audio pro

SERVICE MANUAL

FOR

A4-14 AND A4-14 MK2

Audio Pro

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LIST OF CONTENTS

1. TECHNICAL DESCRIPTION

1.1 Power Supply Circuits

Unregulated voltages +30V & -30V supply the Power Amplifier & also a regulator for ±15V
-15V supply tracks +15V in order to avoid transients & oscillations when power is switched on or off. The positive supply must decay faster than the negative supply when power is disconnected, which is assured by a 2k2Ω dummy load (R101) on the +30V capacitor.

1.2 Automatic On/Off

The Auto ON/OFF circuits are powered via D201, D202 & C201. The power transformers & the auto ON/OFF circuits are powered as long as the speaker A4-14 is plugged in to a live outlet. The remaining circuits are powered only in "ON" state when relay K101 is closed.

The audio signals enter via pins 3 & 5 in DIN connector J301. The other A4-14 in a stereo pair receives signals via pins 3 & 5 in DIN connector J302. The signals enter the amplifier circuits via push-button switches S301-S302 which select Left or Right Channel.

The input stage of auto ON/OFF, Z202 (1,2,3) works as amplifier with gain -7 determined by feedback network R204, R205. D208 & D209 limit the amplifier signal to ±7V. The second stage, Z201 (1,2,3) works as an amplifier with gain of ~2,000 at 500Hz.

The signal at pin 1 is limited to +7.0V/-7.0V. Z201 (5, 6, 7) plus transistor V201 works as a Schmitt trigger with ON level approx. 7V & OFF level approx. 5V. The input, pin 5, senses a DC voltage which is obtained via diode D211 & capacitor C206.

Transistor V201 drives relay K101, which connects power to the audio circuits in A4-14. When switch S201 is in "AUTO" position, relay K101 will open about 5 minutes after the signal at the input disappears. The time relay is determined by C206 & R210. During testing you may shunt R210 by 100kΩ to obtain shorter OFF-delay.

When switch S201 is in "ON" position, the auto ON/OFF circuits are bypassed & A4-14 remains permanently ON.

A thermistor TS3-75 senses the temperature of the heatsink. When this temperature is too high, the thermistor resistance becomes so low, that relay K101 opens.

1.3 Overload Protection For Midrange And Tweeter
Z202 (4-13) acts as an overload protection device which is actuated if there is risk for damage to the midrange driver or the tweeter.

The voltage across the voice coils are rectified in diodes D220, D219, & the rectified voltages charge capacitors C212, C211. The time constants for discharge are longer than the charging time constants. If the voltage at Z202 pins 5 or 6 exceeds a threshold value (approx. 3.4V), the mono-stable flip-flop Z202 (8-13) is triggered for 10 seconds. This causes V201 to be shut off, so relay K101 opens & A4-14 is de-energised for 10 seconds.

1.4 Input Stage

When the Bass-Blend switch is off, the signals enter via R302, C302, R303.

When the Bass-Blend switch is ON, the bass frequency signals in left & right channels are added via filters C301, R301 & R304, C303, R305.

C301, R301 is a high-pass filter with cut-off frequency 100Hz. Lower frequencies are attenuated by a factor of 2.

R304, C303, R305 is a Low-pass filter with cut-off frequency 100Hz, & attenuation 1:2 relative filter R302, C302, R303.

The signals below 100Hz are summed at Z301, pin 9. Because of the attenuation introduced in each channel, the bass level is the same as when Bass-Blend is not used.

The gain is adjusted by potentiometer R306 in the feedback circuit of operational amplifier number one. After this amplification the signals are Split to bass circuits & midrange/tweeter circuits.

5 Bass Circuits

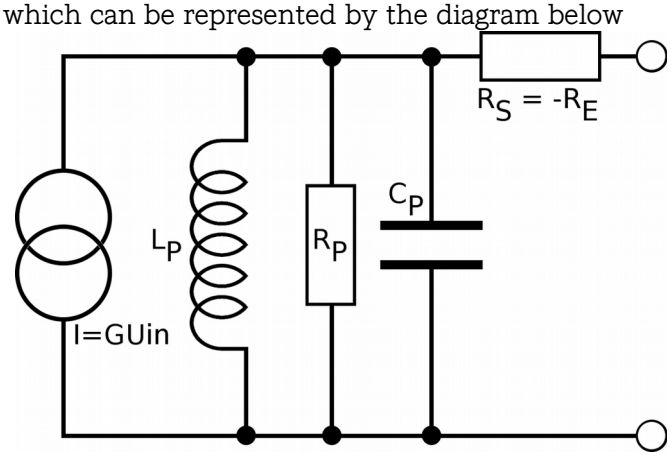
The signal passes the bass control circuits R311, Z301 (12,13,14), which controls the signal level to the woofers. The bass control circuits affect higher frequencies (e.g. 100Hz) more than low frequencies (e.g. 30Hz).

The bass signal then passes via a low-pass link R313, C306 which forms one part of the crossover filter between bass & midrange.

The next link is a high-pass filter, which cuts frequencies below 30Hz 12dB/octave, & is part of the woofer's total transfer function.

1.6 Ace-Bass* Circuit

The power amplifier for the woofer, together with Z302 (1,2,3,5,6,7) forms the ACE-BASS*, amplifier, which can be represented by the diagram below



R412 & Z302 (1,2,3) sense the voice coil current in-the woofers. Z302 (5,6,7) acts as a band-pass filter & sums signals from Ⓓ &Ⓕ

The power amplifier for the woofer is inverting & acts as adder for signals from Ⓔ & Ⓕ.

The part of the current signal Ⓕ which is fed back positively produces the negative output resistance R_S.

The parallel resonant circuit Lp, Rp, Cp is formed by negative feedback of the current signal via the band-pass filter.

*ACE-BASS = Amplifier Controlled Euphonic Bass.

1.7 Midrange And Treble Circuits

From the gain control the signal is also fed to the midrange/treble amplifier. Z301 (5,6,7) acts both as high-pass filter for the crossover (C502, R501, R502) & as treble boost filter (R505, R506, C503).

The high-pass link C504, R507, R508 forms the second part of the crossover filter between bass & midrange.

The power amplifier is of the inverting type, & acts as, operational amplifier for the treble control R510, which is active above 5kHz.

POWER AMPLIFIER CIRCUITS

1-8 Power Stage For Woofers

The signal is coupled via C703 to the input of the power amplifier.

From the output, the signal is fed back negatively via R 709 & C704. When the signal amplitudes are large, negative feedback also is provided via a network of resistors & diodes. The output signal is compared to the supply voltage, & a couple of volts before clipping will occur, the signal will be rounded by the diode network so the clipping is soft.

The input stage consists of a differential stage V702 & V707 fed via a constant-current generator, V701. The output stage is of Darlington design with transistors V710-V711 & has AC gain -1. V707 senses the temperature of the output transistors so that the bias current is constant.

V705 & V709 filter the supply voltage for the input stage, eliminating hum & other kinds of noise. (If A4-14 "pops" when switched on, one of these transistors is probably shorted).

No-signal DC-levels of voltages & currents are shown in the circuit diagram enclosed.

To avoid on & off-transients, the bass amplifier is active only when the supply voltages exceed +17V, so that the operational amplifiers always work properly when the bass amplifier is active, When diode D712 starts conducting, the constant current generator V701 starts working, & via V712 activates even current generator V706. The amplifier is inactive when these current generators are shut off.

1.9 Power Amplifier For Midrange And Tweeter

The power amplifier is similar to the bass amplifier but the diode network for soft clipping is not included. The voltage delayed on-function is also eliminated, so this power amplifier is active at low supply voltages.

The signal from the power amplifier is split in passive crossover filters L602, C616, C617 to midrange & C614, C615, L601 to the tweeter.

2 FAULT FINDING

A4-14 does not work
2 Set auto ON/OFF in position on
2.1 Check that both the green & red LED are lit.
2.2 Check the power fuses & fuses F601, 602, 701, 702.
2.3 Measure supply voltages +33v ±2.5V, -33v ±2.5V, +15v ±2V, -15v ±2V
2.4 To localise the fault, connect test instruments as follows:
-Tone generator to J301 pins 3 & 5. Adjust till B is 42mV. Sensitivity in Max position, bass & treble pots in centre position. Compare to voltage levels according to values in circuit diagram.
2.5 If fuses F601, 602, 702 blow during measurement per Section 1.4, you may disconnect the woofers & replace midrange driver & tweeter by 5-10Ω resistors. Test again per Section 1.4 (signal levels in points Ⓔ, Ⓕ, Ⓖ, Ⓚ & Ⓙ will of course be different).
2.6 Auto ON/OFF can also be tested with set-up per 1.4.
-Set auto ON/OFF in AUTO. The signal at 2201 pin 1 should be $7V_{p-p}$, & the signal Z201 pin 7 should be $15V_{DC}$.
Relay K101 Should close at 15mV/500Hz in (R210 may be shunted by 100kΩ to reduce the off delay)

3. ADJUSTMENTS

3.1 Bias Current In Power Amplifiers

After replacing any output transistor in any of the power amplifiers, the bias current must be readjusted. Setting of bias current should be done while heatsinks are at room temperature, that is immediately after A4-14 is turned on.

Set potentiometer R722 or R617 till DC voltage between emitters of V710, V711 reads 10mV Or voltage between V610, V611 reads of 20mV,which corresponds to 23mA bias current.

NOTE: When output transistors are replaced, heat sink compound must be applied to both sides of the insulation washers & to the temperature compensating transistors.

Check that insulation is adequate & that the power transistors are mounted flat against the heatsink. The heatsink must be screwed on to the PC card before the transistors are soldered in.

3.2 Negative Output Resistance

After replacing a Woofer, or any of the current sensing resistors R408-R412, the negative output resistance must be re-adjusted.

The woofers must be properly mounted in the cabinet, their voice coils must be connected, & the bass adjustment potentiometer R311 must be in centre position. Voice-coils must be cold (at room temperature).

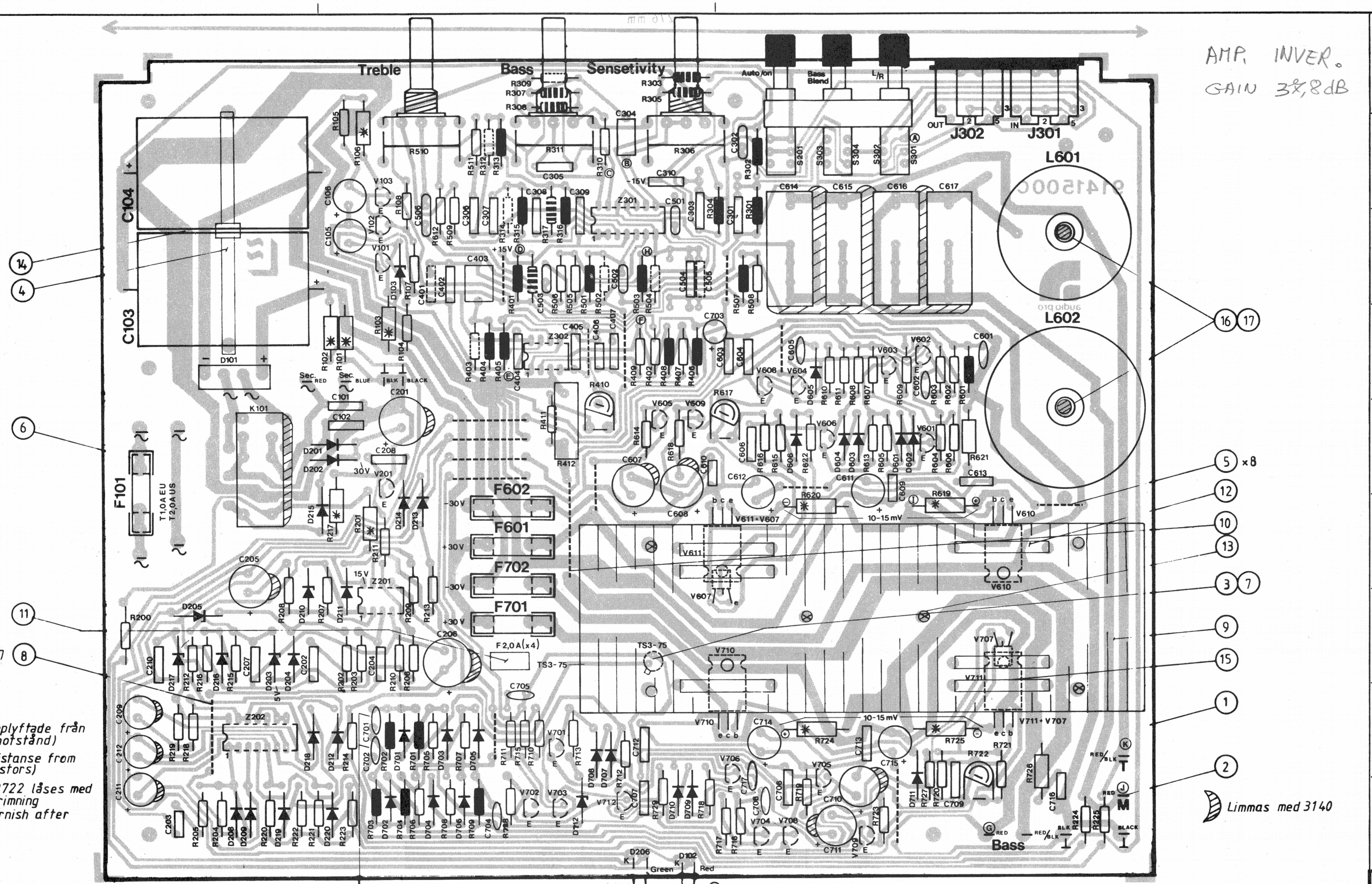
Apply an input signal of 60Hz ±1Hz & adjust signal generator till test point (Ⓖ reads 0dB (=0.775V). Change frequency to 180Hz +3Hz without changing the signal level of the signal generator, & set potentiometer R410 till voltage at test point Ⓖ is -5.5dB (5.5dB below 60Hz),

Go back & forth between 60Hz & 180Hz & readjust if required until the difference is stable at 7.3dB.

4. SPARE PARTS

Spare parts can be obtained from Audio Pro Sweden, or from Distributors & Service Centres. When ordering spare parts, please refer to serial number of speaker, & component number per Circuit diagram 2-141504 resp. 5520991-01

AMP. INVER.
GAIN 3?,8dB



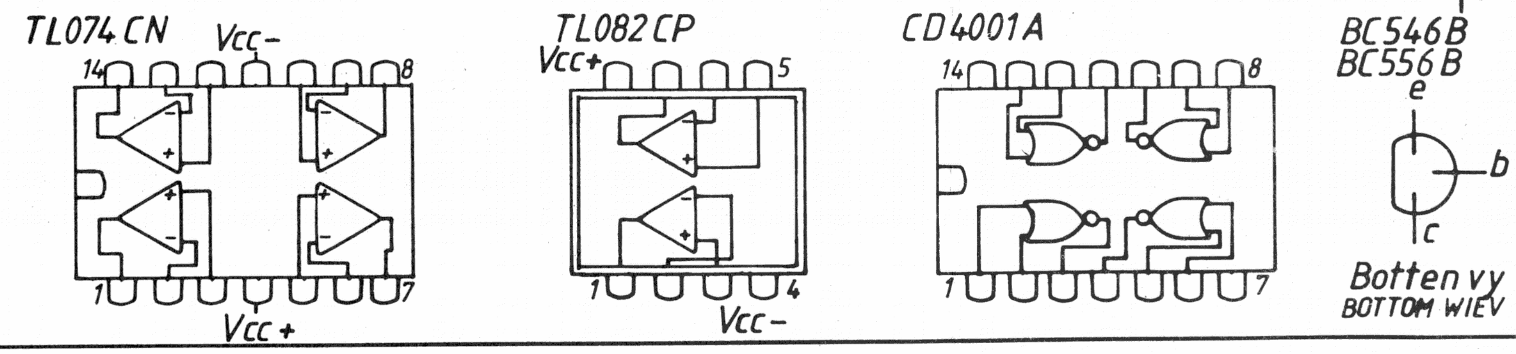
*Monteras upplyftade från kortet (10st motstånd)

*Install at distanse from card (10 resistors)

R410 R617 R722 låses med lack efter trimning

lock with varnish after adjustment

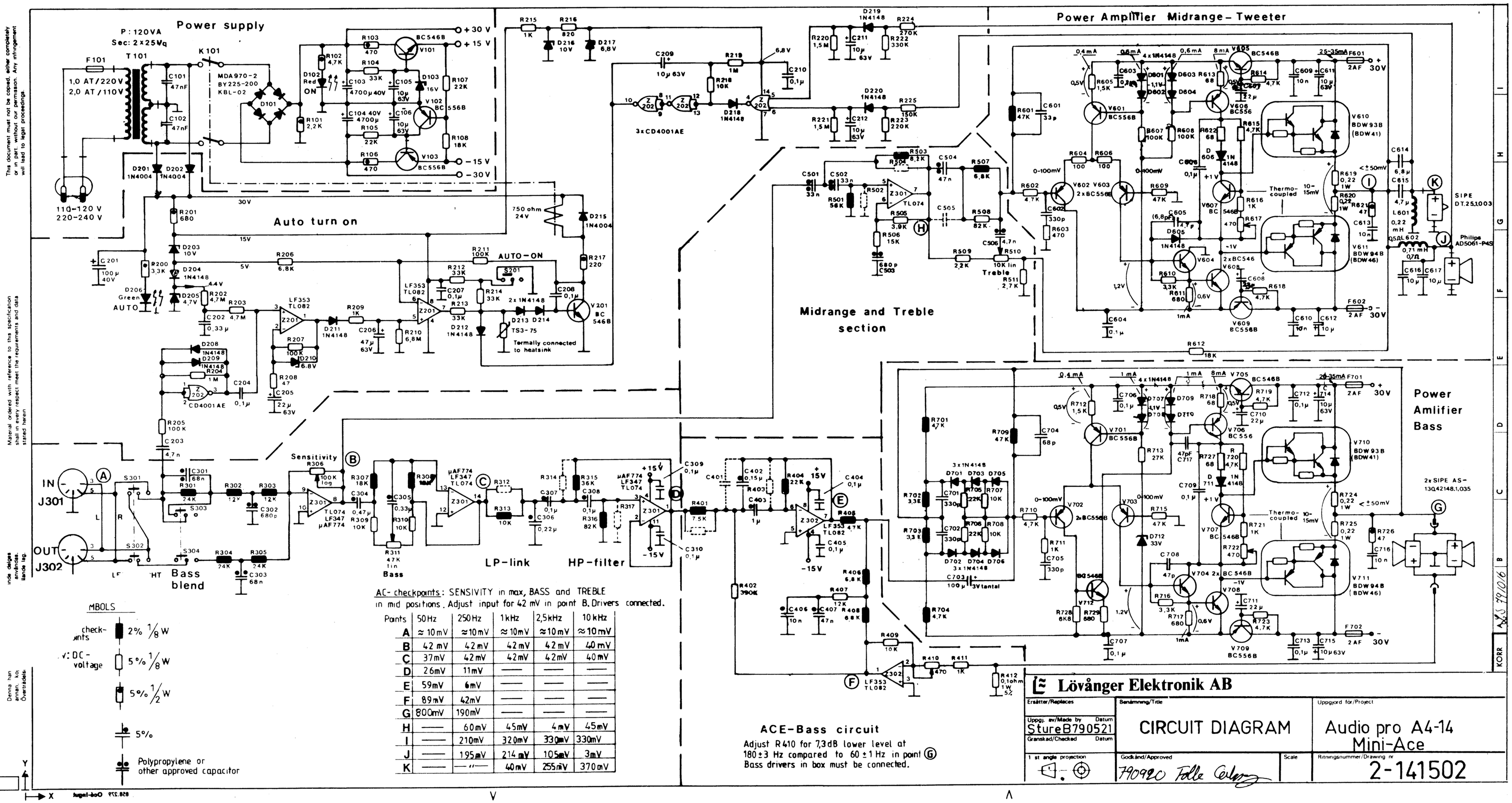
C701 C702 monteras upplyftade och bockade



Enclosure 5.2

Lövånger Elektronik AB

Ersätter/Replaces	Benämning/Title: KOMPONENTPLACERING COMPONENT LAYOUT MINI-ACE		Uppgjord för/Project: audio pro A4-14
Uppgj. av/Made by: MG 790827	Datum		
Granskad/Checked	Datum		
1 st angle projection	Godkänd/Approved: 790828 Tolke Carlsson	Scale: 1:1	Ritningsnummer/Drawing nr: 3-141504



AC- checkpoints: SENSIVITY in max, BASS and TREBLE in mid positions. Adjust input for 42 mV in point B. Drivers connected.

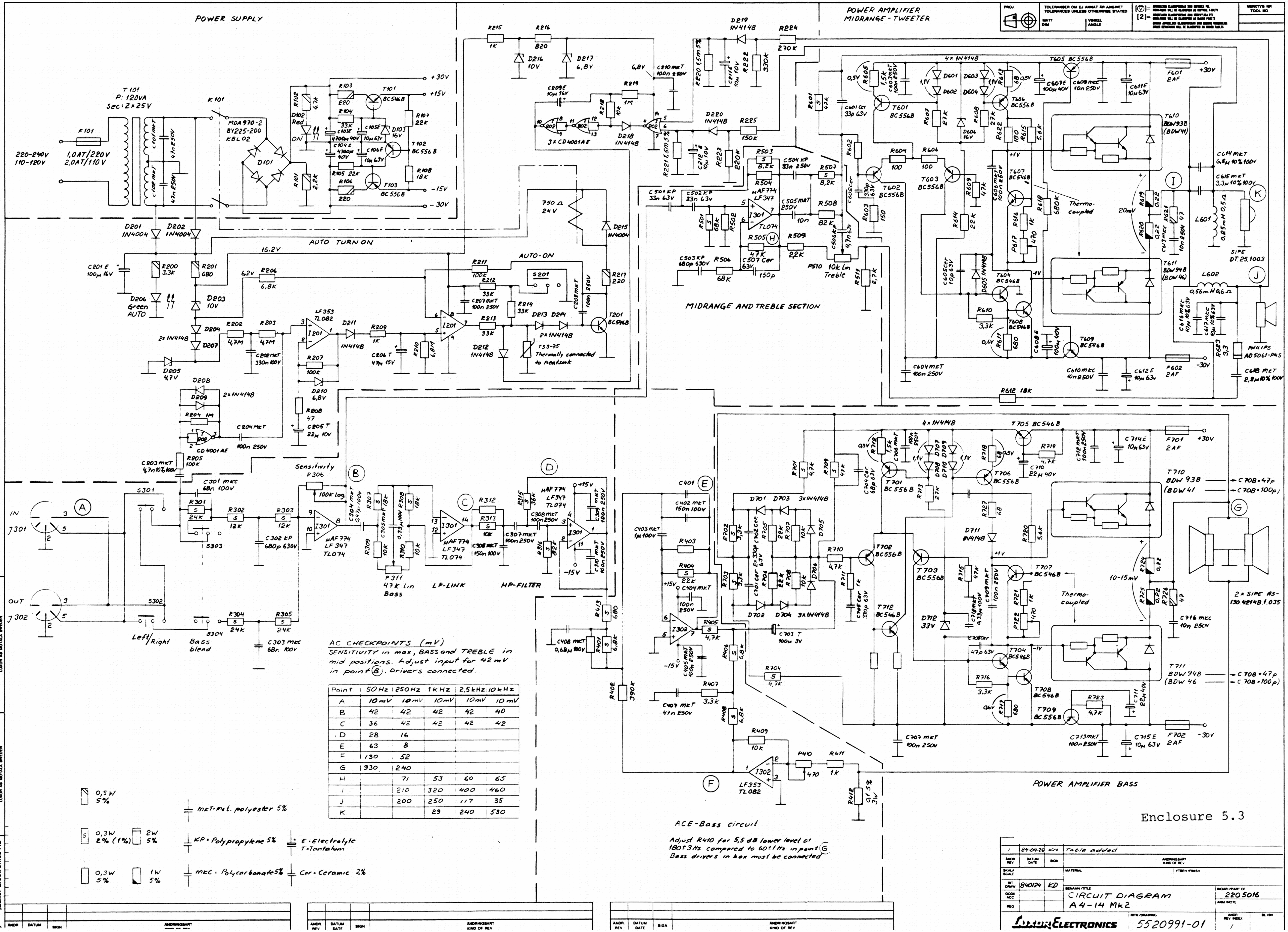
Points	50Hz	250Hz	1kHz	2,5kHz	10kHz
A	≈ 10mV	≈ 10mV	≈ 10mV	≈ 10mV	≈ 10mV
B	42 mV	42 mV	42 mV	42 mV	40 mV
C	37mV	42 mV	42mV	42mV	40 mV
D	26mV	11mV	—	—	—
E	59mV	6mV	—	—	—
F	89mV	42mV	—	—	—
G	800mV	190mV	—	—	—
H	—	60mV	45mV	4mV	45mV
I	—	210mV	320mV	330mV	330mV
J	—	195mV	214 mV	105mV	3mV
K	—	— " —	40mV	255mV	370mV

ACE-Bass circuit

Adjust R410 for 7,3dB lower level at 180±3 Hz compared to 60±1 Hz in point G. Bass drivers in box must be connected.

Lövånger Elektronik AB

Ersätter/Replaces	Benämning/Title	Uppgjord för/Project
Uppgj. av/Made by: Sture B 790521	CIRCUIT DIAGRAM	Audio pro A4-14 Mini-Ace
Granskad/Checked		
1 st angle projection	Godkänd/Approved: 790920 Folke Carlsson	Ritningsnummer/Drawing nr: 2-141502



AC CHECKPOINTS (mV)

SENSITIVITY in max, BASS and TREBLE in mid positions. Adjust input for 42 mV in point (B). Drivers connected.

Point	50 Hz	250 Hz	1 kHz	2.5 kHz	10 kHz
A	10 mV	10 mV	10 mV	10 mV	10 mV
B	42	42	42	42	40
C	36	42	42	42	42
D	28	16			
E	63	8			
F	130	52			
G	930	240			
H		71	53	60	65
I		210	320	400	460
J		200	250	117	35
K			29	240	530

ACE-Bass circuit

Adjust R410 for 5,5 dB lower level at 180±3 Hz compared to 60±1 Hz in point (G). Bass drivers in box must be connected.

0,5W 5%

0,3W 2% (1%)

2W 5%

0,3W 5%

1W 5%

mkT: Met. polyester 5%

KP: Polypropylene 5%

mkC: Polycarbonate 5%

E: Electrolyte
T: Tantalum

Cer: Ceramic 2%

Enclosure 5.3

ÄNDR REV	DATUM DATE	SIGN	ÄNDRINGSART KIND OF REV
1	84-04-26	KN	Table added

RIT DRAW: 840124 KD

BENÄMN/TITLE: CIRCUIT DIAGRAM A4-14 Mk2

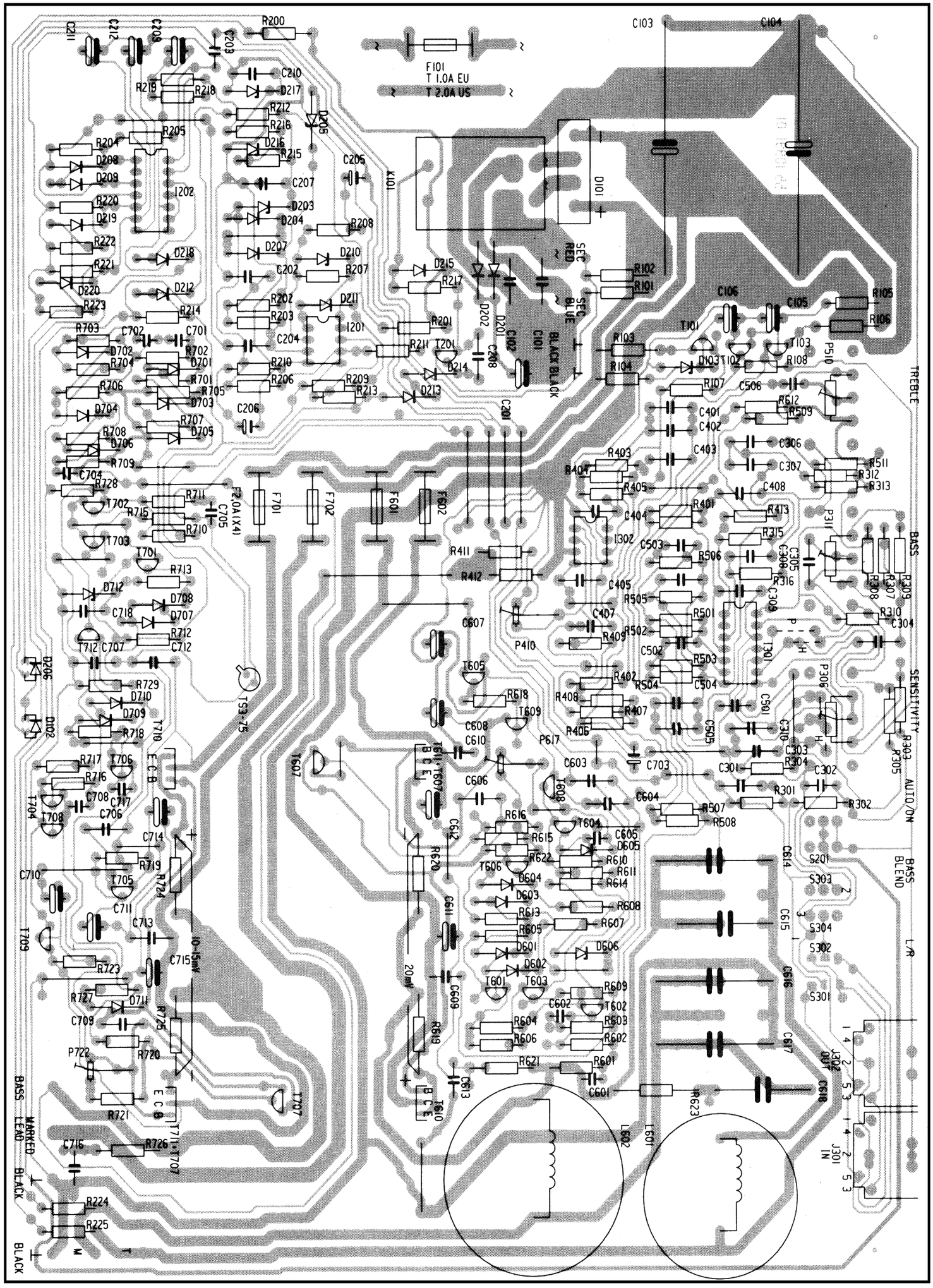
INGÅR I/PART OF: 2205016

RITN/DRAWING: 5520991-01

ÄNDR REV INDEX: 1

LUXOR ELECTRONICS

Luxor Electronics AB



Enclosure 5.4

Antal/Qty	Pos./Item	Benämning/Description	Material/Detalj
C B A			

Ritad/Drawn	Kontr./Checked	Dat./Date	Skala/Scale
KN		840507	-

audio pro
SWEDEN

A4-14 Mk2

COMPONENT LAYOUT

Ritn.-nr/Drg No.	Rev. No.
4-80150	