



**SERVICE MANUAL**  
**for**  
**SUBWOOFER B2-40**

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## 1. TECHNICAL DESCRIPTION

The theoretical Background for the Ace-Bass principle used in Subwoofer B2-40 is described in AES Preprint #1381.

The functions described below are separated by dotted lines on the Circuit Diagram.

### 1.1 Power Supply

The primary of the power transformer is always connected to the power cord via a power fuse (2.0A slow at 117 V, 1.0A slow at 220-250 V). The idle current in this transformer is very low (approx. 25mA at 117 V supply).

The center tapped secondary winding supplies the Automatic ON/OFF via two diodes D201, D202, and a double rectifier D101 via a DPST switch K101. This switch is operated by a relay in the Automatic ON/OFF circuits.

Rectifier D101 supplies + 30 V to the Power Amplifier, and also stabilized + 15 V via voltage regulators, V101, V103.

It is very important that the -15 V tracks the +15 V accurately when power is switched off. Mistracking can cause transients or oscillations in the electronic circuits.

This is assured by a 2.2 dummy load (R101) on the +30 V capacitor.

## 1.2 Automatic ON/Off

This circuit powered via diodes D201, D202 and capacitor C201.

The power transformer and the Automatic ON/OFF circuit are powered at all times when B2-40 is plugged into a live outlet. The other circuits in B2-40 are powered only when relay K101 is actuated.

The audio signal on left channel is sensed by operational amplifier V 201 and Z201 which acts as an amplifier with gain 20000 at 500 Hz. The amplified voltage (point K) is limited to +7.0 V and -0, 7 V by zener diode D209.

Operational amplifier Z201 (3, 2, 1) and transistor V202 work as a Schmitt trigger with ON level 7 V and OFF level 5 V. The input (pin 3) senses the voltage from Z201 (5,6,7) after rectification in D210 and capacitor C206.

Transistor V202 drives relay K101 and a red LED indicating "ON".

B2-40 is in position "Auto", relay K101 is de-energized about 5 minutes after the audio signal on left channel input disappears. The time delay is determined by C206 and R213. (During testing R213 may be shunted by 100 kohm, so delay time is reduced).

Temperature sensor TS3-75 senses the temperature of the Power Amplifier heatsink. If this temperature becomes too high, the resistance is TS3-75 drops to a low value, and relay K101 is de-energized.

### 1.3 Input Stage

The audio signals on DIN plug 301 pin 1 (left channel) and pin 4 (right channel) pass through variable high pass filters formed by C303, R309, R310, and C304, R311, R310 and buffer amplifiers V303, V301 and V304, V302 to DIN plug J301 pins 3 and 5. From pins 3 and 5, they can be returned to an external power amplifier driving the satellite speakers. The buffer amplifiers provide low output impedance, so cable capacitances will not affect the treble response.

The audio signals on DIN plug J303 pins 1 and 4, are summed by resistors R312, R313 into a first active low pass filter with kneepoint 106Hz and 9.5 dB gain at 100Hz (when channels are in parallel).

The signal from the first low pass filter is passed via a volume control R316 to a second amplifier stage Z301 (10, 9, 8) with 2.5 dB gain at 100Hz.

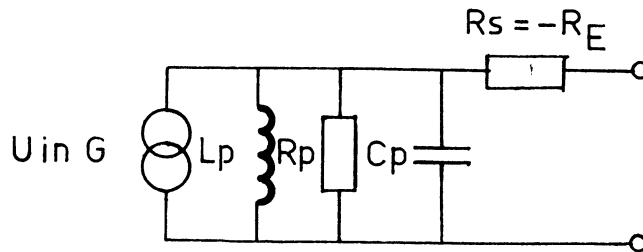
### 1.4 Filter

The signal from Z301 pin 8 (test point C) passes a variable low pass filter including R322, R321, R323, C307, C308 and Z301 (12, 13, 14), and then on to a fixed high pass filter with kneepoint 28Hz. The output terminal is test point (E).

Remaining components in the filter circuits are part of the Ace-Bass amplifier, and is described in section 1.5.

## 1.5 Ace-Bass\* Circuits

The Power Amplifier together with Z401 (1, 2, 3) and Z401 (5, 6, 7) form the Ace-Bass amplifier, which can be represented by the diagram below.



R413 and Z401 (3, 2, 1) sense the current through the drivers.

Z401 (5, 6, 7) works as an active bandpass filter, and also sums the signals in test points (E) and (G).

The Power Amplifier is of inverting type, and also acts as a summing amplifier, adding signals (F) and (G).

Part of the driver current signal is fed back positively through the Power Amplifier, which gives the Power Amplifier a negative output resistance  $R_s$ . The amount of positive feedback, and thereby, the value of  $R_s$ , can be adjusted by trimpot R411.

The parallel circuit  $L_p$ ,  $R_p$ ,  $C_p$  in the Ace-Bass amplifier is accomplished through negative feedback of the driver current signal via the bandpass filter, Z401 (5, 6, 7).

\*ACE-Bass = Amplifier Controlled Euphonic Bass.

## 1.6 Power Amplifier

The input signal to the Power Amplifier is DC decoupled by capacitor C503, and is amplified linearly to the output (test point H).

The output signal is fed back negatively to the input via R509, C504.

When the output signal is large, negative feedback is also obtained via a diode - resistor network. The amplitude of the output signal is compared to the supply voltages ( $\pm 30$  V) in this network, and about 2 volts before clipping, the output signal is rounded off by the diode network so clipping will be soft.

The differential input stage (V501, V504) is supplied via a current generator (V502).

The output stage is of Darlington design with transistors V511-V512 and has AC gain 1. V508 senses the temperature of the output transistors so that the bias current is constant. V506 and V510 filter the supply voltages to the input stages, removing hum and transients.

NOTE: If there is a "click" in B2-40 when it is switched on, the cause could be a short circuit in one of the transistors V506, V510.

## 2. TROUBLE SHOOTING TIPS

Use + pole of C104 or - pole of C103 as common point for measurements of DC or AC voltages.

### 2.1 B2-40 Does Not Work

Connect a signal generator to plug J301, pin 1 and 4 in parallel. (5mV).

2. 1-1 Check that both the green and red LED are lit.
2. 1-2 Check power fuse and fuses F501, F502.
2. 1-3 Check that DC voltages are OK.

+30V :  $30 \pm 2.5V$

-30V :  $30 \pm 2.5V$

+15V :  $15 \pm 2V$

-15V :  $15 \pm 2V$

2. 1-4 To localize the fault, connect a signal generator to DIN plug J301, pins 1 and 4 in parallel. Set generator to 5mV, 100Hz sine wave. Turn "sensitivity" (R316) and "crossover frequencies (R309) and (R321) to max. clockwise position. You should now measure as follows:

<u>Test Point</u>	<u>AC Volts</u>
A	approx. 5 mV
B	approx. 15 mV
C	approx. 20 mV
D	approx. 20 mV
E	approx. 20 mV
F	approx. 32 mV
G	approx. 80 mV
H	approx. 520 mV
I	approx. 1.7 mV
J	approx. 1.7 mV

} with drivers connected



## 2.2 Fuses F501, F502 Blow

- 2.2-1 Disconnect drivers, and repeat test per 2.1-4. Signal at test point (H) now should be around 0.3V.
- 2.2-2 Measure resistance of voice coils in drivers. Should be 5.8 ohm each, 2.9 ohm in parallel.

## 2.3 Automatic ON/OFF

This can also be checked with the same setup as in 2.1-4.

- 2.3-1 Connect a signal generator to plug J301, pin 1. (5mV)
- 2.3-2 Signal at test point (K) should be clipped and measure 7 V peak to peak. (Oscilloscope) Signal at test point (L) should be about 15 V DC.
- 2.3-3 Shunt R213 by 100k ohm to shorten off - delay.  
Check that ON is actuated when signal from generator exceeds 0.2mV at 500Hz.

### 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 B2-40 is turned on.

Set potentiometer R523 till DC voltage between emitters of V511 and V512 reads 10mV, 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 and to the temperature compensating transistors. Check that insulation is adequate and 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

Whenever a driver element or any of resistors R409 - R413 in the current sensing circuit has been replaced, the negative output resistance must be reset to equal the positive resistance of the parallel voice coils in the drivers.

The woofers must be properly mounted in cabinet, their voice coils must be connected and the voice coils must be cold (at room temperature).

Turn "sensitivity" (R316) and "crossover frequency to max. clockwise position".

Connect a signal generator to plug J301 with 5mV at 31Hz  $\pm$  2Hz on both channel inputs pin 1 and 4.

Adjust R411 for 1.30V output : point (H).

#### 4. SPARE PARTS

When ordering spare parts, please refer to serial number of B2-40, and component number per diagram 2 - 124003.

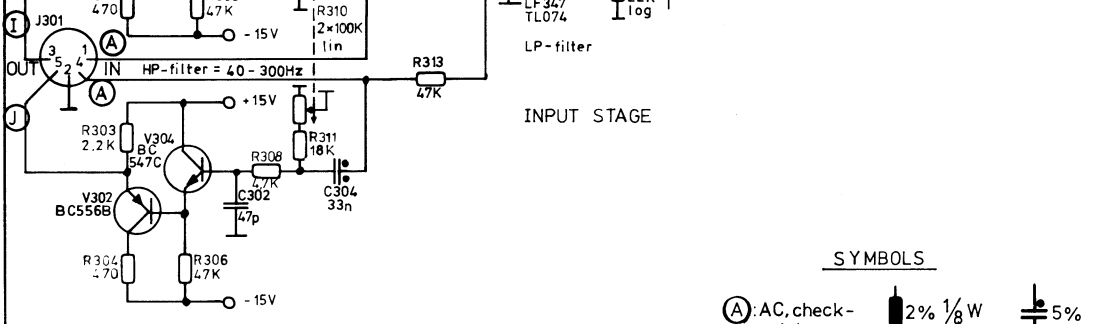
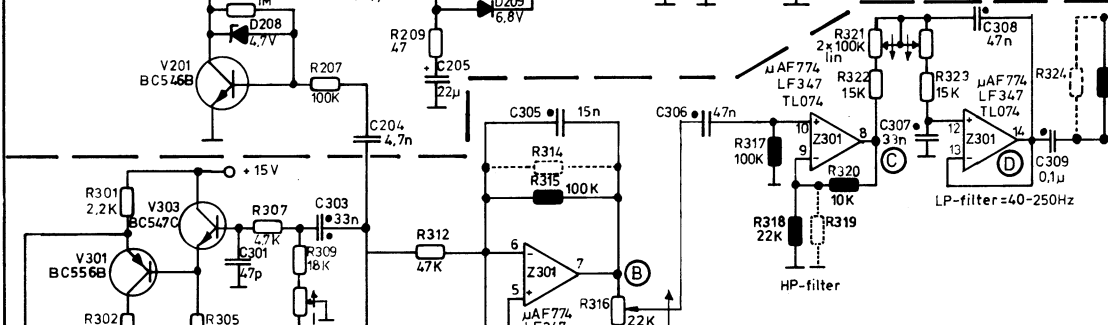
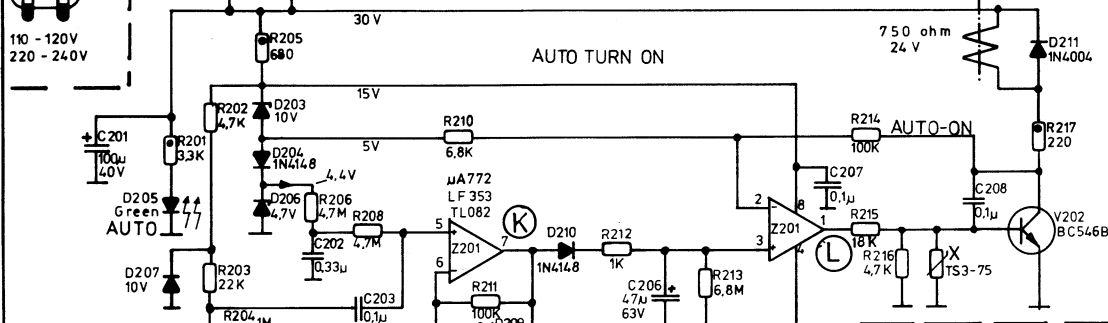
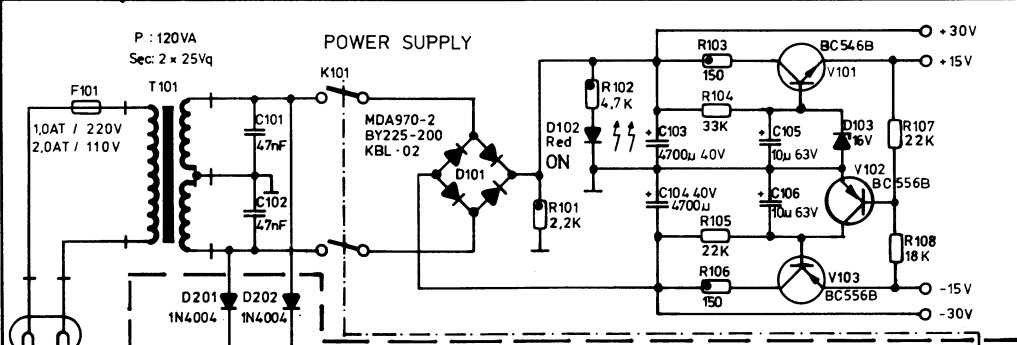
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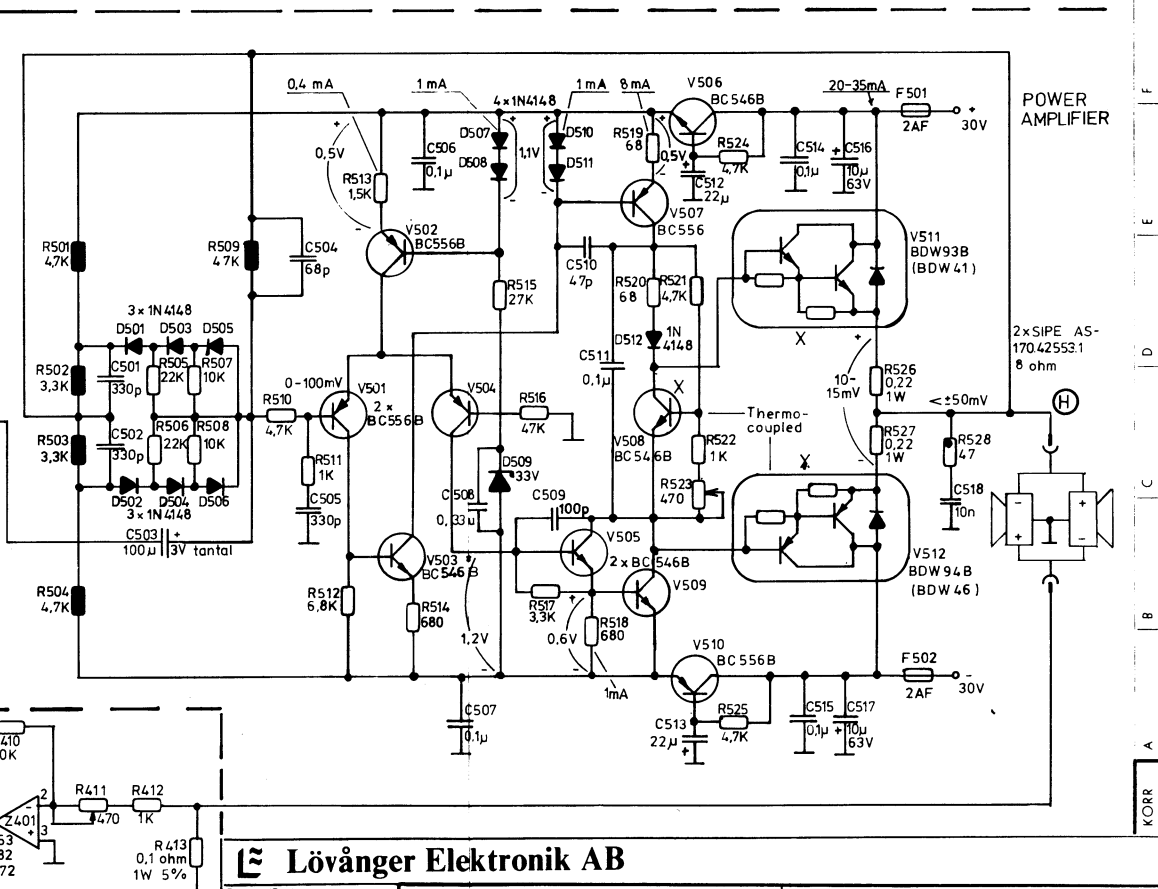
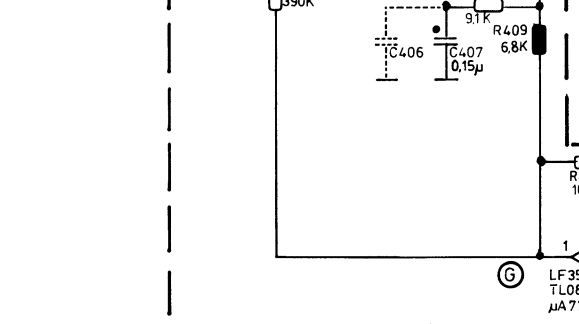
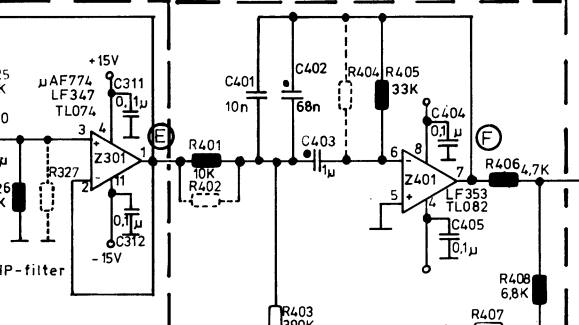
Material ordered with reference to this specification shall in every respect meet the requirements and data stated herein.

Den här handling (år 4) utan vårt medgivande delgas åtman. Kopieris eller efter förändring. Invalideris. Översättis från svenska med tillstånd av Gällande lag.



AC-checkpoints: SENSITIVITY and CROSSOVER FREQUENCIES in maximum positions. Input 5mV to both left and right channels. Bass drivers connected.

TESTPOINT	31Hz	100Hz	200Hz
A	5mV	5mV	5mV
B	21mV	15mV	9mV
C	20mV	20mV	13mV
D	20mV	20mV	9mV
E	20mV	20mV	9mV
F	45mV	32mV	9mV
G	265mV	80mV	42mV
H	1.30V	520mV	200mV
I	0.8mV	1.7mV	3.0mV
J	0.8mV	1.7mV	3.0mV



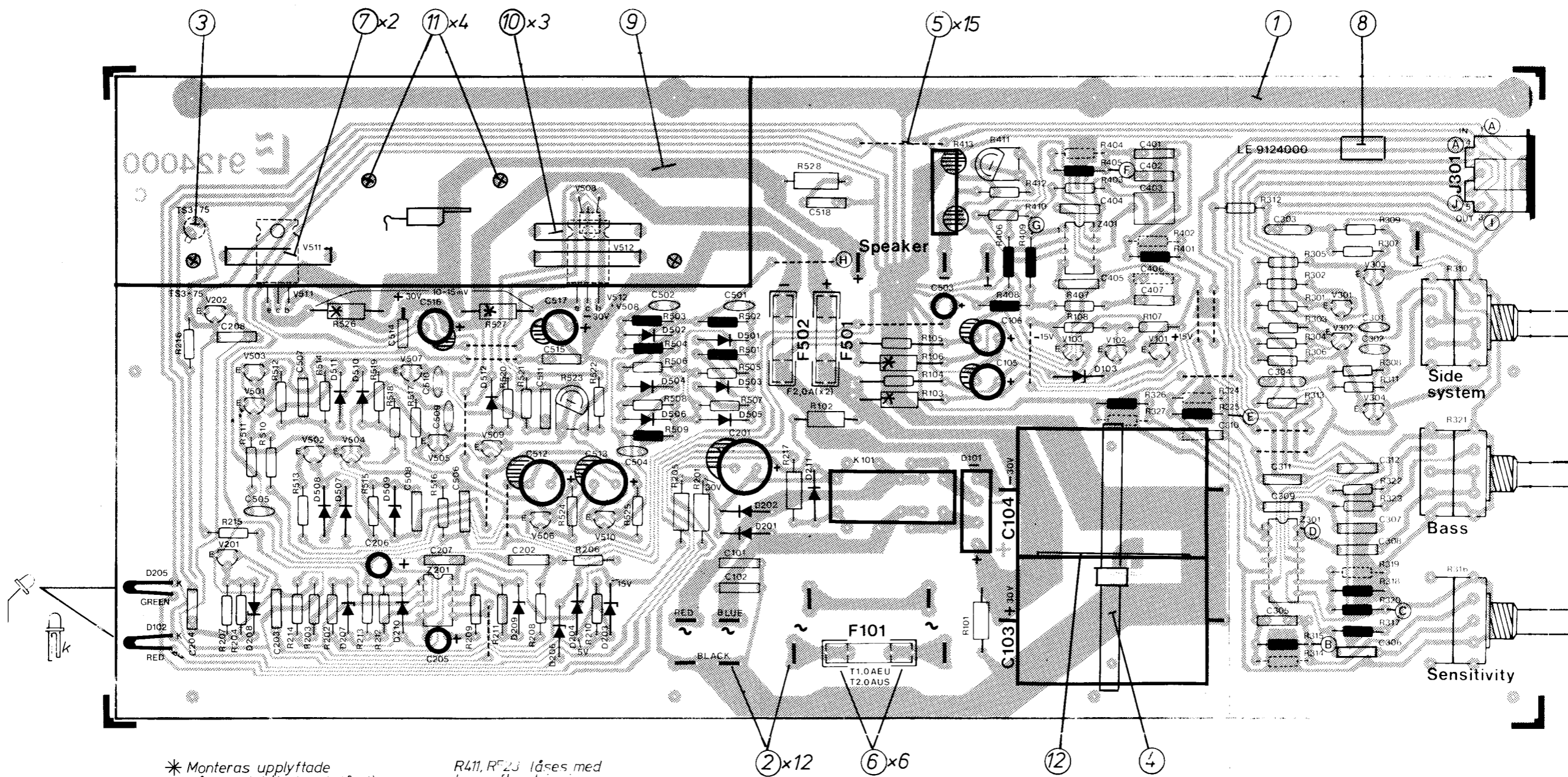
- SYMBOLS**
- (A): AC-check-points
  - 0.5V DC-Idling voltage
  - 0.4mA DC-Idling current
  - X: on heatsink
  - 2% 1/8 W
  - 5% 1/8 W
  - 5% 1/2 W
  - 5%
  - Polypropylene or other approved capacitor

ACE - BASS CIRCUIT  
Adjust R411 for 1.30V output in point (H) when both channel inputs are fed with 5mV at 31±2Hz. Bass drivers in box must be connected. Only for service.

**Lövånger Elektronik AB**

Ersätter/Replaces	Benämning	Uppgjord för Project
Uppgj. av/Made by	Datum	<b>AUDIO PRO</b>
Granskad/Checked	Datum	<b>B2-40</b>
1st angle projection	Godkänd/Approved	Scale
	800819 <i>Tolle Carlén</i>	Ritningsnummer Drawing nr
		<b>2-124003</b>

I  
H  
G  
F  
E  
D  
C  
B  
A  
KORR



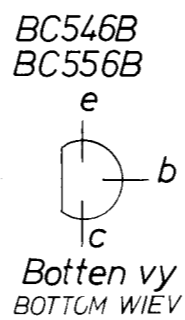
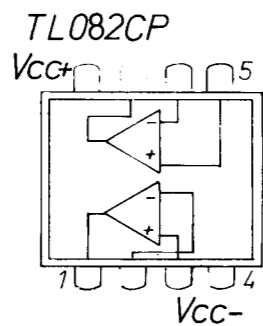
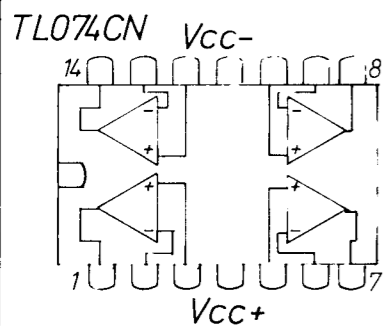
\* Monteras upplyftade från kortet (4 st motstånd)

\* Install at distance from card (4 resistors)

R411, R523 låses med lack efter trimning

lock with varnish after adjustment

Limmas med 3140



Lövånger Elektronik AB

LS 800616

KOMPONENTPLACERING  
COMPONENT LAYOUT

B2-40



800819 *Tolle Cedez*

3-124002