output transformer is defective, Amplimo b.v. could conclude that the damage has been caused by misuse. For instance: by shortening the leads of the output transformer (which you shouldn't do) or damage due to a short circuit through the transformer caused by the incorrect positioning of a valve in its socket. Because we are dealing with a DIY construction kit, damage is possible if the construction directions are not followed in full. The guarantee does not cover damage if it is due to faulty construction.

TERMS OF DELIVERY
1) The UL40-S2 amplifier is only sold as a complete construction kit, inclusive of the construction manual.
2) Individual components for the kit will only be supplied for the replacement of defective or incorrectly supplied parts, to the original owners of the kit.
3) Delivery will only take place after the purchase price has been paid in cash, in advance into the international bank account of Amplimo b.v. (IBAN NL 36 RABO 031311250), by cash on delivery or by payment using VISA or MasterCard. If you want to personally collect the construction kit please contact Amplimo b.v. first.
4) Acceptance by the buyer only takes places when the buyer has taken notice of the safety instructions on the following page of this manual.
5) Amplimo b.v. and Ir. buro Vanderveen will not entertain any claim, under any circumstance, if it is the result of not or only partially following the safety and building instructions.
6) In addition to the above, the General Terms of Delivery for the "Instrumentenbranche of the FHI" are applicable

SAFETY INSTRUCTIONS
1) This construction kit employs high voltages (220/230 Volt 50 Hz AC and 380 Volt DC). These voltages are potentially lethal if they come in contact with the human body. This is why you must take the greatest care in avoiding accidents or damage of any kind.
2) Only work on the opened amplifier cabinet after the mains plug has been removed from the mains socket AND after the amplifier's high voltage supply has been discharged by first switching the amplifier to the stand-by mode (power switch up and standby switch down) with the valves inserted (although the filaments will glow, high voltage will be absent as the electrolytic capacitors would have been discharged through the valves).

3) Never work with both hands placed in the amplifier at the same time when it is switched on, or when there is still a high voltage present in the set. This situation is extremely dangerous, as leakage or discharge currents may flow from hand to hand via the heart.
4) Only use the prescribed fuses.
5) Take care to ensure that all high voltage leads are insulated and positioned far away from metal parts.
6) DO NOT SHORTEN THE LEADS OF THE OUTPUT TRANSFORMERS as this will cause irreparable damage to the transformers.
7) Do not insert conductive objects into the cabinet.
8) Thoroughly check that the electrolytic capacitors are mounted as instructed, take care not mistake the negative pole with the positive pole, as this could cause acid to leak or for the capacitor to explode.
9) Thoroughly check that transformer leads are connected to the PCB and other parts in accordance with their prescribed colour scheme.
10) Ensure that valve sockets (particular the Octal types) are mounted the right way round in accordance with the diagram.
11) When switching on for the first time explicitly follow the "test procedure" given for the completed set.
12) On the following pages you will find the so called "EG-verklaring van overeenstemming" with explanations. To meet the terms of this declaration, the constructor has to follow ALL directions and conditions.
13) Make sure that there is sufficient room around the amplifier for ventilation; at least 3cm is required each side and 10cm above. Take care to prevent any fluids from entering the amplifier. If this happens, immediately disconnect the set from the mains supply and send the amplifier to Amplimo to be checked. Also note that the cover situated above the valves will become very warm. Take care at all times to prevent the cover from being touched (paying special attention to children). Again with children in mind, position the amplifier so that it becomes impossible to poke metal objects into the cabinet.
14) This amplifier has to be earthed – ensure that the mains socket has an earth connection.
15) With soldered joints, hook the wire in place to form a mechanically stable joint before soldering. This ensures that the wire cannot become loose to cause potential damage or to become a hazard. A piece of heatshrink sleeving around this type of joint not only prevents you from touching the bare terminal, but is also gives extra protection against the contact from working loose.
16) Where two or more wires are soldered in close proximity to each other on the PCB or for instance on the volume control, they have to be secured in place by the use of a cable tie. This prevents the wires from drifting about in the cabinet if they accidentally become unsoldered.

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INTRODUCTION

Dear buyer,

Thank you for buying the UL40-S2 valve amplifier. This amplifier was born out of the love for music, faithful music reproduction and exceptional spatial image. This amplifier is based on many years of experience and study by the designer. The latest techniques and knowledge are used in this design. Some of the details are outlined below:

The output transformer is designed according the latest techniques. Superior insulation materials, grades of copper wire, core compositions and other materials are used (the ultimate of transformers using superior silver/gold wire are now also available at extra cost). All of this results in not only an extremely wide frequency range, but also in excellent detailed reproduction. Each valve is carefully selected by using computerized measuring equipment before finally being matched by hand. The electrical circuit excels by simplicity, realising minimal distortion by using carefully selected components in the signal paths. As negative feedback from the output to the input is not used the concept is amplification straightforward. The printed circuit board uses an extraordinary structure

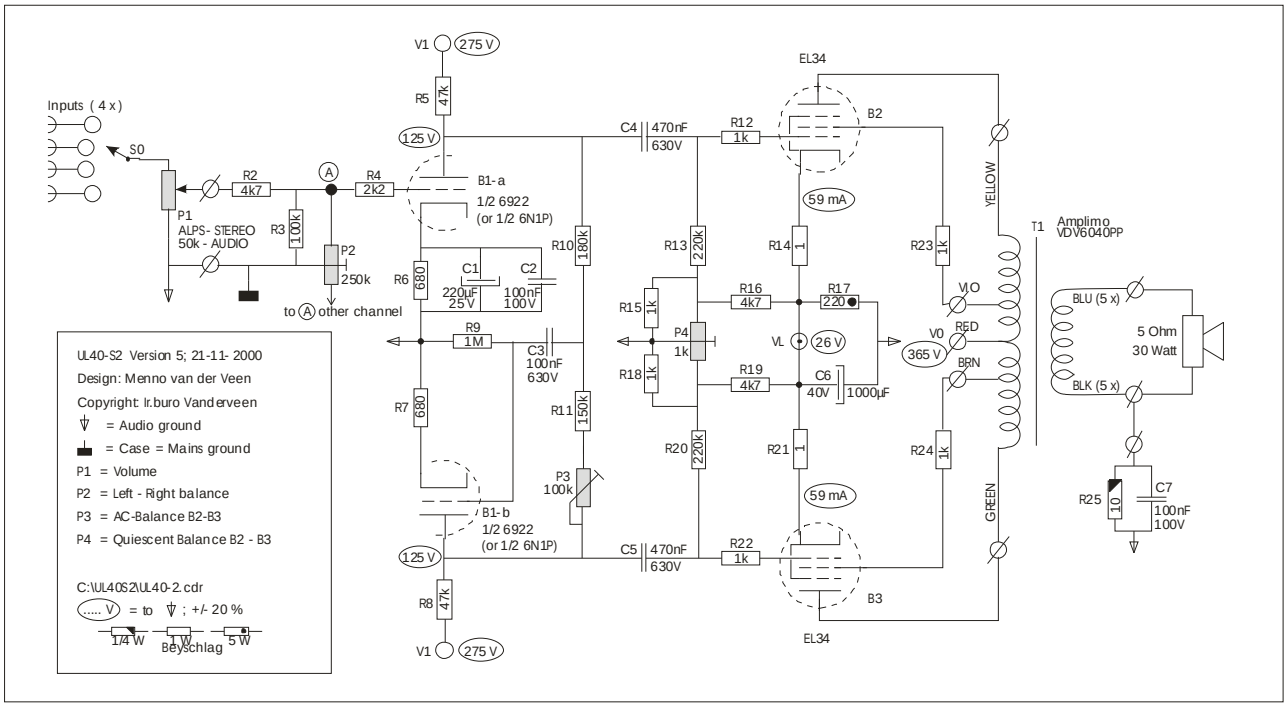
called “LEP = logistic earth patterns”. This means that the ground tracks are laid out in a special way so that there is a minimal degradation of audio signals. Even the mains ground is connected in a special way to one central point. Passive components such as resistors and capacitors are selected with extreme care to contribute to an open and detailed sound image. The amplifier can be operated in several modes (Triode, Ultra-Linear and Pentode) making it possible to experiment with these well known valve configurations. Fast electrolytic capacitors are used in the power supply to give the amplifier a clear and clean high-frequency response. High frequency decoupling is used for the filaments, providing low radiation from the PCB.

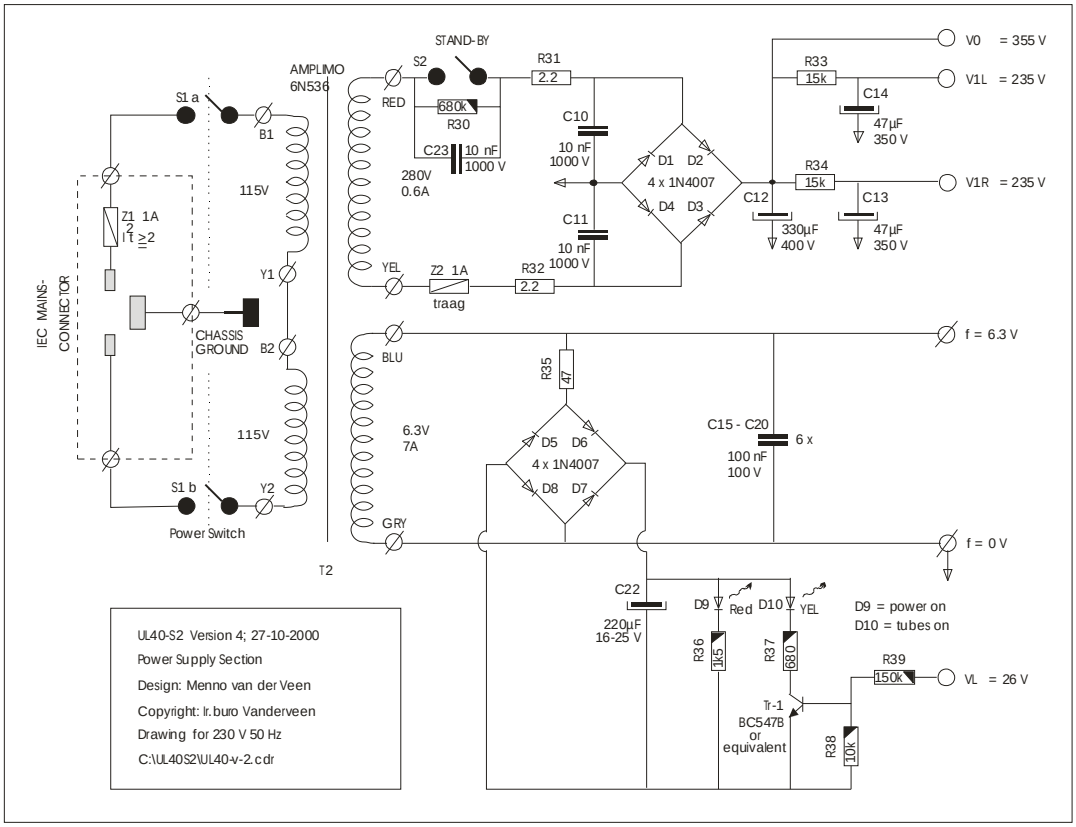
We could reveal further new facts and advantages, but much greater details are given in previously written articles (publication in Radio Bulletin Elektronica, December 1994, publication in Radio Bulletin Elektronica July/August 1996, publication in “Het Vanderveen BuizenBouwboek”, 4th and later releases, publication in the book “Modern High End Valve Amplifiers with Toroidal Transformers”; all of which are available from Amplimo b.v.). In these the details of this design are extensively explained. The UL40-S2 is a revamped version of the original UL40-S, to which several improvements have been incorporated (including the option of quiescent current adjustment for the output valves to keep them matched for longer and more extensive high-frequency decoupling of the power supply) in addition to having a superior metal cabinet.

We hope that you will get lot of pleasure from building this UL40-S2 valve amplifier together with a greater joy in listening to your favourite music using this amplifier. Should you have any questions, please contact our customer support department.

Ir. buro Vanderveen and Amplimo b.v.

Menno van der Veen, Hans Braam


Inputs (4 x)
S0
P1
ALPS - STEREO
50k - AUDIO
R3 100k
R2 4k7
R4 2k2
P2 250k
to A other channel
V1 275 V
R5 47k
125 V
B1-a
1/2 6922
(or 1/2 6N1P)
R6 680
C1 220µF 25 V
C2 100nF 100V
R10 180k
R9 1M
C3 100nF 630V
R7 680
R11 150k
P3 100k
B1-b
1/2 6922
(or 1/2 6N1P)
R8 47k
V1 275 V
C4 470nF 630V
C5 470nF 630V
EL34
R12 1k
R22 1k
B2
B3
59 mA
R13 220k
R20 220k
R14 1
R21 1
R15 1k
R18 1k
P4 1k
R16 4k7
R19 4k7
R17 220
C6 40V 1000µF
VL 26 V
V0 365 V
R23 1k
R24 1k
V1O
RED
BRN
YELLOW
GREEN
T1 Amplimo VDV6040PP
BLU (5 x)
BLK (5 x)
5 Ohm
30 Watt
R25 10
C7 100nF 100V
UL40-S2 Version 5; 21-11- 2000
Design: Menno van der Veen
Copyright: Ir.buro Vanderveen
= Audio ground
= Case = Mains ground
P1 = Volume
P2 = Left - Right balance
P3 = AC-Balance B2-B3
P4 = Quiescent Balance B2 - B3
C:\UL40S2\UL40-2.cdr
..... V = to ; +/- 20 %
1/4 W 1 W 5 W
Beyschlag

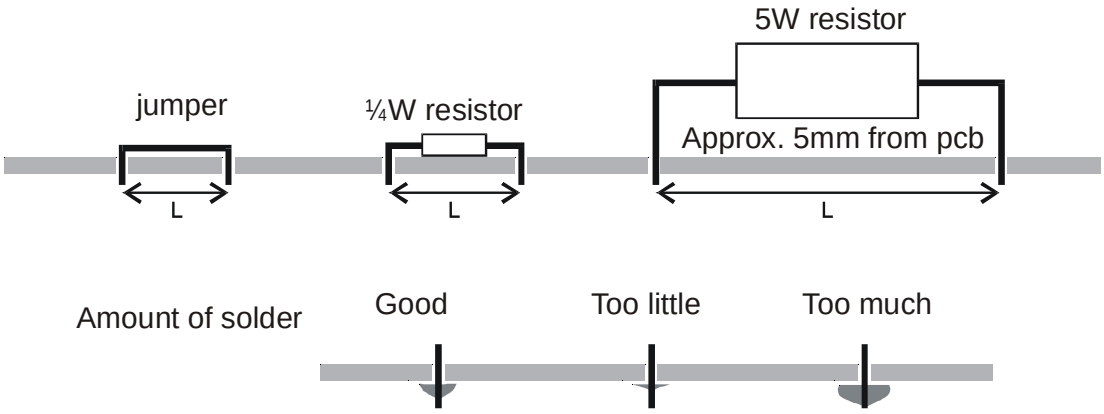

AMPLIMO
6N536
STAND-BY
S2
S1 a
S1 b
B1
B2
115V
115V
Y1
Y2
Z1 1A
I²t ≥2
IEC MAINS-CONNECTOR
CHASSIS GROUND
Power Switch
RED
680k R30
C23 10 nF 1000 V
280V 0.6A
YEL
Z2 1A traag
R31 2.2
R32 2.2
C10 10 nF 1000 V
C11 10 nF 1000 V
D1 D2
4 x 1N4007
D4 D3
C12 330µF 400 V
R33 15k
R34 15k
C14 47µF 350 V
C13 47µF 350 V
V0 = 355 V
V1L = 235 V
V1R = 235 V
BLU
GRY
6.3V 7A
R35 47
D5 D6
4 x 1N4007
D8 D7
C15 - C20 6 x 100 nF 100 V
f = 6.3 V
f = 0 V
T2
C22 220µF 16-25 V
D9 Red
D10 YEL
D9 = power on
D10 = tubes on
R36 1k5
R37 680
R39 150k
VL = 26 V
Tr-1 BC547B or equivalent
R38 10k
UL40-S2 Version 4; 27-10-2000
Power Supply Section
Design: Menno van der Veen
Copyright: Ir.buro Vanderveen
Drawing for 230 V 50 Hz
C:\UL40S2\UL40-v-2.cdr

LIST OF COMPONENTS

CODE	VALUE	TYPE		QUANTITY	PRINTING
Resistors					
R2	4,7kΩ	1W	metal film	2	ye-vi-blk-br-br
R3	100kΩ	1W	metal film	2	br–blk–blk–or–br
R4	2,2kΩ	1W	metal film	2	rd–rd–blk–br–br
R5	47kΩ	1W	metal film	2	ye–vi–blk–rd–br
R6	680Ω	1W	metal film	2	blu–gry–blk–blk–br
R7	680Ω	1W	metal film	2	blu–gry–blk–blk–br
R8	47kΩ	1W	metal film	2	ye–vi–blk–rd–br
R9	1MΩ	1W	metal film	2	br–blk–blk–ye–br
R10	180kΩ	1W	metal film	2	br–gry–blk–or–br
R11	150kΩ	1W	metal film	2	br–grn–blk–or–br
R12	1kΩ	1W	metal film	2	br–blk–blk–br–br
R13	220kΩ	1W	metal film	2	rd–rd–blk–or–br
R14	1Ω	1W	metal film	2	br–blk–blk–sil–br
R15	1kΩ	1W	metal film	2	br–blk–blk–br–br
R16	4,7kΩ	1W	metal film	2	ye–vi–blk–br–br
R17	220Ω	7W	Wire wound	2	220R 5% 7W
R18	1kΩ	1W	metal film	2	br–blk–blk–br–br
R19	4,7kΩ	1W	metal film	2	ye–vi–blk–br–br
R20	220kΩ	1W	metal film	2	rd–rd–blk–or–br
R21	1Ω	1W	metal film	2	br–blk–blk–sil–br
R22	1kΩ	1W	metal film	2	br–blk–blk–br–br
R23	1kΩ	1W	metal film	2	br–blk–blk–br–br
R24	1kΩ	1W	metal film	2	br–blk–blk–br–br
R25	10Ω	1/4W	carbon film	1	br–blk–blk–gld
R30	680kΩ	1/4W	carbon film	1	blu–gry–ye–gld
R31	2,2Ω	1W	metal film	1	rd–rd–blk–sil–br
R32	2,2Ω	1W	metal film	1	rd–rd–blk–sil–br
R33	15kΩ	1W	metal film	1	br–grn–blk–rd–br
R34	15kΩ	1W	metal film	1	br–grn–blk–rd–br
R35	47Ω	1W	metal film	1	ye–vi–blk–gld–br
R36	1,5kΩ	1/4W	carbon film	1	br–grn–rd–gld
R37	680Ω	1/4W	carbon film	1	blu–gry–br–gld
R38	10kΩ	1/4W	carbon film	1	br–blk–or–gld
R39	150kΩ	1/4W	carbon film	1	br–grn–ye–gld
Capacitors					
C1	220µF / 25V	electrolytic cap radial		2	
C2	0,1µF / 100V	capacitor radial	MKT, MKH	2	
C3	0,1µF / 630V	capacitor radial	MKP	2	
C4	0,47µF / 630V	capacitor radial	MKP	2	
C5	0,47µF / 630V	capacitor radial	MKP	2	
C6	1000uF / 40V	electrolytic cap axial		2	
C7	0,1µF / 100V	capacitor radial	MKT, MKH	1	
C10	10nF / 1200V	capacitor radial	MKP	1	
C11	10nF / 1200V	capacitor radial	MKP	1	
C12	330µF / 400V	electrolytic cap radial		1	
C13	47µF / 350V	electrolytic cap axial		1	
C14	47µF / 350V	electrolytic cap axial		1	
C15	0,1µF / 100V	capacitor radial	MKT, MKH	1	
C16	0,1µF / 100V	capacitor radial	MKT, MKH	1	
C17	0,1µF / 100V	capacitor radial	MKT, MKH	1	
C18	0,1µF / 100V	capacitor radial	MKT, MKH	1	
C19	0,1µF / 100V	capacitor radial	MKT, MKH	1	
C20	0,1µF / 100V	capacitor radial	MKT, MKH	1	
C22	220µF / 25V	electrolytic cap radial		1	
C23	10nF / 1200V	capacitor radial	MKP	1	
Potentiometers					
P1	50kΩ log	stereo volume control	ALPS	1	
P2	250kΩ	trimpot	small horz.	1	
P3	100kΩ	trimpot	small horz.	2	
P4	1kΩ	trimpot	small horz.	2	

Semiconductors					
D1 t/m D8	1N4007	diode		8	
D9	LED	red	flat top	1	
D10	LED	yellow	flat top	1	
Tr1	BC547	transistor	NPN	1	
Other parts					
Z	Fuse holder	PCB-mount		1	
Z1,Z1'	T1A I²t min.15t	Slow-blow fuse	IEC127 5x20mm	2	for 230V use only
Z1,Z1'	T2A I²t min.40t	Slow-blow fuse	IEC 127 5x20mm	2	for 115V use only
Z2	T0,63A	Slow-blow fuse	5x20mm	1	
S0	switch	Selector		1	
S1, S2	switch	Toggle		2	
T1	PAT4002	Output transformer	VDV6040PP	2	
T2	6N536P	Power transformer	AMPLIMO	1	
PRINT1		PCB main	double sided	1	
PRINT2		PCB input	single sided	1	
PRINT3		PCB alps	single sided	1	
B1	6922	Valve	Electro Harmonix	2	
B2, B3	EL34	Matched valve	Svetlana	4	
NOVAL	noval	Valve socket	PCB mount	2	
OCTAL	octal	Valve socket	PCB mount	4	
WBTR		Speaker terminal	WBT red	2	
WBTW		Speaker terminal	WBT white	2	
CINCH		2V stereo input	cinch gold plate	2	
MAINS INPUT		Mains input	3-terminals	1	
MAINS CORD		Mains cord		1	
SHAFT		Extension shaft	aluminium	1	
SHAFTCOUPL.		Shaft coupling		2	
SHAFTSUPPORT		Shaft support		1	
KNOB		Instrument knob	aluminium black	2	
BUSH		Nylon spacer	7,5mm	1	
FOOT	incl.	Mounting material		3	
Assembly-parts					
CABINET				1	
COVER				1	
BASE				1	
FRONT				1	
M4x10mm	screw	Pan head	black	8	for base
M3x8	screw	Counter sunk	black	1	for mains input
M3x10	screw	Counter sunk	black	1	for mains input
ST2,9x6,3mm	screw	Pan head	black	3	for cover
ST2,9x13mm	screw	Pan head	black	2	for cinch inputs
M4x12mm	screw	Pan head	black hex socket	4	for front
M3x10mm	screw	Pan head	black	5	for PCB
M5x60mm	screw	Pan head	black hex socket	1	for power transformer
M4 washer	spring washer			8	
M3 washer	spring washer			3	
M3 nut	nut			2	
M5 nut	nut			1	for power transformer
M5 washer	washer			1	for power transformer
SOLDER	solder	with silver	SILTECH	30	grams
WIRE	wire	several colours		7	several lengths
ISOLATION SLEEVE		several colours		2	several lengths
HEAT SHRINK				2	several lengths
TIE WRAPS	Tie wraps			20	
STICKER	warning	sticker		1	for base
SOLDER TERMINAL	Solder terminal	6.3mm blade	Faston	2	
SOLDER TERMINAL	Solder terminal	small ceramic lug		32	
SOLDER TERMINAL	Solder tag	M3		1	For mains-earth

CONSTRUCTION - general hints -



MOUNTING OF COMPONENTS ON THE PCB

Some examples for mounting axial components (= longitudinal leads) are drawn above. Determine length "L" for these components by measuring the distance between the holes in the circuit board. Then bend the leads to the right size using a pair of pliers. The components will then fit neatly into the holes of the circuit board. To prevent the part falling out when turning the PCB upside down, you can bend the leads slightly outwards.

SOLDERING

A good soldering technique is important for long term reliability and the correct functioning of the set.

Bad solder connections ("dry joints") are the main cause of poor electrical contact. These can work loose after several cycles of warming up and cooling down.

Note the following:

1. Use a good soldering iron rated at a medium power (30-75 Watt).
2. Only use the high quality solder supplied in the kit. This contains silver and a resin core.
3. Briefly preheat the contact and the lead to be soldered by touching both parts at the same time with the soldering iron.
4. Then introduce the solder letting it flow properly round the lead.
5. Use of the correct amount of solder is very important (see figure above).
6. Visually check the joint: a good joint is shiny, a bad one is dull.
7. Cut the leads close to the soldered joint to ensure that there are no long protruding leads. Corona discharge from sharp points at high voltage can be prevented in this way.
8. Experts recommend against cutting the leads after soldering as this might deform the joint causing bad contacts after a period of time. However cutting before soldering is not always possible, therefore trim the lead back after soldering, and to guarantee good connections you can reheat each joint with the soldering iron.

WIRING

We recommend cutting the various wires to length, and stripping the ends before you start to build the amplifier. Neatly twist the stripped ends to strengthen them.

COLOUR	LENGTH	QUANTITY	FUNCTION	COLOUR	LENGTH	QUANTITY	FUNCTION
blue	30 cm	2	mains input	yellow	15 cm	1	+ yellow LED
yellow/green	10 cm	1	earth	yellow	25 cm	2	Stand-by switch
green	10 cm	2	power switch	black	15 cm	2	- red and yellow LED
green	35 cm	2	input pcb	black	35 cm	1	input pcb
green	7 cm	2	volume control	black	7 cm	2	volume control
red	15 cm	1	+ red LED	black	30cm	1	speaker terminal R
				black	20cm	1	speaker terminal L

STEP 1 – main circuit board -

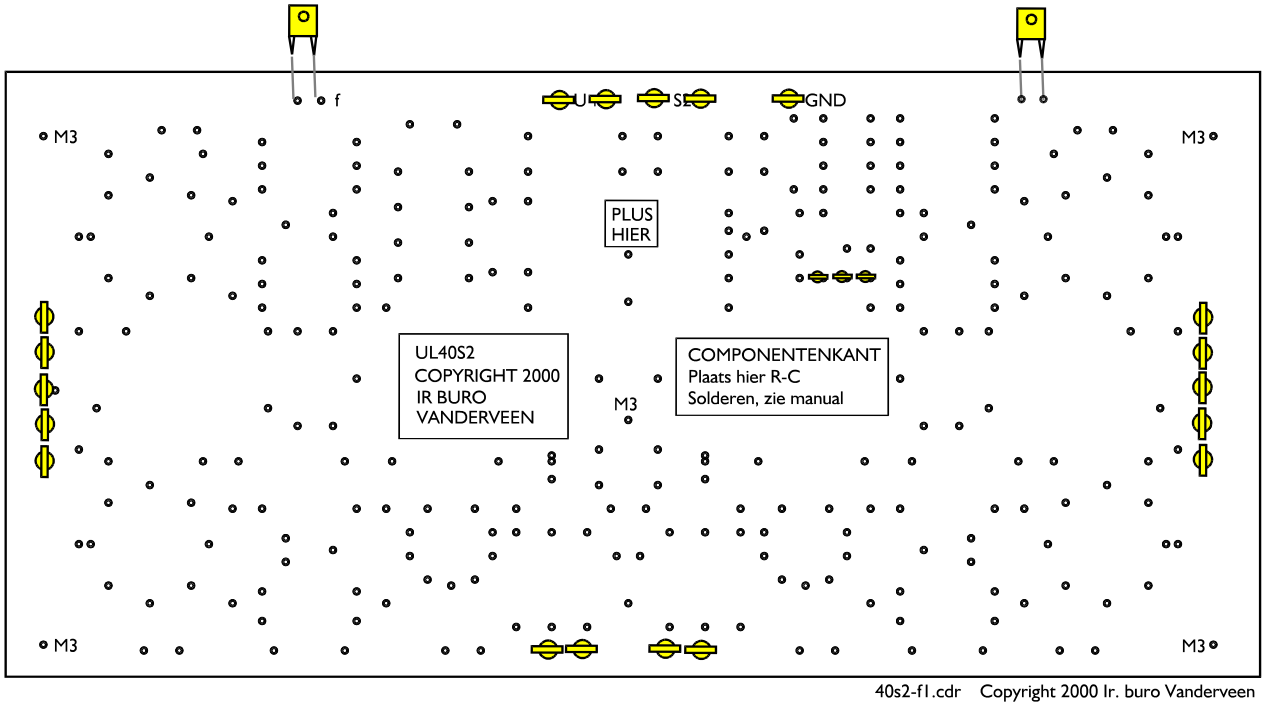


Figure 1

SOLDER TERMINALS + FASTON CONNECTORS

1. The correct side for mounting the valve sockets is clearly marked on the circuit board (Dutch: BOVENKANT=BUISVOETKANT). The side for mounting the other components is also marked (Dutch: COMPONENTENKANT).
2. First push the 22 small solder terminals into their holes on the **component side** of the PCB using a pair of pliers and align them as shown in figure 1. Solder them into place (to ensure a nice flat surface first bend the pins aside with a knife before soldering. This mounting method provides a strong connection as well as preventing corona discharge from the PCB to the metal cabinet).
3. Now solder the two largest Faston spade connectors into place on the **component-side**. These are for the 6.3V filament supply for the valves.
   Scratch any oxide off with a knife until they are clean, the solder will flow better now.

STEP 2 – main circuit board –

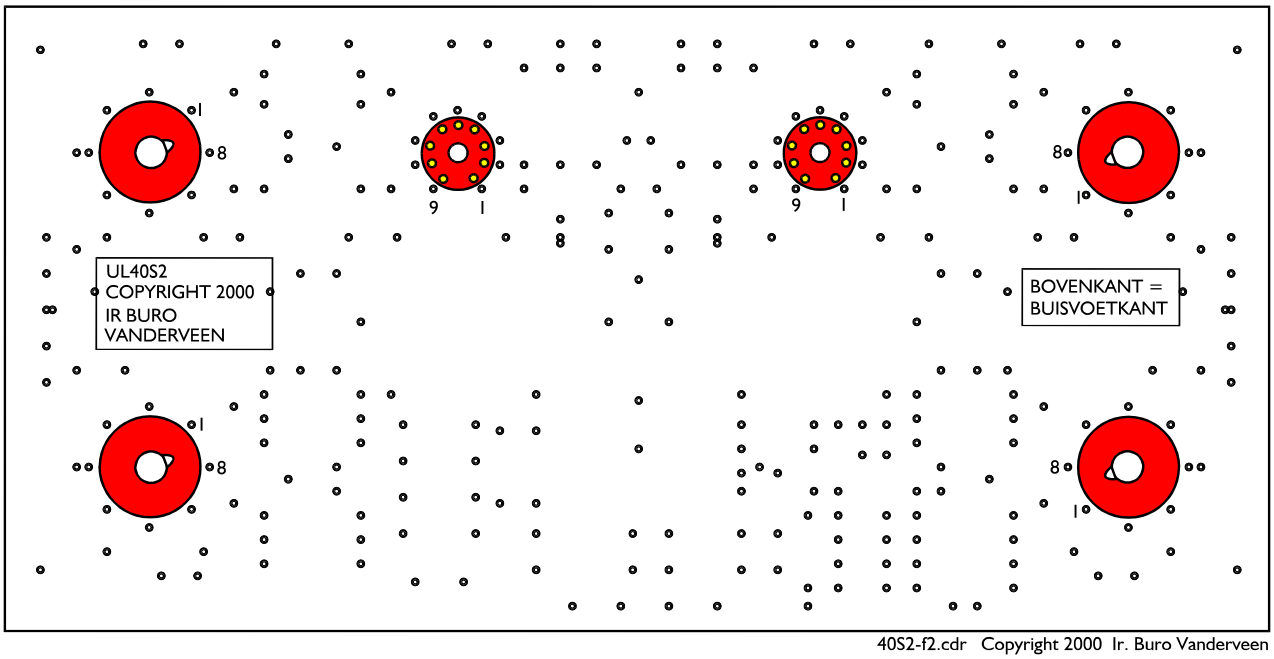


Figure 2

NOVAL and OCTAL VALVE SOCKETS

1. First mount the two smaller ceramic Noval (9 pin) sockets on the **socket side (BUISVOETKANT)**, and solder them into place. Insert the 6922 valve into the socket prior to soldering for the best results as the prongs will now be correctly aligned. After soldering, the valve can be removed from the socket.
2. Note: do not bend the prongs of the Noval sockets over as this is not necessary to keep them in place. If the sockets need replacing at a later date, it is almost impossible to do so once the prongs have been bent. Bending also puts strain on the contacts.
3. Mount the four white ceramic Octal (8 pin) sockets on the **socket side**, but do not solder them in place yet. Take note of the alignment of the slot in the middle hole of the socket. Align this slot with the dash on the PCB between pins 1 and 8. (Please ignore the numbers on the base of the socket as these might differ).

   Now insert the circuit board from the bottom upwards into the cabinet, in such a way so that the four octal-sockets protrude through the holes provided for them in the cabinet. Now turn the cabinet (complete with the PCB) upside down and temporarily fasten the board in place using the M3 screws. Check that the sockets correctly protrude through the cabinet before soldering them in place.
4. Note: do not bend the prongs of the octal sockets for the same reasons as given for the noval sockets. In this case it is unnecessary to insert the valves into the sockets prior to soldering.

STEP 3 – main circuit board –

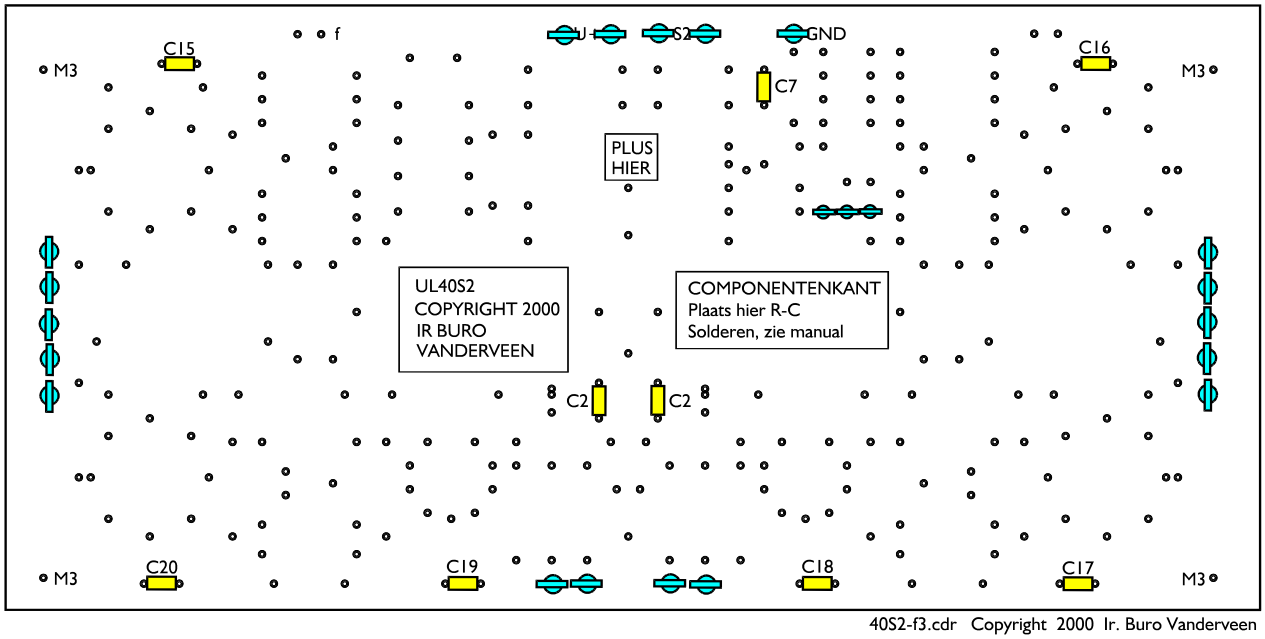


Figure 3

0.1 µF CAPACITORS

1. Components that have been mounted so far are coloured turquoise in figure 3, while the parts which are to be mounted at this stage are coloured yellow. From now on this colour code will be used as this makes it easier to recognise what is required for each construction step.
2. Capacitors C15-C20 (high frequency decoupling of the 6.3 V filament supply), capacitor C2 (high frequency bypass of the electrolytic capacitor C1) and C7 (high frequency decoupling of the ground-connection), are all 0.1µF. Their positions are marked in figure 3.
3. Solder these into place and crop the leads.

STEP 4 – main circuit board -

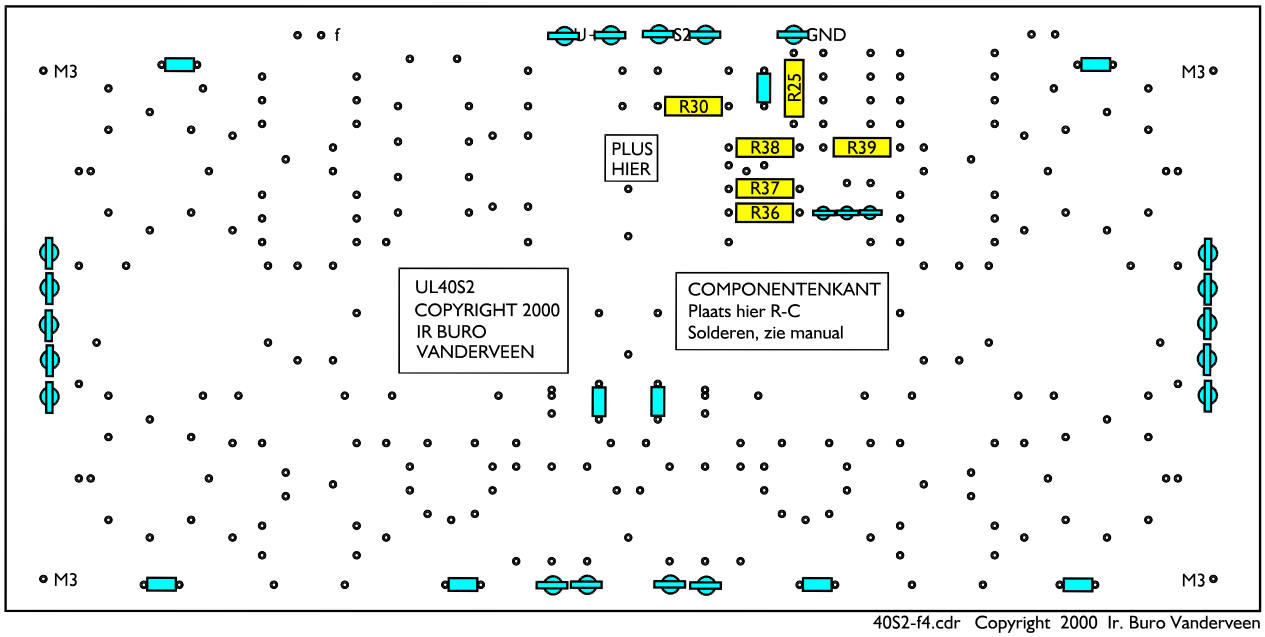


Figure 4

¼ WATT RESISTORS

1. Resistors R25, R30, R36, R37, R38 and R39 are all ¼ Watt types. These resistors are clearly recognisable because they are smaller then the pale blue 1 Watt metal film Beyschlag resistors.

2. Values and colour codes are as follows:

R25	=	10 Ω	brown black black	+tolerance band
R30	=	680 kΩ	blue grey yellow	+tolerance band
R36	=	1k5=1500 Ω	brown green red	+tolerance band
R37	=	680 Ω	blue grey brown	+tolerance band
R38	=	10 kΩ	brown black orange	+tolerance band
R39	=	150 kΩ	brown green yellow	+tolerance band

3. Mount the resistors at the marked positions and solder them into place.

COLOURCODE-INDEX 1 for ¼ Watt resistors (3 bands in total)

COLOUR		BAND 1	BAND 2	BAND 3
black	bl	0	0	x 1
brown	br	1	1	x 10
red	rd	2	2	x 100
orange	or	3	3	x 1K
yellow	ye	4	4	x 10K
green	grn	5	5	x 100K
blue	bl	6	6	x 1M
violet	vi	7	7	x 0.1
grey	gry	8	8	x 0.01
white	wt	9	9	

TOLERANCES: brown 1%, red 2%, gold 5%
EXAMPLE: brown - green - yellow - gold = 150kΩ / 5%

STEP 5 – main circuit board -

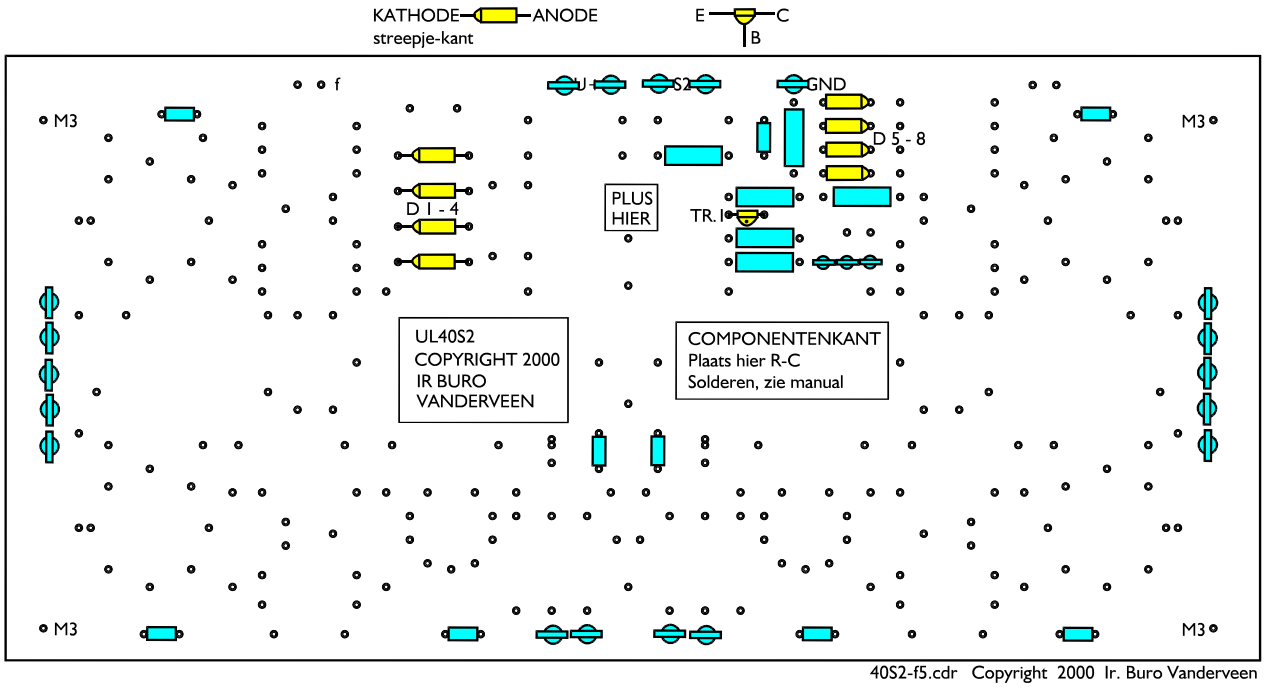


Figure 5

DIODES and TRANSISTOR

1. Diodes D1-4 and D5-8 each are all type 1N4007. These black diodes carry a clear white ring marking the cathode. Each cathode is marked with a black line in figure 5.

2. Diodes D1-4, inserted with the correct cathode orientation, must be mounted **5mm** above the circuit board. This distance is necessary to prevent high voltage discharge from the diodes to the printed circuit below. The diodes will also radiate heat better without discolouring the PCB.

3. Diodes D5-8, inserted with the correct cathode orientation, may be mounted close to the PCB. These diodes are not at high voltage, they only rectify the 6.3V AC for the LED indication circuit.

4. Transistor T1 has three terminals, the middle of which is the 'Base'. The case has a flat side, which provides clear identification of the 'Collector' and 'Emitter' terminals. Mount the transistor into the marked position and make sure the distance between the transistor and PCB is about 7mm. This keeps any mechanical strain to a minimum.

5. Solder the diodes and transistor into place.

STEP 6 – main circuit board -

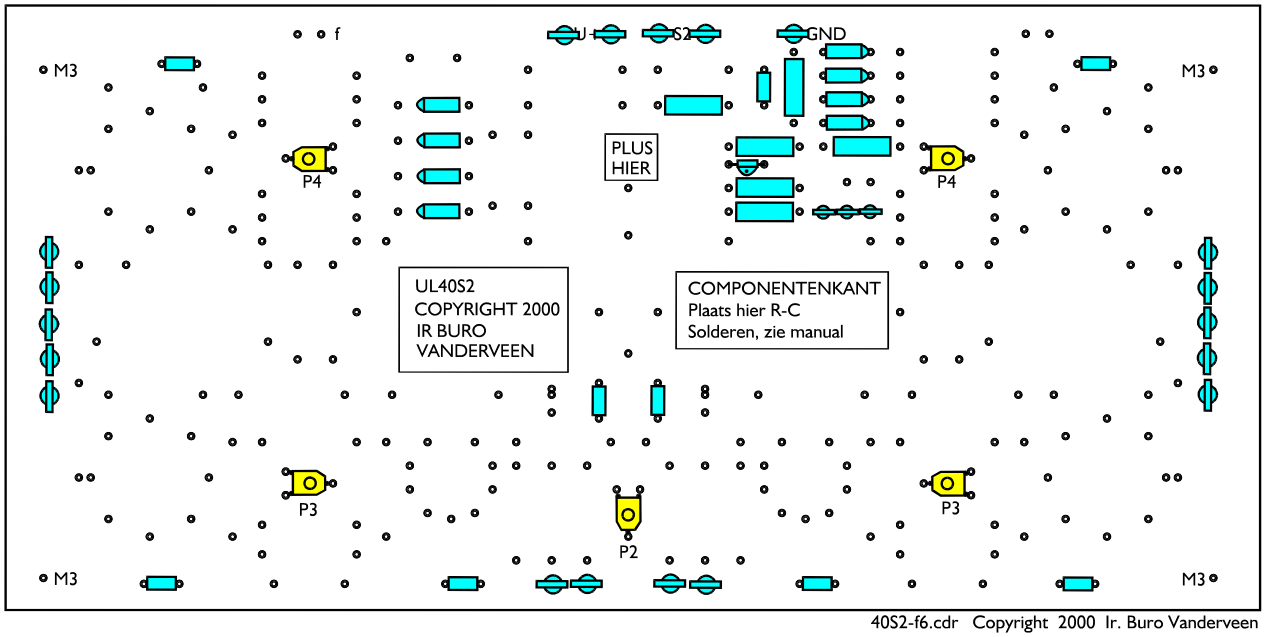


Figure 6

TRIMPOTS

1. Trimpots P2 (1 piece), P3 (2 pieces) and P4 (2 pieces) are now inserted into the PCB.

2. The value of each is clearly printed on the side.
   P2 = 250 kΩ
   P3 = 100 kΩ
   P4 = 1 kΩ

3. Solder the trimpots into the marked positions and turn each indicator (marked by a little arrow) into the mid position using a screwdriver (the arrow is to point to the middle of the round section). The adjustment of each trimpot is almost right at this setting and will only need slight adjustment.

4. The function of each trimpot is as follows:
   P2 = balance between right and left channel (balance control)
   P3 = one per channel: equal signal to both output valves (AC-balance)
   P4 = one per channel: equal quiescent current through each output valve (DC-balance)
   The function of P2 is straightforward. Left and right channels have to have the same volume setting to obtain a correct balance in the sound image.
   P3 provides the grids of the output valves with equal signal levels to ensure that the output transformer is driven symmetrically. This prevents transformer hum and overshoot when a 100Hz squarewave is reproduced. In the adjustment procedure given at the end of this manual, the correct adjustment of P3 is clearly described.
   The quiescent-plate-current through both output valves can be adjusted by means of P4. The output valves are supplied as matched pairs (matched for equal currents), however quiescent current can drift as the valves age. This can be compensated for by adjusting P4. The adjustment is very simple: position yourself close to the speaker and listen to the level of hum. Adjust P4 until the hum is at a minimum.

STEP 7 – main circuit board -

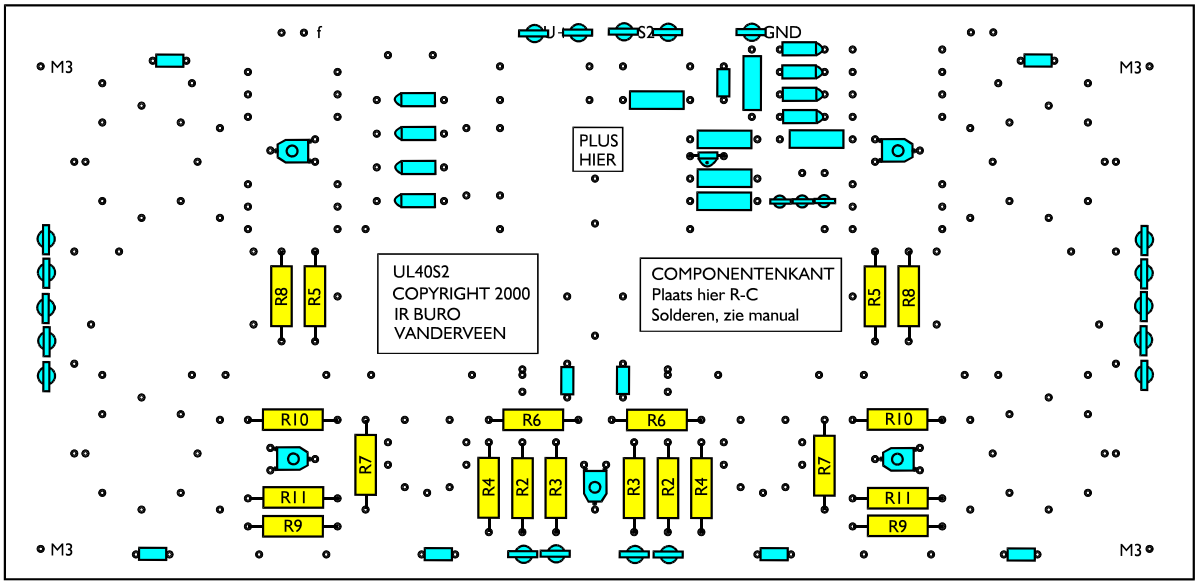


Figure 7

1 Watt RESISTORS, audio part 1

1. Resistors R2 up to and including R11 are used for the preamplifier and the phase splitter of the amplifier. They are all 1 Watt Beyschlag metal film resistors.

2. **As they run hot mount resistors R5 and R8, 5mm above the PCB**. The remaining resistors may be mounted close to the PCB.

3. Values and colour codes are as follows (see table below)

R2 =	4k7 = 4700 Ω	yellow violet black brown	+tolerance band
R3 =	100 kΩ	brown black black orange	+tolerance band
R4 =	2k2 = 2200 Ω	red red black brown	+tolerance band
R5 =	47 kΩ	yellow violet black red	+tolerance band
R6 =	680 Ω	blue grey black black	+tolerance band
R7 =	680 Ω	blue grey black black	+tolerance band
R8 =	47 kΩ	yellow violet black red	+tolerance band
R9 =	1 MΩ	brown black black yellow	+tolerance band
R10 =	180 kΩ	brown grey black orange	+tolerance band
R11 =	150 kΩ	brown green black orange	+tolerance band

COLOUR CODE-INDEX 2 for 1 Watt resistors (4 bands in total)

COLOUR		BAND 1	BAND 2	BAND 3	BAND 4
black	bla	0	0	0	x 1
brown	bro	1	1	1	x 10
red	red	2	2	2	x 100
orange	ora	3	3	3	x 1K
yellow	yel	4	4	4	x 10K
green	grn	5	5	5	x 100K
blue	blu	6	6	6	x 1M
violet	vio	7	7	7	x 10M
grey	gry	8	8	8	
white	wht	9	9	9	
gold	gld				x 0.1
silver	sil				x 0.01

TOLERANCES:
brown 1%, red 2%, gold 5%

EXAMPLE:
yellow -violet -black -red -brown = 47 k /1 %

STEP 8 – main circuit board –

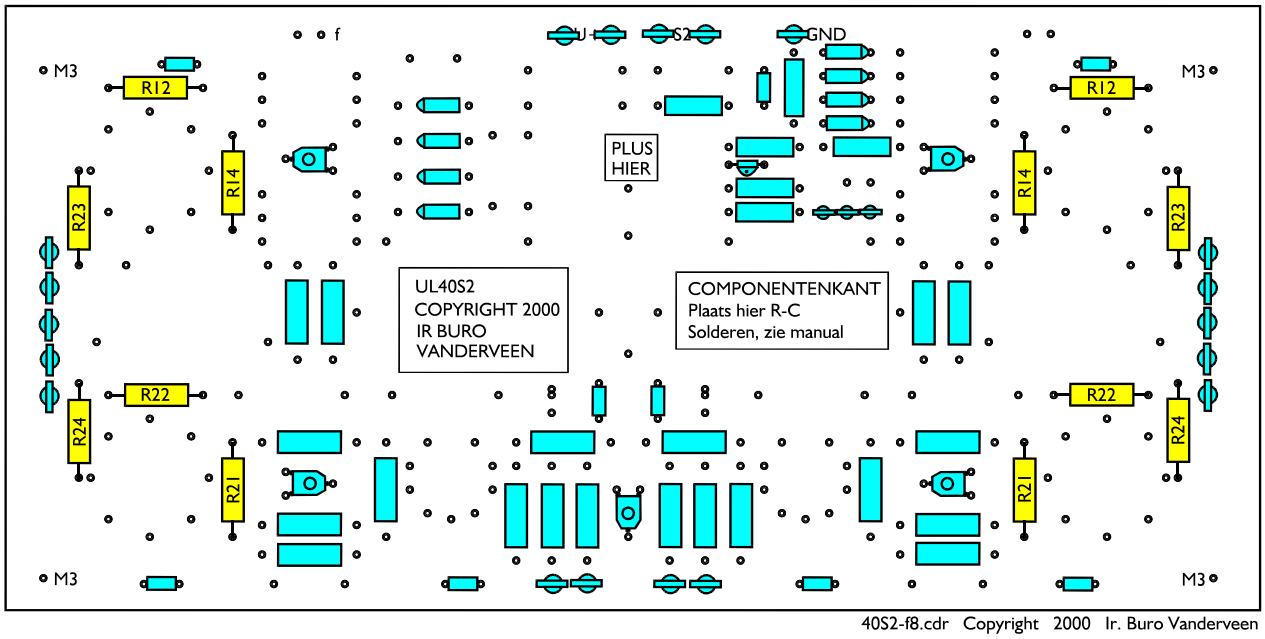


Figure 8

1 Watt RESISTORS, audio part 2

1. Resistors R12, R14, R21, R22, R23 and R24 are also 1 Watt metal film resistors and are situated around the output valves.

2. These resistors do not get warm and may be mounted close to the PCB.

3. Values and colour codes are:

R12 =	1 kΩ	brown black black brown	+tolerance band
R14 =	1 Ω	brown black black silver	+tolerance band
R21 =	1 Ω	brown black black silver	+tolerance band
R22 =	1 kΩ	brown black black brown	+tolerance band
R23 =	1 kΩ	brown black black brown	+tolerance band
R24 =	1 kΩ	brown black black brown	+tolerance band

STEP 9 – main circuit board –

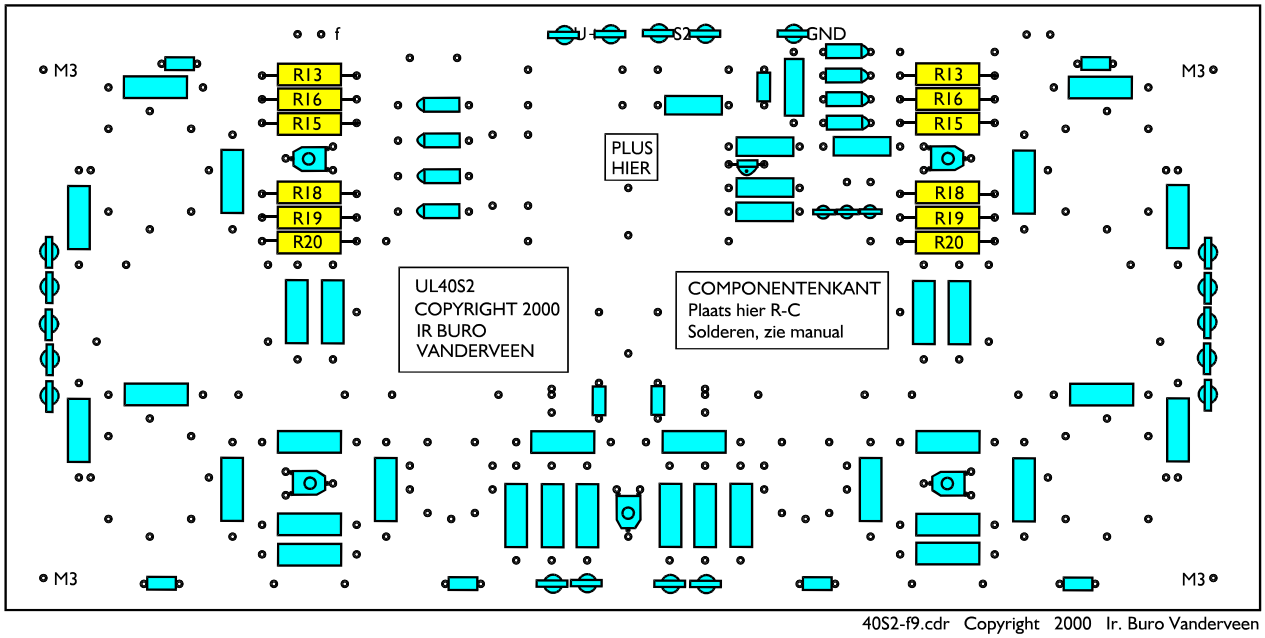


Figure 9

1 Watt RESISTORS, quiescent current adjustment

1. Resistors R13, R15, R16, R18, R19 and R20 (together with trimpot P4) are part of the quiescent current adjustment circuit for the output valves. They do not belong to the audio circuit, but metal film resistors are used to guarantee long term stability.

2. None of these generate heat. They can be mounted close to the PCB.

3. Values and colour codes are:

R13 =	220 kΩ	red red black orange	+tolerance band
R15 =	1 kΩ	brown black black brown	+tolerance band
R16 =	4k7 Ω	yellow violet black brown	+tolerance band
R18 =	1 kΩ	brown black black brown	+tolerance band
R19 =	4k7 Ω	yellow violet black brown	+tolerance band
R20 =	220 kΩ	red red black orange	+tolerance band

STEP 10 – main circuit board –

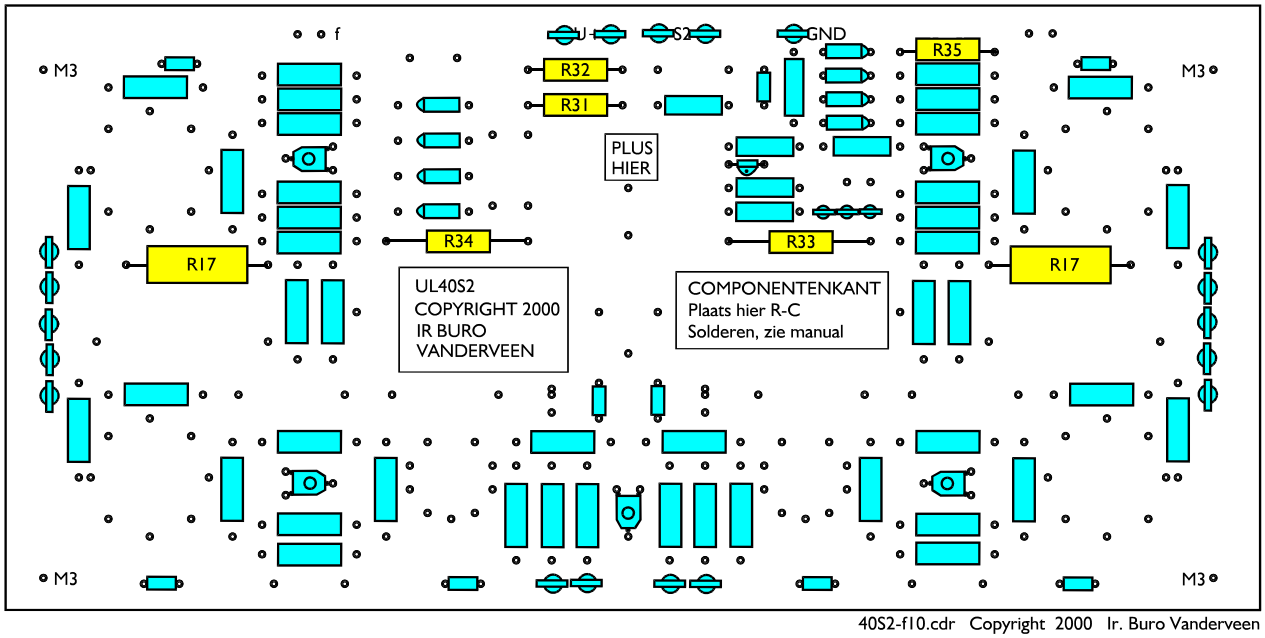


Figure 10

Cathode and Supply Resistors

1. Resistor R17 is a 7 Watt resistor which has to be mounted 1cm above the PCB. This resistor radiates a lot of heat, but at a distance of 1cm the PCB will not get damaged (otherwise discolouration and even carbonization of the PCB will occur). The value of R17 is 220 ohm and it is physically larger than the metal film resistors.

2. Resistors R31, R32, R33 and R34 are 1 Watt metal film resistors and all generate some heat. Therefore they have to be mounted 5mm above the PCB.
   However R35 does not get warm and may be mounted close to the PCB.

3. Values and colour codes are:

R31 =	2,2 Ω	red red black silver	+tolerance band
R32 =	2,2 Ω	red red black silver	+tolerance band
R33 =	15 kΩ	brown green black red	+tolerance band
R34 =	15 kΩ	brown green black red	+tolerance band
R35 =	47 Ω	yellow violet black gold	+tolerance band

STEP 11 – main circuit board –

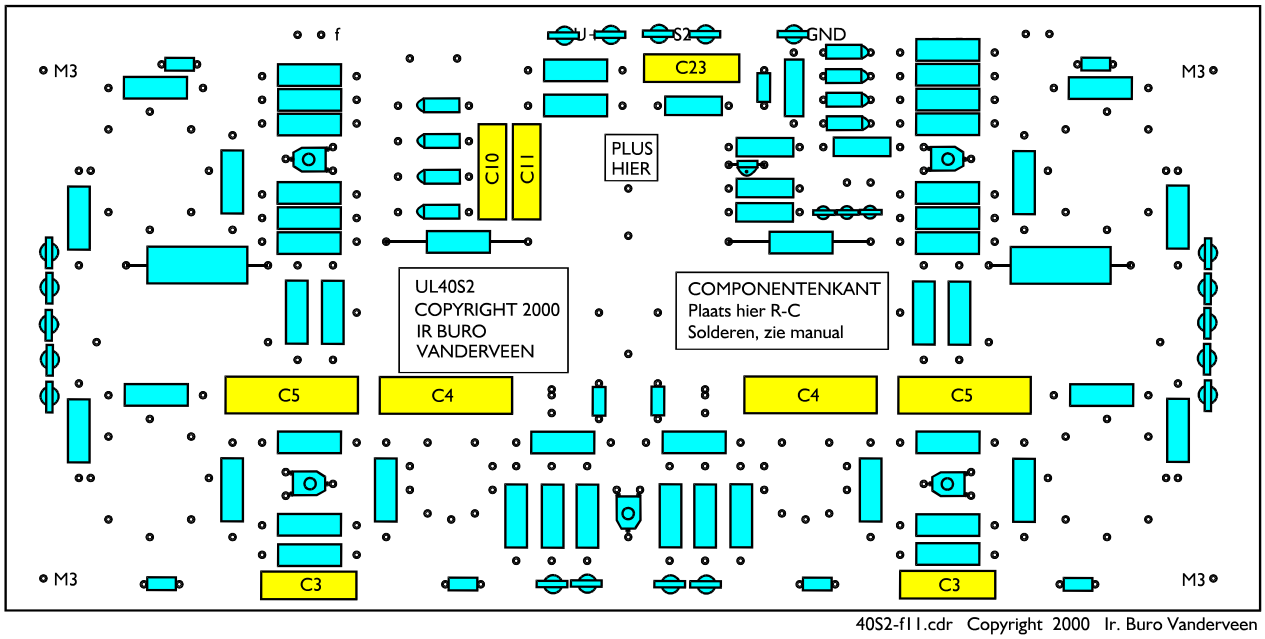


Figure 11

CAPACITORS, signal and HF supply decoupling

1. Capacitors C4 and C5 (each 0.47µF / 630V, MKP = polypropylene) are used for the coupling between the preamplifier stage and phase splitter to the output valves. Mount them close to the PCB on the component side and SOLDER AT THE SOCKET SIDE.

2. Capacitor C3 (0.1µF / 630 V, MKP) provides the AC coupling of the audio signal to the grid of the phase splitter.
   Mount it close to the PCB and SOLDER AT THE SOCKET SIDE.

3. Capacitors C10 and C11 (each 10nF / 1200V, MKP) are used for high frequency decoupling of the plate supply voltage from the power transformer. Together with resistors R31 and R32 they prevent all high frequency noise from the mains from reaching the audio part of the amplifier via the power transformer. This RC filtering is very effective in this case and the switching pulses of diodes D1-4 will also be suppressed.
   Mount them close to the PCB and SOLDER AT THE SOCKET SIDE.

4. Capacitor C23 (10nF/1200V, MKP) is used for the suppression of the switching pulse generated when switching from stand-by mode. Mount it close to the PCB and SOLDER AT THE SOCKET SIDE.

STEP 12 – main circuit board –

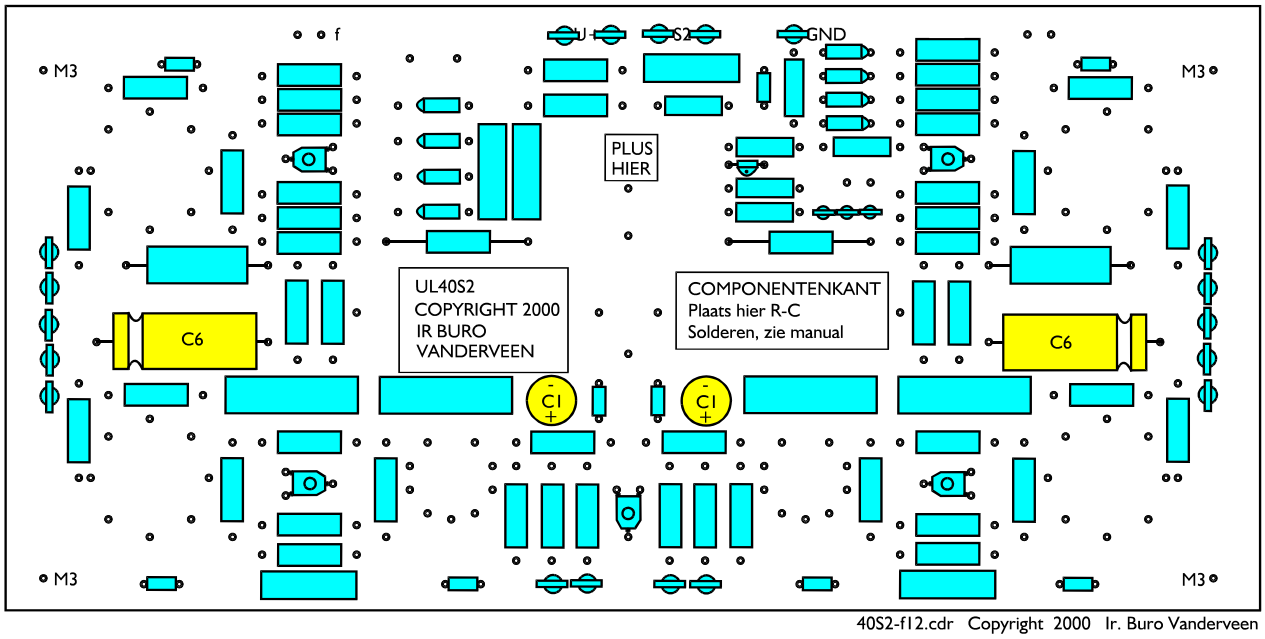


Figure 12

CAPACITORS, audio electrolytic capacitors

1. Capacitor C1 (220µF, 25V) may be placed close to the PCB and soldered on the other side (socket side). Carefully check that the negative terminal (marked by a thick line on the capacitor) is in the correct position (see figure 12 pointing to the upperside)

2. Capacitors C6 (1000µF, 40 V) may also be mounted close to the PCB. Soldering is possible on either side of the PCB; use whatever side is the easiest. The positive terminal of this electrolytic capacitor is marked by a notch in the housing (see figure 12). Carefully check for the correct polarization of these capacitors. To prevent C6 from becoming warm ensure that it does not touch cathode resistor R17.

STEP 13 – main circuit board –

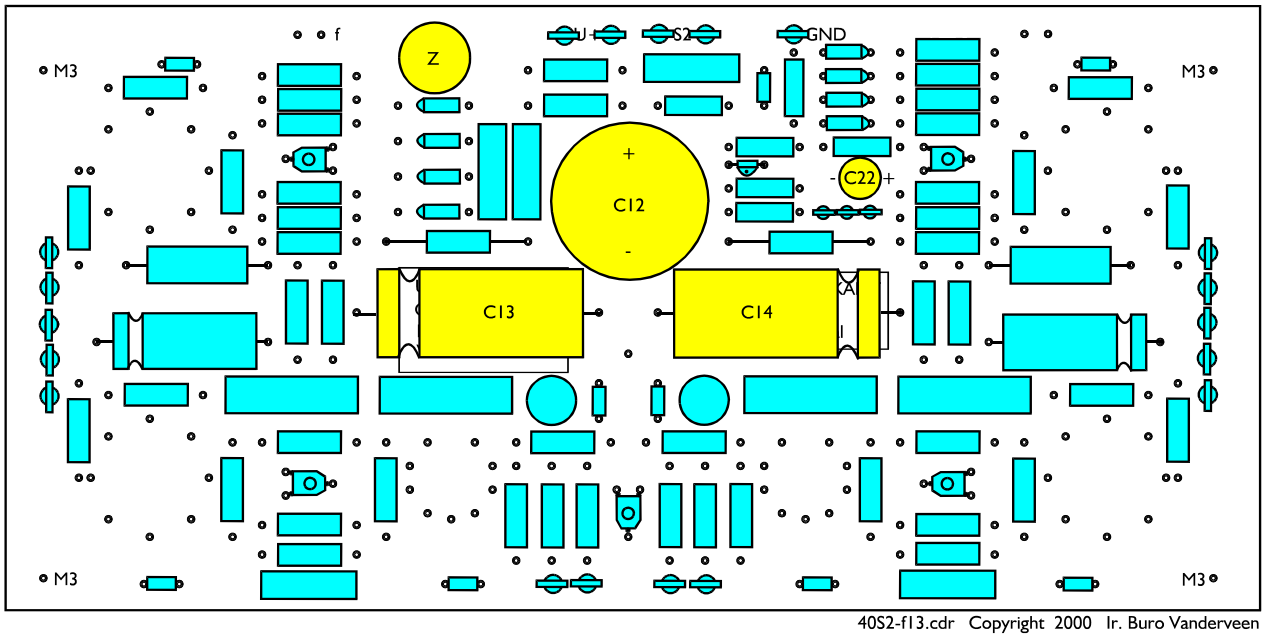


Figure 13

SUPPLY, capacitors + fuseholder

1. Capacitor C22 (220µF, 16-25V) is used in the LED circuit. This capacitor may be mounted close to the board, and has to be soldered at the socket side. Carefully check the polarity of this electrolytic capacitor. The negative terminal points to the left (see figure 13).

2. Capacitors C13 and C14 (each 47µF, 350V) may be mounted close to the PCB. The positive terminal is marked by a notch in the housing (see figure 13). Soldering is possible on either side, use whatever is most convenient.

3. On capacitor C12 (330µF, 400V) the negative terminal is marked in two ways: on the base a black dot is used and on the housing it is indicated by means of arrows with “-“symbols. Carefully study figure 13 and place the capacitor into position the correct way round. Solder at the socket side. Take time to check that the polarity is correct; a leaky capacitor will result if you are mistaken. The acid in the electrolytic capacitor will damage the PCB, so make sure you mount it correctly.

4. Now place fuseholder Z onto the PCB and solder into place on the socket side.

5. Insert the 630mA fuse Z2 into its holder.

STEP 14 – main circuit board –

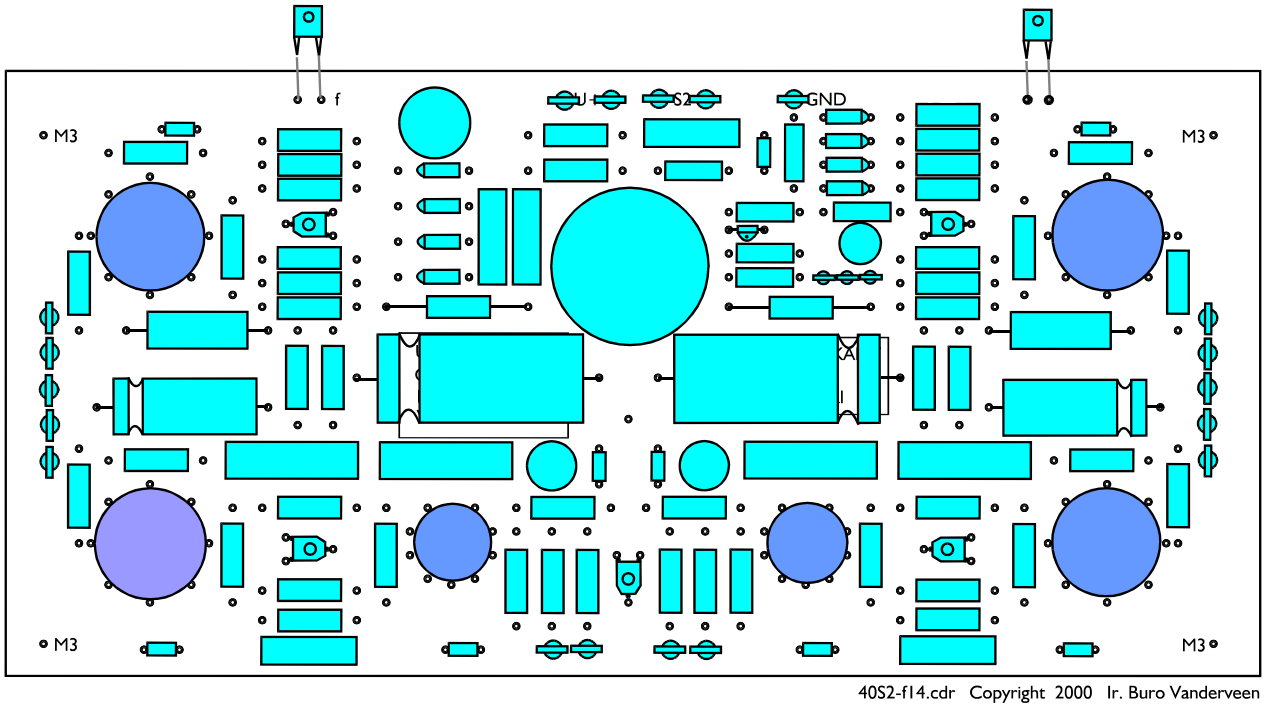


Figure 14

The main circuit board is now complete.

1. The main board should appear as shown in figure 14 above.

2. All mounted components are drawn in. By comparing your board with this figure you can check if anything has been forgotten or inserted incorrectly.

3. Check that all leads are cut off short on the socket side, and then finally visually check the complete circuit board. If all of the steps have been carried out correctly, the construction of the entire amplifier can start now.

STEP 15 – final assembly -

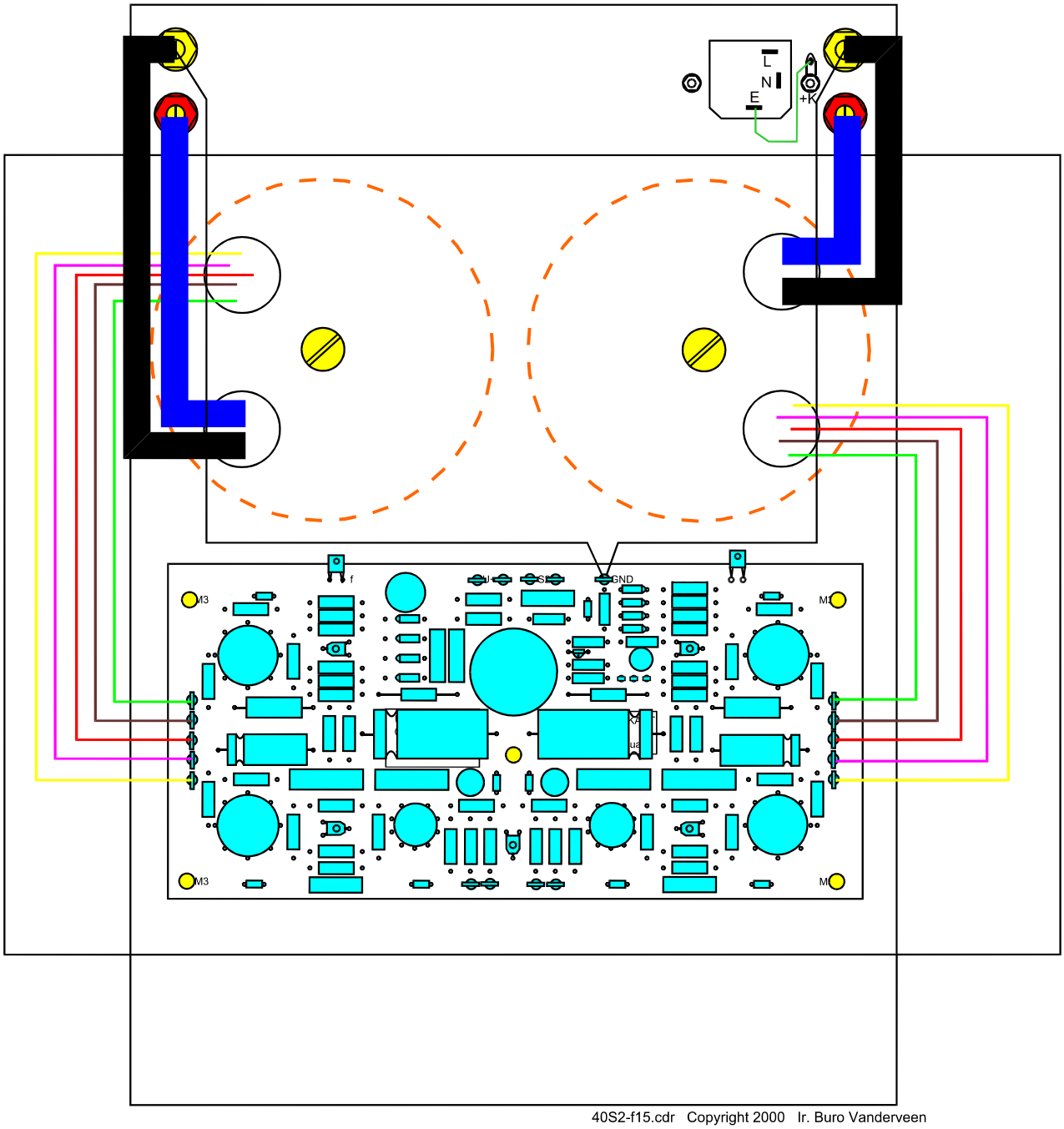


Figure 15

Main circuit board, Output transformers, Speaker terminals, Mains input

1. Mount the main circuit board into the cabinet using five M3 screws. Place a spring washer under the middle screw and tighten really tight as this provides the ground connection for the electronic circuit.

2. Now mount the output transformers on top of the cabinet by using the supplied bolts and washers from the inside.

3. The primary leads of each output transformer have the colour codes shown in figure 15. DO NOT CUT or SHORTEN these leads, but solder them to their terminals as shown in figure 15. It is important that you do not mistake one colour for another.

4. Firmly mount the gold plated loudspeaker terminals to the cabinet using the insulating washers. Ensure that the cam of the isolating washer points in the right direction. Firmly tighten the nut as the mechanical load on these terminals can be considerable.
5. For each transformer twist and solder the five blue wires together. Repeat with the five black leads.
6. Solder the blue wires into the hole of the nearest red speaker terminal. We advise using a somewhat bigger soldering iron here (100 Watt), as there is a lot of metal to be heated. Ensure that the solder flows properly.
7. Take one piece of 20cm long plus one piece of 30cm long black ground wire, strip the insulation back 1.5cm. Wind the bared end of the 30cm long lead around the twisted black wires from the output transformer on the left in figure 15. Repeat with the 20cm long lead with the other output transformer. Now solder the black wires complete with their extra ground wire to the white speaker terminals. Again use a 100 Watt solder-iron.
8. Bring the black ground wires to the GND terminal at the upper edge of the PCB and solder both to the terminal. Route these two ground wires along the sides of the cabinet, out of sight, as drawn in black in figure 15.
   Now you can start tidying the transformer leads with tie-wraps. Place some tie-wraps around the primary leads, and some more around the secondaries. Now neatly push all of the wires to the sides of the cabinet. This produces a neat finish and provides space for the power transformer and its leads in the middle of the cabinet. Now consider the input selector extension shaft.
   Place some tie-wraps around any wires close to the PCB solder terminals. If one of the wires becomes unattached, it will be prevented from wandering around in the cabinet causing unwanted contact.
9. Next, mount the mains input terminal to the rear of the cabinet using one M3x8 and one M3x10 countersunk screw with nuts, spring-washers and the solder tag under the right nut (see figure 15). Push the mains input connector in from the outside of the cabinet. Then push the right screw (the longest) from the outside into its hole, followed by a spring washer, next the solder tag, then a second spring washer and finally the M3 nut. Firmly tighten this nut and screw as this connection has to be very solid and reliable. This because it provides the cabinet to earth contact, guaranteeing that the metal cabinet remains connected to mains ground. For electrical safety a 100 % reliable contact is necessary. Be very careful here and don't forget the spring washers, they will ensure a firm corrosion free connection.
10. The upper terminal of the mains input connector **marked "E"** is the earth terminal. Take a 10cm length of the green/yellow striped wire, strip the insulation back 1cm and insert the stripped end through the little hole in the above mentioned (E) earth-terminal. Bend it so it lies flat against the terminal. Now solder the wire into place, slip a 2cm length of the widest heatshrink over the wire and shrink it over the solder connection; next slip a 2cm length of the narrow heatshrink over the wire and solder the other end of the wire to the solder tag under the right screw.
    We advise that the solder terminal is bent a little away from the cabinet so you can easily hook in the wire. It also has the added advantage of there being less heat flow into the cabinet, making soldering easier. Now slip and shrink the heatshrink over this terminal.
11. Fit fuse Z1 and the spare fuse Z1' (both fit into the insert in the mains input terminal).

STEP 16 – final assembly -

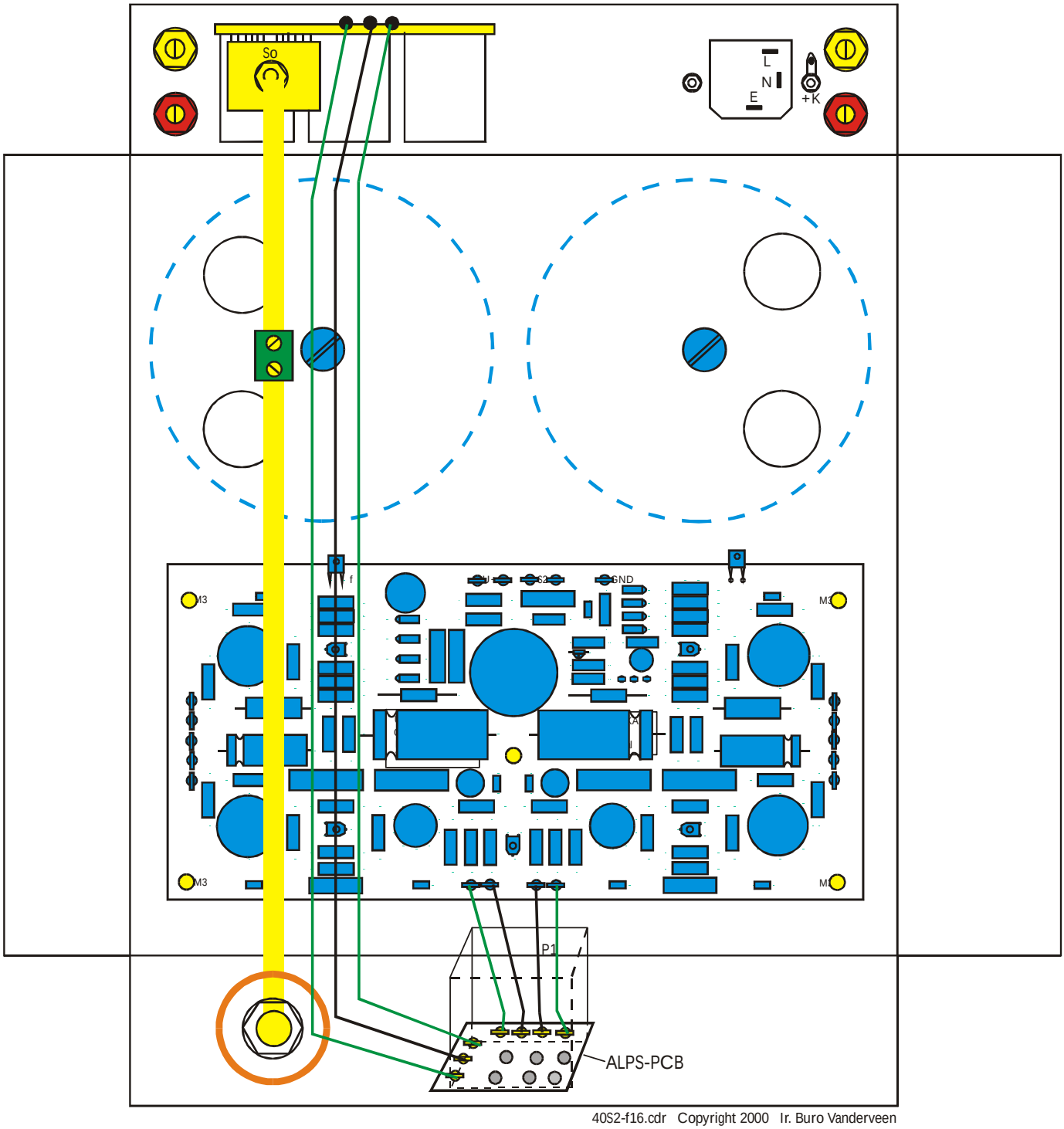


Figure 16

Input PCB, Input selector and Volume control

1. Solder the three solder terminals into place as shown in figure 18 on the next page.

2. Take three 2cm lengths of uninsulated wire, insert them into the holes in the PCB to provide the jumpers to the selector switch (as indicated on the drawing), solder them into place and trim back the wire ends (see figure 18)

3. Solder the two gold plated input terminals into place on the input PCB. For easier mounting remove the two little tabs either side of these terminals with a pair of pliers.

4. Now undo the two M3 screws on the input selector switch, insert them into the two holes in the PCB with the distance washers on top of it, then insert the switch terminals into the corresponding holes on the other side of the PCB, and tighten the screws. Solder the switch terminals into place. As they are very close together take care not to short-circuit them.

5. Now rotate the selector anti-clockwise to the stop. Undo the nut around the shaft, a round metal washer will now be evident. Lift this washer a little, noting which hole of the switch the tab of the washer was in. Turn the washer anti-clockwise to the next hole in the switch and press the tab in. Replace the nut. By doing this you have created a four position switch instead of five, corresponding to the number of inputs of the UL 40-S2 amplifier. Check the number of selections of the switch now by turning it clockwise (It is not absolutely necessary to change the position of the washer as positions 4 and 5 are short-circuited on the PCB, but it is certainly more convenient).

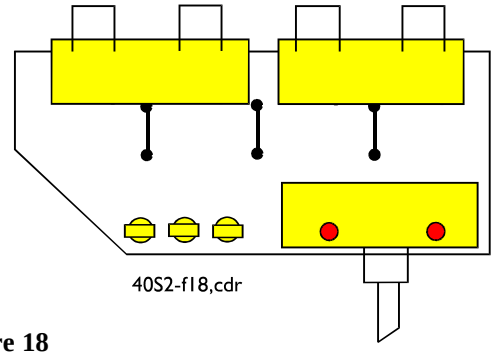


Figure 18

6. Now cut two pieces of green and one piece of black wire, each 35cm long. Solder these wires to the solder terminals on the input PCB, and mark one of the green wires at each end using a felt tip pen. Now twist the three wires together as this is very effective in reducing hum.

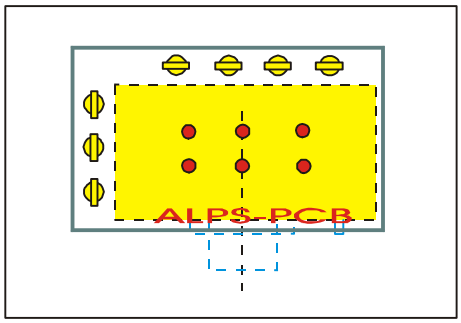
7. Mount the input PCB into the cabinet using two screws.

8. Insert the 6mm shaft support into the front side of the cabinet and fasten with the nut.

9. Push the shaft extension of the input selector through the support in the cabinet; slide both shaft couplings over the shaft. Now connect the extension shaft to the shaft of the input selector, by tightening the two screws of the first coupling.

10. Using a file, we advise you to slightly flatten the aluminium shaft at the spot where the coupling is to be mounted. The screw will hold better on a flat surface, providing a more reliable connection in the long term. It is unnecessary to do this to the shaft of the input selector itself as it is made of a much softer synthetic material and the screw will hold well.

11. Slide the second shaft coupling to the front of the extension leaving approximately a 1mm space between the coupling and the support and then firmly tighten the two screws. This prevents the shaft from being pulled out and causing damage to the selector. Please do not push the coupling too tight to the support as this will make the selector hard to turn.



12. Mount on the Alps-PCB (smallest PCB) 7 solder terminals on the side with the wire-pattern. Align them according to figure 19 en solder them.

13. Mount the Alps-PCB to the Alps-volume control en solder the pins

14. Mount the Alps-volume control to the front of the cabinet with the mounted PCB pointing to the bottom (see figure 16). Tighten the nut firmly to prevent the control from slipping.

15. Mount the wires of the input-PCB to the solder terminals on the Alps-PCB en solder them.

16. Cut two lengths of green wire and two lengths of black wire, each 7cm long and strip the ends. Solder the wires to the solder terminals on the volume control, twist them together in pairs and solder them to the terminals on the PCB. Make sure not to mix up the four wires. See figure 16 for details. These wires have to be secured by using tie-wraps at both ends to ensure that there is no risk of them wandering around in case they come adrift.

STEP 17 – final assembly –

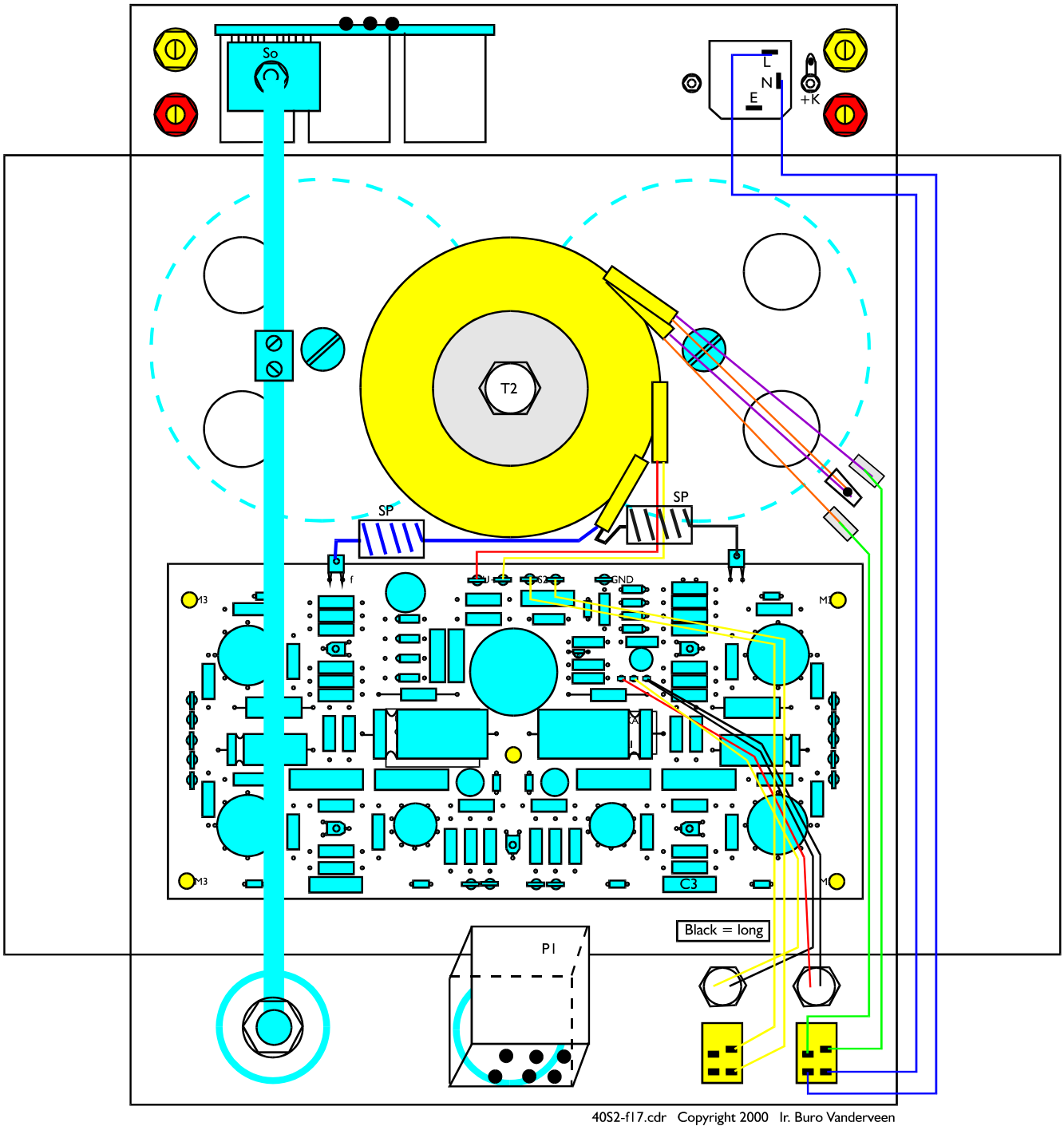


Figure 17

Power transformer, Switches, LED's

1. Mount the power transformer using the supplied nut and bolt. First push the bolt through the hole on the top of the cabinet. Slide the transformer over the bolt, followed by the 5mm washer and then the nut. Screw all parts tightly together using a 4mm Allen wrench. To prevent damage to the cabinet we advise that you keep the bolt still and just tighten the nut. Align the leads of the transformer as shown in figure 17.

2. Mount the two switches to the front panel, and tighten the hexagonal nuts tightly before tightening the black ornamental nuts.

3. Slide the white nylon washer over the input selector shaft and then push the knob on so that there is just less than a 1mm gap between the knob and washer. Next tighten the screw in the knob. The white washer prevents damage to the input selector if someone pushes or something bumps against the knob.
   Mount the knob of the volume control with the same distance to the front panel.

4. Now take the synthetic front panel, the red 3mm LED (the right one in the figure) and the yellow 3mm LED (the left one), and put a spot of glue at either side of each LED (super glue for instance). Push the LED's into the front panel sufficiently so that the flat surfaces of the LED's are exactly in line with the surface of the front panel. Allow the glue enough time to dry.

5. Do not shorten the leads of the LED's as their polarity is indicated by the length of the leads. The anode being the longest, the cathode the shortest.
   Solder 2 pieces of 15cm long black wire one to each of the longest leads of the LED's. Then solder a red and a yellow piece of wire, also 15cm long, to the shortest leads as shown in figure 17.
   Slide pieces of the narrow heatshrink, each 4cm long, over these four joints and shrink until they are tightly in place.

6. Now mount the front panel using the four hexagon socket screws. Ensure that the panel fits nicely around the knobs allowing them to be turned freely.

7. Twist the black, red and yellow wires of the LED's together and bend them in a curve to the three solder terminals at the middle of the PCB. Solder them into place (see figure 17).

8. The two primary windings of the transformer have to be connected for 110/115V **or** 230V mains voltage.
   If you live in a country with 230V mains voltage wire them in series as follows: Solder the brown wire of one winding to the pink wire of the other winding (that is a brown wire coming out of one insulation sleeve and a pink wire coming out of the other sleeve) and insulate this joint very carefully with two layers of heatshrink (each 3cm long). Now take two pieces of 10cm long green wire of and solder one to each of the remaining brown and pink transformer leads. Also carefully insulate these joints with two layers of 3cm long heatshrink. Twist the green wires together and slide a 25cm length of the widest piece of insulation sleeve supplied in the kit, over the full length including the leads of the transformer. Now slide two 2cm lengths of the narrowest heatshrink over the projecting green wires. Hook the wires into the little holes in the terminals of the power switch, bend them over until they are flat, solder them, then slide and shrink the heatshrink over the terminals (see figure 17).
   If you live in a country with 110/115V mains voltage wire in parallel as follows: Solder both brown transformer leads together, and then solder both pink leads together. Now take two pieces of 10cm long green wire and solder one of them to the brown leads and the other to the pink leads. Insulate these joints very carefully with two layers of the narrowest heatshrink (each 3cm long). Twist the green wires together and slide a 25cm length of the widest piece of insulation sleeve supplied in the kit, over the full length including the leads of the transformer. Now slide two 2cm lengths of the narrowest heatshrink over the projecting green wires. Hook the wires in the little holes into the terminals of the power switch, bend them over until they are flat, solder them, then slide and shrink the heatshrink over the terminals. (Attention: figure 17 shows 230V wiring!)

9. Take two pieces of 30cm long blue wire and solder them to the terminals “L” and “N” on the mains input connector; using the same procedure as before: first hook in the wire, then bend and solder. Slide 2cm lengths of the widest heatshrink over each wire and shrink them over the terminals. Slide the narrowest piece of insulation sleeve over the entire length of these wires for 25cm, next slide two 2cm long pieces of the narrowest heatshrink over each of the projecting ends, and then solder them to the other two terminals of the power switch. Use the same method described in para.8 (see figure 17). Position these wires along the sides of the cabinet, away from the PCB, because they carry mains interference pulses.

10. Take two 25cm lengths of yellow wire and solder them to the stand-by switch terminals as shown in figure 17. Finish these connections using the same method used for the power switch. Slide a 22cm length of the narrowest heatshrink over these wires to provide extra insulation. Route these wires to the solder terminals at the other edge of the PCB, and solder them in place. Ensure that they are kept away from capacitor C3, because they can produce a kind of ‘rattling sound’. Look at figure 17 for the best location of these wires. Note, these are high voltage wires, so keep any bare parts well away from the cabinet.

11. The transformer leads for the high voltage supply (red and yellow) can now be soldered to their terminals on the PCB. Do not shorten these leads but wind them around a pen to form a coil and then strengthen these coils with tie-wraps (these coils will effectively suppress high frequency interference from the mains). Tie both leads together with a tie-wrap close to the PCB. Take care to keep any bare parts away from the metal cabinet.

12. The thicker leads of the transformers (blue and grey) also have to be formed like a coil for the same reason. Insert the ends through the holes of the Faston blades and solder them, making sure the solder flows thoroughly.

The amplifier is ready now.

Check everything carefully for possible mistakes again!

If you live in a country with a 230V mains voltage, the “115V” and “2A” markings at the rear of the cabinet have to be made illegible, using for instance, a black felt tip pen. The amplifier is internally wired for 230V, which must be clearly visible at the outside. Alternatively it is evident that you have to make “230V” and “1A” illegible if you have wired your amplifier for use on 115V mains as described in Step 17, para.8.

Put the yellow “high-voltage” sticker on the base plate of the cabinet.

Mount the three feet on the base plate using the supplied screws.
In certain cases the rubber material of the feet can affect the surface of your table or cupboard; to prevent this you could fit some felt underneath.

Screw the base plate on so that one foot is in front, and two behind (you can do this later if you wish after testing and adjusting).

Plug the valves in place. ATTENTION, the output valves are in matched pairs. They are marked by numbers on the top of their boxes: two equal numbers form a pair. Put one pair on the right side and one pair on the left side of the amplifier.

Fit the cover. As with the base plate this can be done later after you have finished testing. However the cover will come in handy when placing the amplifier upside down during adjustment (please place a piece of cloth underneath, to prevent scratches).
When you finally come to mount the cover we recommend that you drill the three little holes at the rear of the cabinet up to 2.5mm wide.

STEP 18 – TESTING -

ATTENTION: CAREFULLY FOLLOW THE SAFETY INSTRUCTIONS!

1. Plug the mains cord in and switch on the POWER switch, leaving the STAND-BY switch off.
2. The left red LED must light up now and the valves start to glow.

3. **TESTING WITH THE AID OF MEASURING EQUIPMENT**
4. Connect a 5 ohm 30 watt resistor as the load to each pair of speaker terminals.
5. Switch the STAND-BY switch on and check the supply voltages with a digital voltmeter. See the diagram on page 6 for the correct values. Deviations of up to 20 % on these values are possible.
6. Check that the yellow LED is lit.
7. Connect a function generator (adjusted to a 100Hz square-wave signal, with an output voltage of about 2Vrms) to one of the inputs and connect an oscilloscope (adjusted to 5V/div.) to the speaker output (with the the 5 ohm load). Turn the volume up to nearly maximum output (in fact up to 70 % of the maximum “clipping” level) and now adjust the AC balance using trimpot P3 by observing the output waveform until a symmetrical square wave without overshoots or dips is achieved. Repeat the adjustment for the other channel.
8. Adjust the input balance by connecting both inputs, left and right together, and then applying a weak (100mV) 1kHz sine-wave signal from the generator; turn the volume control up full leaving the 5 Ohm resistor loads connected to the outputs. A two channel oscilloscope comes in handy here. Adjust the left / right balance by rotating trimpot P2 until both output signals are equal.
9. Adjustment of the DC balance (quiescent current of the output valves) is done by turning P4 as follows: completely turn down the volume control P1; connect the oscilloscope to the speaker output, with sensitivity 10 mV/div. A hum signal (100 Hz) is now visible which you can decrease to a minimum by adjusting P4. Minimum hum means equal quiescent currents. Repeat this for the other channel.

10. **TESTING WITHOUT TEST EQUIPMENT**
11. Connect two loudspeakers to the speaker terminals.
12. Turn volume control P1 down completely, connect a CD player to the input and select the CD input.
13. Switch on the STAND-BY switch. After a short while the yellow LED should light up.
14. With your ear just in front of the speaker you might hear a weak humming sound, which should be inaudible at a distance of 0.5m. Is there a louder hum level then try to adjust P4 (DC balance) to reduce it. It is at a minimum when the quiescent currents of the output valves are equal.
15. Turn trimpots P2 and P3 to their mid-positions.
16. Now play a CD and turn the volume up to the desired level. If everything is correct you should now hear undistorted music.
17. If necessary adjust trimpot P2 for correct volume balance between the left and right channel.
18. Check for any evidence of smoke issuing from the amplifier. When the amplifier is switched on for the first time some of the resistors (the 7 Watt types) and the valves might smell. This is

due to the paint fully curing and dirt burning off as they reach operating temperature for the first time.

19. IF ANYTHING SEEMS WRONG AND YOU DO NOT HAVE SUITABLE MEASURING EQUIPMENT, CONTACT AMPLIMO SERVICE. PLEASE SEE THE INITIAL PAGES OF THIS MANUAL FOR INFORMATION. IF NECESSARY JUST CHECK THE AMPLIFIER ***VISUALY*** FOR FAULTS. IF YOU FIND ANY, FIRST SWITCH THE “STAND-BY” SWITCH TO “OFF”, WAIT A FEW MINUTES, THEN TURN THE “POWER” SWITCH OFF. NOW REMOVE THE MAINS CORD. NOW YOU CAN ATTEMPT TO LOCATE THE FAULT.

20. If everything is working well, fit the base and the cover. **The amplifier is now ready!**

STEP 19 – experiments -

EXPERIMENTS WITH VALVE TYPES AND CONFIGURATIONS

This is a universal design that allows the possibility of using various power valve types and some alternative valve configurations.
So far the construction manual has only covered the ULTRA LINEAR configuration of the output valves. We now describe below how to achieve other modes.

TRIODE CONFIGURATION

1. Disconnect the purple and brown leads from each output transformer to the PCB by means of soldering, not cutting. Make sure that you insulate each of these leads with great care, preferably using heatshrink before laying them aside.
2. Now using wire links, make the following solder connections on the PCB:
   join the "purple" & "yellow" solder terminals together
   and join the "brown" & "green" solder terminals together.

PENTODE CONFIGURATION

1. Disconnect the purple and brown leads from each output transformer to the PCB by means of soldering, not cutting. Make sure that you insulate each of these leads with great care, preferably using heatshrink before laying them aside.
2. Now using wire links, make the following solder connections on the PCB:
   join the "purple" & "red" solder terminals together
   and join the "brown" & "red" solder terminals together.

You will find a table of several valve specifications and their configurations outlined below. The measured output power is also given, as well as the frequency response (f-3dB $_1$), the amplification and the damping factor (DF $_2$).The pentode specification is omitted, since although this mode has the highest efficiency, it is not really hi-fi due to the low damping factor.
However do not let the numbers confuse you, let your ears decide which valve type and configuration suits you best.

$_1$ Reference: 1 Watt in 5 Ohm.
$_2$ Reference: 8 Ohm nominal loudspeaker impedance

VALVE TYPE	CONFIGURATION	P_{max}	DF	Vout/Vin	f-3dB
EL34	triode	13.8W	3.3	10.5x	100kHz
Svetlana	ultra-linear	28.5W	1.6	17.0x	86kHz
KT88	triode	12.7W	4.8	7.7x	106kHz
Svetlana	ultra-linear	25.6W	2.2	13.3x	84kHz
6L6GC	triode	-	-	-	-
Svetlana	ultra-linear	20.3W	1.2	12.9x	80kHz
6550C	triode	13.2W	4.5	7.8x	104kHz
Svetlana	ultra-linear	25.6W	1.6	12.5x	81kHz

A very special EL34 power valve is now made by Svetlana. It has a gold-plated control grid to prevent secondary emission of electrons from the grids. Theoretically this valve behaves like the Tesla EL34, but sonically it is more “transparent”.

The preamplifier valves also lend themselves to experimentation. The following types can be used: Electro Harmonix 6922, Svetlana 6N1P, the E88CC (Philips, Siemens or Telefunken) or the E88CC-01. Extensive listening sessions indicated that the Electro Harmonix 6922 gave the best audio performance.

STEP 20 -TIPS-

and THINGS WORTH KNOWING

- Switching the amplifier on and off, the following sequence is advised:

  1) Switch the "power" switch to 'on'
  2) Wait for 1 minute
  3) Now switch the "stand-by" switch to 'on'.
  4) The amplifier is now ready for use.

  Explanation: by turning the "power" switch on and then waiting for one minute, the filaments of the power valves can warm up properly. When you now turn on the "stand-by" switch the valves are ready to cope with the high voltage. The electrolytic capacitors will also quickly reach their correct working voltage.

- The reverse order is advised for switching off the amplifier:

  1) Turn the "stand-by" switch to the 'off' position
  2) Wait for 1 minute
  3) Turn the "power" switch 'off'
  4) The high voltage will now have dissipated.

- There is no problem in leaving the set in the stand-by mode for a longer period of time. Although the filaments will glow, there is only a small amount of heat emission, the power valves will not wear out, and the amplifier is instantly ready for use by just switching the stand-by switch on.

- The old-fashioned advice of not operating valve amplifiers with the loudspeakers unconnected causing possible damage to the output transformer and producing unwanted oscillations is not strictly applicable. In the case of the UL40-S2 both phenomena will not happen, the transformer will function without speakers, and since there is no feedback, oscillations are impossible.
  But, what is the use of an amplifier without speakers? Therefore we advise that you follow the good old rule: only operate your amplifier with the speakers connected.

- Do you have useful tips, please let us know. We can use them in the next release of this manual.