Dual

Dual CV 240
Service Manual

Edition September 1974

Contents

Dual Gebrüder Steidinger · 7742 St. Georgen/Schwarzwald

Technical data

Power output (measured at 4 Ohms)

Music power	4 x 60 watts
Continuous power	4 x 38 watts
Continuous power	2 x 40 watts

Input sensitivity

Phono	2.6 mV at 47 kohms
Tuner	300 mV at 470 kohms
Tape	300 mV at 470 kohms
4-channel AUX 1	300 mV at 470 kohms
4-channel AUX 2	300 mV at 470 kohms
4-channel AUX 3	300 mV at 470 kohms

Frequency response

measured with tone controls in midposition

20 - 25,000 Hz	± 0.5 dB
15 - 40,000 Hz	± 1.5 dB

Rated output bandwidth (DIN 45500 standard)	8 - 40,000 Hz

Tone controls

Acting equally on all four channels simultaneously.

Bass at 40 Hz	+17 to - 18 dB
Treble at 15 kHz	+16 to - 18 dB

Presence

at 4 kHz + 5 dB

Rumble filter

Frequency limit	- 3 dB, 50 Hz
Slope	12 dB/octave

Scratch filter

Frequency limit	- 3 dB, 6,500 Hz
Slope	12 dB/octave

Balance control

4 separate controls each + 4 dB to - 45 dB

Volume control

4-element variable resistor with optional loudness characteristic

Damping factor

≧ 25

Stereo/Mono switch

Monitor switch

for tape listening

Outputs

6 speaker sockets (to DIN 41529 standard), 4 - 16 Ω

for 3 pairs of speakers

Front loudspeakers can be switched off

REAR I speakers can be switched off

REAR I output can be switched to REAR II

Signal/noise ratio

related to Na = 4 x 50 mW

Low-impedance inputs	≧ 50 dB
Typical value	≧ 56 dB
High-impedance inputs	≧ 50 dB
Typical value	≧ 58 dB

related to nominal output

Magnetic PU input	≧ 62 dB
Typical value	≧ 64 dB
High-impedance inputs	≧ 70 dB

Crosstalk attenuation

at 1 kHz ≧ 45 dB

Power consumption

app. 400 VA

Mains supply voltages

Solder-on tappings 110, 117, 220, 240 V

Fuses

110, 117 V	5 Amp slow-acting
220, 240 V	2.5 Amp slow-acting

Components

64 silicon transistors
8 silicon power transistors
9 integrated circuits
6 Z-diodes
47 silicon diodes
4 silicon bridge rectifiers
2 thermo switches

Dimensions

Width 420 mm, height 108 mm, length 385 mm

Weight

app. 14 kg

Fig. 1 Pre-amplifier frequency response

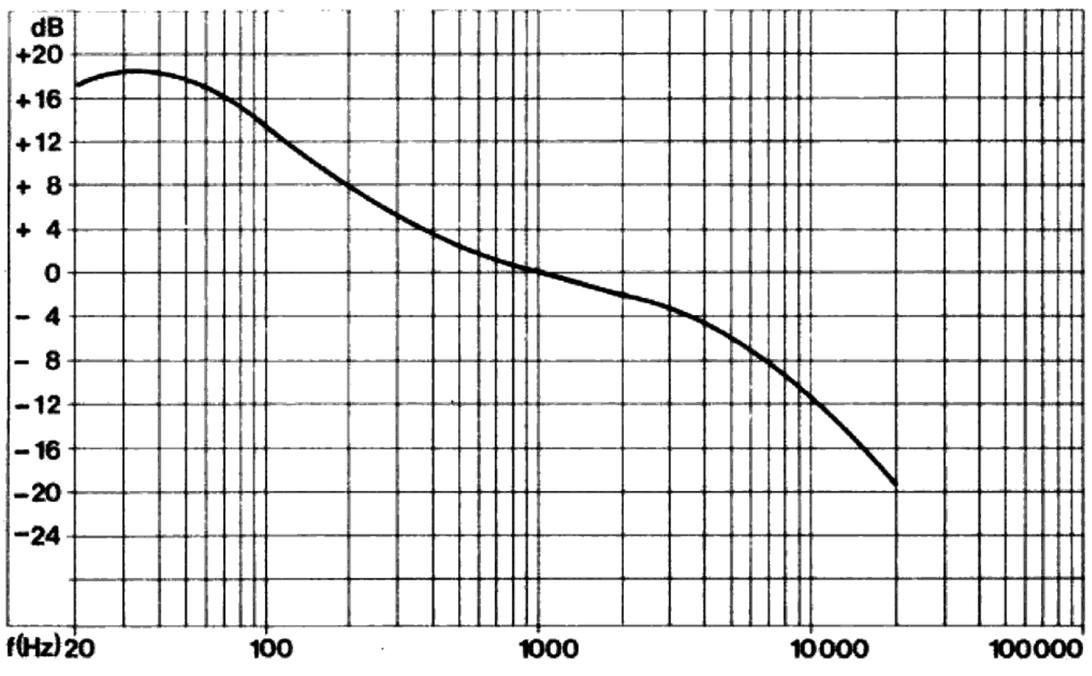


Fig. 2 power bandwidth

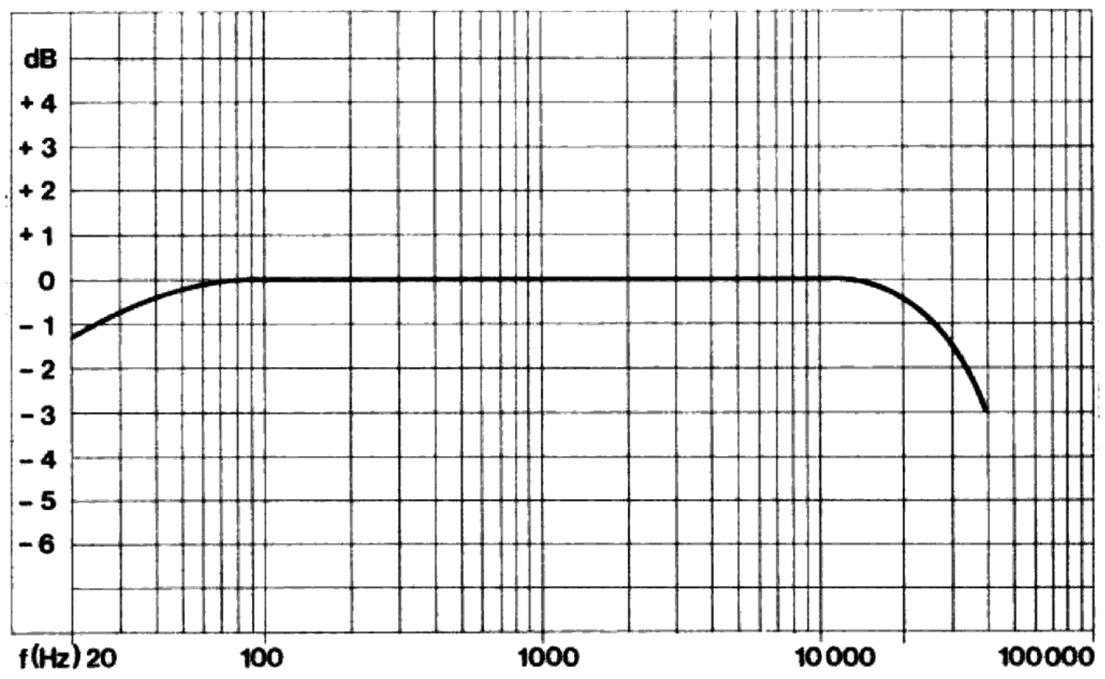


Fig. 3 Distortion at 40 Hz, 1000 Hz, 12500 Hz related to power output

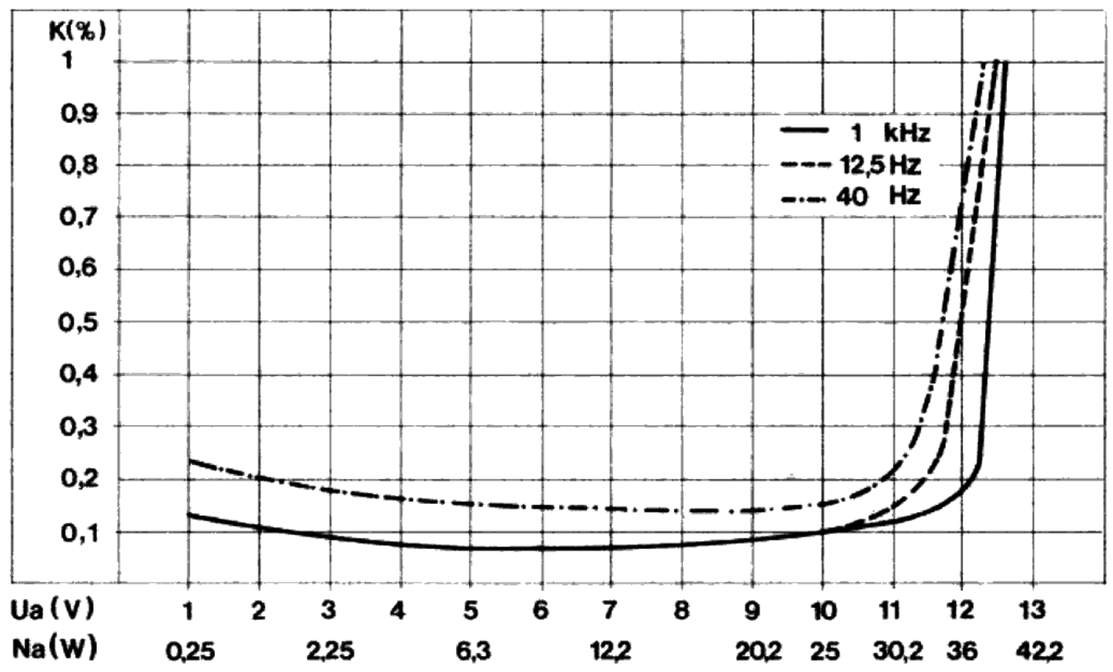


Fig. 4 Tone control responses
0 dB = bass and treble controls in midposition

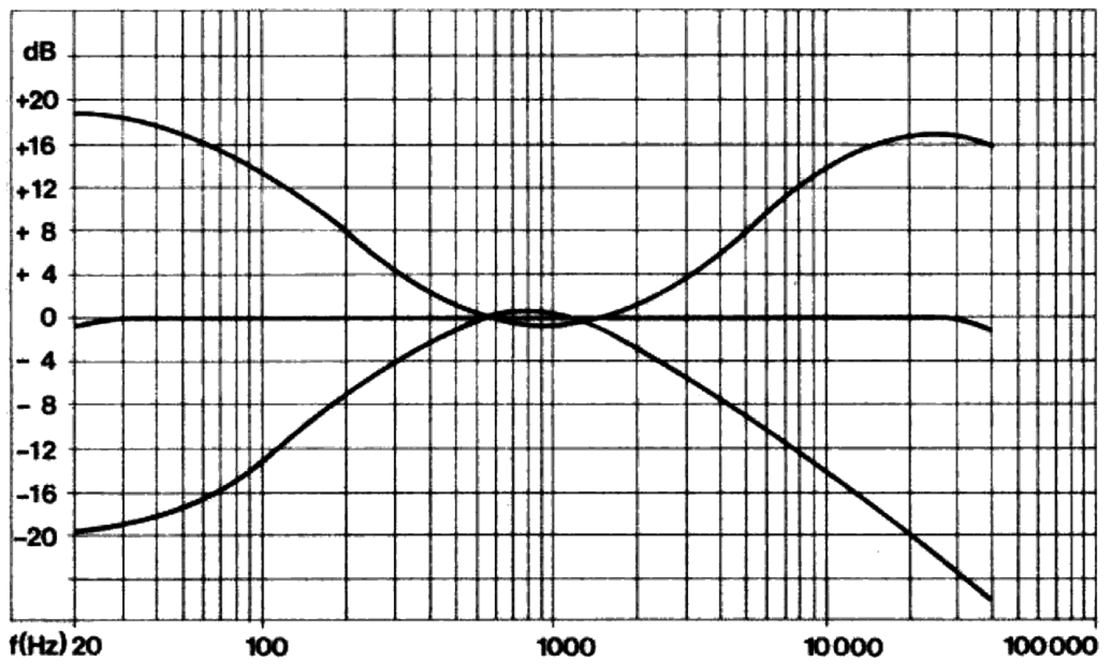


Fig. 5 Presence filter response

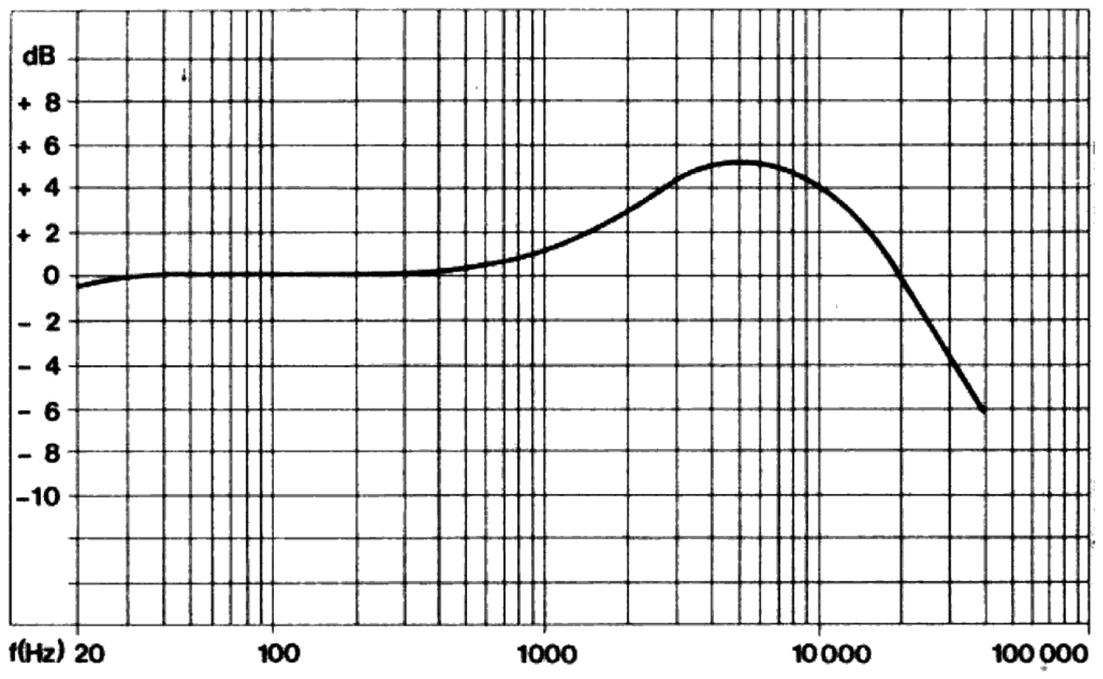


Fig. 6 Scratch filter response

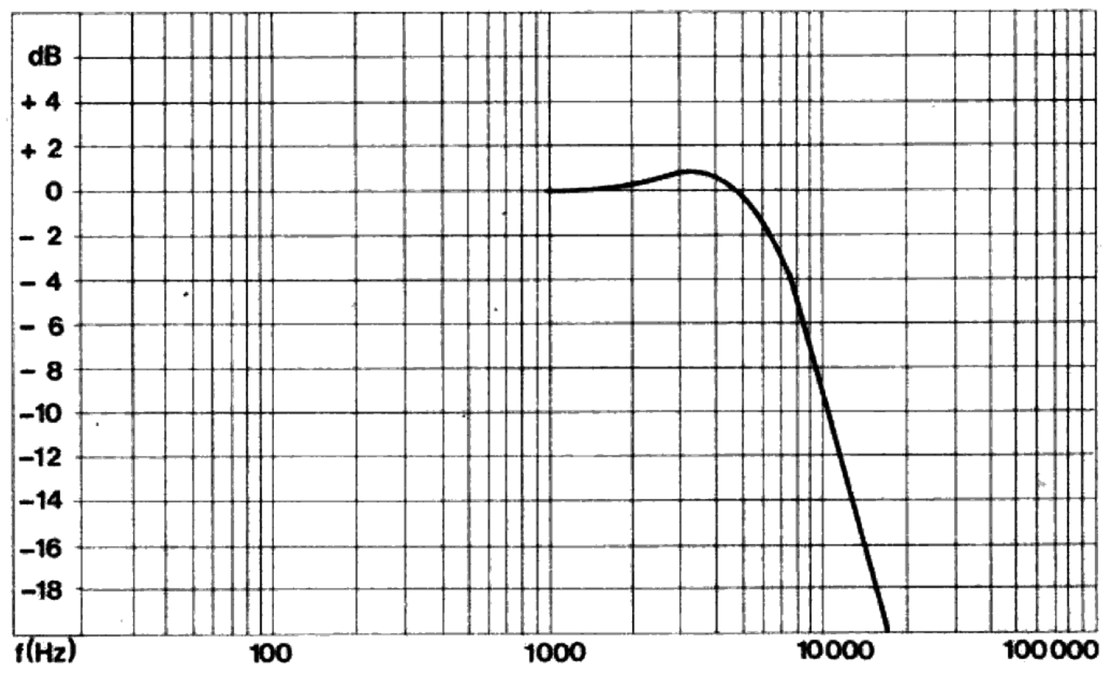


Fig. 7 Rumble filter response

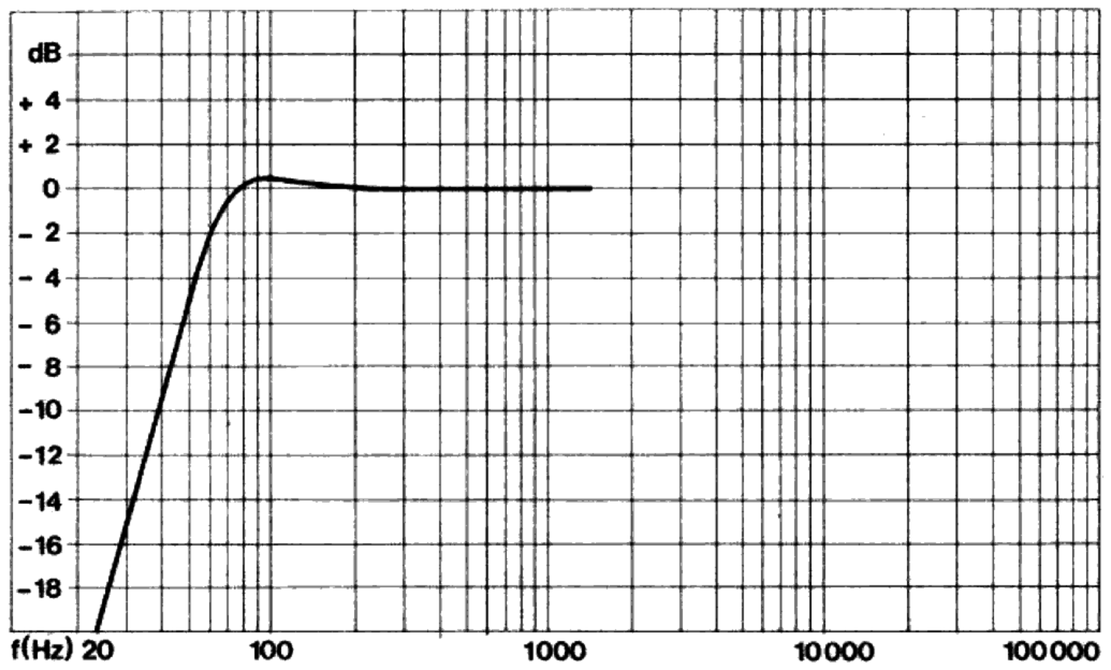
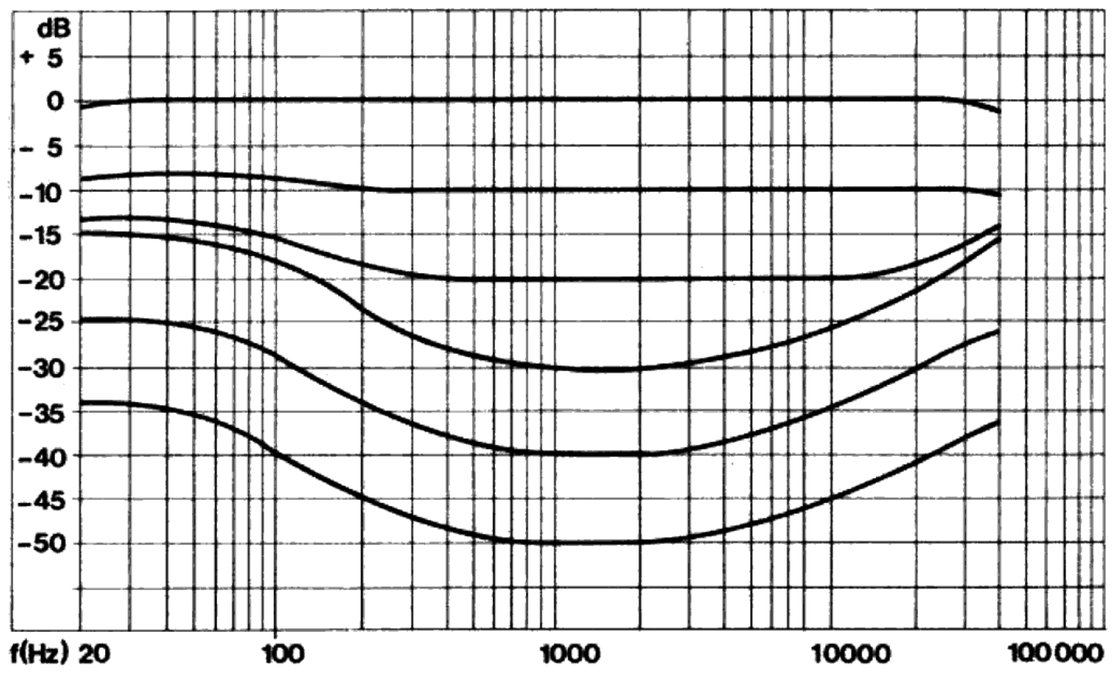
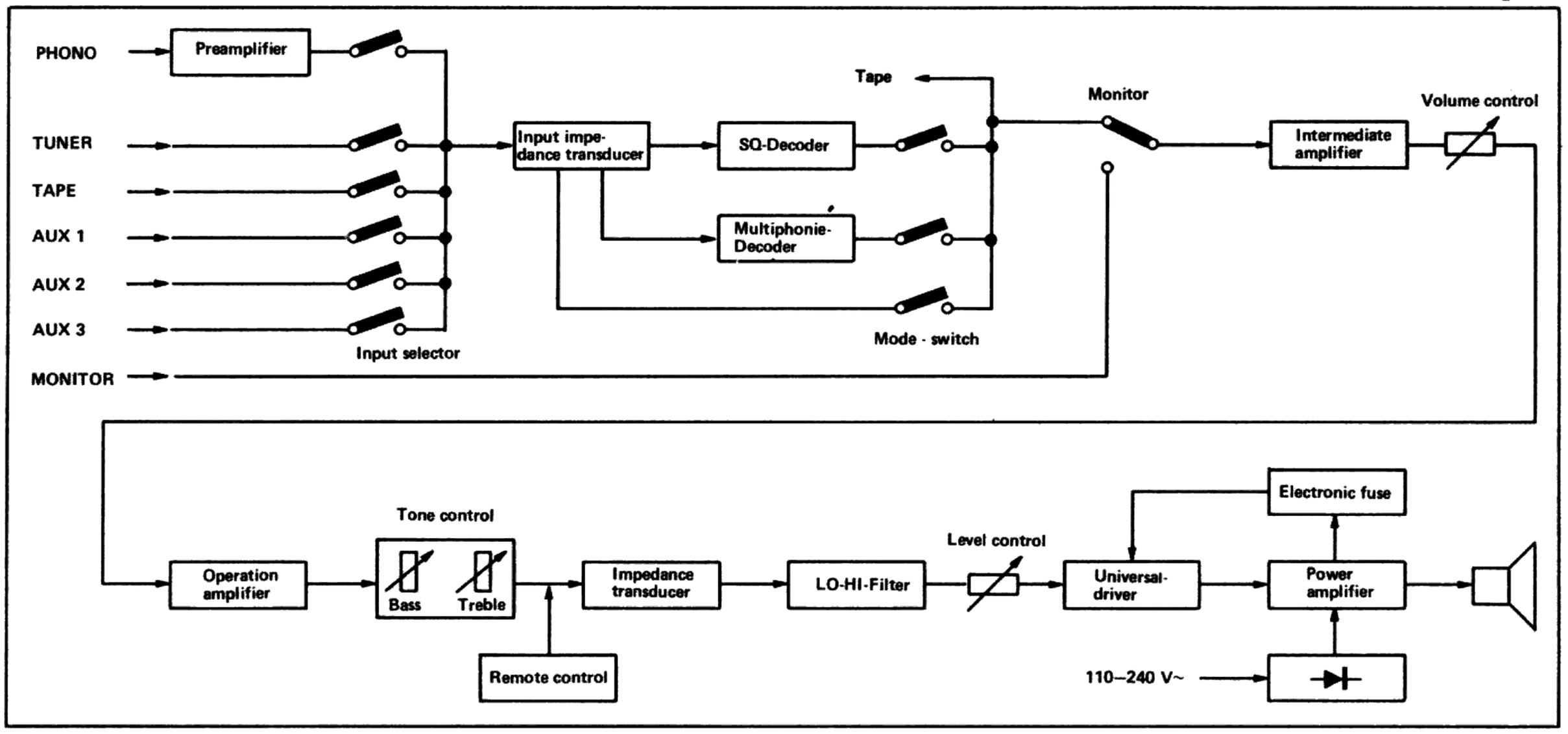


Fig. 8 Loudness control response
0 dB = volume control full gain



Functions

Fig. 9



Pre-amplifier I

The pre-amplifier (T 520, T 521) has two stages. It is provided with frequency-dependent negative feedback. Equalization in the PU-MAGNET setting takes place with 3180, 318 and 75 µs in accordance with the intersecting characteristic. Components determining frequency are R 525, C 524 and C 525. At 1000 Hz, amplification is 42 dB (app. 120 times). Control R 526 is provided to achieve symmetry between the two channels and to enable left-channel amplification to be matched to that in the right channel

Input selector

The input selector is a key switch assembly. To keep crosstalk between channels to a minimum, part of the contact springs is connected to earth (ground) and acts as a screen. In addition, inputs not in use are shorted to ground.

Input impedance transducer II

The Dual CV 240 has been equipped with an input impedance transducer which transmits the high-impedance signal at the input sockets to the operating mode switch or to the multi-matrix (IV) an SQ decoder (III).

SQ decoder IV

The SQ decoder comprises IC component XC 1312 and the associated circuit as recommended by the manufacturer for securing the decoded SQ signal.

Multi-channel (multiphony) decoder IV

By means of transistors T 600, T 601, T 602 and T 603 and resistors R 608, R 609, R 610 and R 611, decoding into

$$\text{left channel} - \frac{\text{right channel}}{2} \quad \text{and}$$

$$\text{right channel} - \frac{\text{left channel}}{2} \quad \text{takes place.}$$

The left rear channel is in phase with the front left channel, since T 600 and T 602 in each case produce a phase shift of 180°.

In the right channel, the phase is reversed by T 601 only. The following transistor, T 603, acts as an impedance transducer. The rear right signal is thus phase-shifted through 180° in relation to the front right signal.

Intermediate amplifier VII

The intermediate amplifier, equipped with complementary transistors T 640 an T 641, ensures optimum matching to the IC amplifier. (Signal amplification 9.5 dB, app. 3 times).

Volume control

The 4-element variable resistor acting as a volume control is provided with a 'loudness' tapping switched into circuit by operating the LOUDNESS key.

IC amplifier V

This stage of amplification uses a Series 709 operation amplifier, as employed and proved in computer manufacture. Its offload amplification (typical value) is 93 dB (app. 45000 times). Strong negative feedback reduces amplification to approx. 7 times. This results in excellent transmission characteristics, for example a very low distortion factor. The lift in the frequency range in the region of 4 kHz for additional 'presence' is achieved by means of R 103 and C 103, and the attenuation at higher frequencies with C 102, on and off switching is by means of 'presence' switch S 20.

Impedance transducer VI

Transistor T 720 converts high-impedance signals to low impedance before they enter scratch and rumble filter (XI).

LO-HI filter XI

The active scratch and rumble filter is equipped with transistor T 740 wired as an impedance transducer. In the linear setting, amplification = 1. Switches S 22 (LO filter) and S 24 (HI filter) are used to switch on the rumble and scratch filters respectively. Bass cut frequency response below 50 Hz is determined by components R 106, R 107, C 104 and C 105, and treble cut above 6.5 kHz by R 740, R 742, C 740 and C 106.

Output amplifier with electronic fuse

The output stages of the CV 240 are electronically protected against inadequate impedances and short-circuits at the loudspeaker outputs. The transistor combination T 300 and T 302, used to amplify the positive half-waves, is protected as follows:

Voltage drop at the amitter protector resistor R 301 varies with current flow. A voltage divider comprising R 316 and R 313 controls trnasistor T 821, which is coupled with driver transistor T 820. This ensures effective current limitation.

Current limiting for transistors T 301 and T 303, which amplify the negative halfwaves, is effected in a similar manner. Voltage drop at protective resistor R 322 passes via voltage divider R 314 and R 317 to the base of T 800. This transistor forms an auxiliary connection to the base - emitter path of T 301 and thus prevents T 301 and T 303 from becoming overloaded.

In this type of circuit the voltage dividers are rated in such a way that the current limiting cut-in point is influenced by the terminal impedance. If this is too low, or a short-circuit is present, the current limiting will start much earlier, so that the thermal load on the output transistors is kept low.

Additional resistors (R 306, R 307), which can be unsoldered, are provided in each output stage to protect the CV 240 against overheating.

Power supply

A low-leakage and tape-wound core line transformer for line voltages of 110, 117, 220, or 240 V. Supplies power to the unit.

Each channel is rectified separately by means of filter capacitors C 304 and C 305.

The output stages are supplied direct ly, and the pre-amp stages after voltage stabilization.

Plus 15 V are stabilized by the Zener diodes D 913, minus 15 V by D 914, and plus 23,5 V with D 900 and D 901.

Filter chains of suitable capacity prevent interference impulses from reaching the speakers when the amplifier is switched on.

Adjustment-and test data

Current consumption

Offload, at 220 V	max. 200 mA
Full load 2 x 38 W (12.3 V into 4 ohms/channel	max. 1 Amp
2 x 38 W (12.3 V into 4 ohms/channel in 4 CH setting)	max. 2 Amp

Operating voltages

Output stage, offload	±24.5 V to ± 26.5 V
Voltage drop at full load (4 x 38 W)	max. 5 V
Supply voltage x	+ 25 V to ± 26.5 V
Supply voltage y	+ 12.5 V to + 15 V
Supply voltage z	- 13 V to - 15 V

Thermal overload protection (power Supply)

38 W (1000 Hz) output at FRONT right and REAR right or FRONT left and REAR left channels (into 4 Ohms/channel), then short both channels supplied (the other two channels remain open) and measure mains current consumption.
Desired value
after app. 2 sec. short-circuit, max. 850 mA
after 8 - 10 min. short-circuit the thermo switch should disconnect the line powerr supply. After a further 1 - 2 minutes the unit should again be operational (thermo switch reset).

Electronic fuse (output stage)

Set one channel to 38 W output (12.3 V) into 4 ohms and short-circuit the channels in sequence or terminate with 2 or 3 ohms.
Channels not being tested remain open.

Current consumption short-circuited	450 - 530 mA
Current consumption into 2 ohms	570 - 630 mA
Current consumption into 3 ohms	610 - 730 mA

Warning: the current consumption recorded when short-circuited must be lower than when terminated with 2 or 3 ohms.

Rest current

After app. 2 min. operating time max. 60 mA measured at emitter resistor R 306, voltage drop 20 mV, adjustable at R 301.

Key to abbreviations used for controls, switches and adjustment settings

Vc	= VOLUME control
Fr	= FRONT gain control
Re	= REAR gain control
Tc	= BASS and TREBLE tone controls
St	= Operating mode switch in STEREO setting
2 St	= Operating mode switch in 2 x STEREO setting
4 CH	= Operating mode switch in 4 CHANNEL setting
SQ	= Operating mode switch in SQ setting
Mu	= Operating mode switch in MULTI-channel setting
Ph	= PU (disc) key pressed
Tu	= TUNER (radio) key pressed
AUX 1	= 4 CH AUX 1 key pressed
Lou	= LOUDNESS key pressed
Pr	= PRESENCE key depressed
Lo	= LO-FILTER (rumble) key depressed
Hi	= HI-FILTER (scratch) key depressed
1	= Control up (open)
2	= Control in mechanical midposition
3	= Control closed (back)
6	= Control 6 dB below full modulation
40	= Control 40 dB below full modulation

Balancing amplifiers

Aux 1, 4 CH, Vc 1, Tc 2, Fr 1, Re 1
Feed 1000 Hz, 140 mV to Aux 1 inputs.
Adjust with R 309 to 10 V into 4 ohms/channel.
Fr 2, Re 2
Increase input voltage to 220 mV. With R 110, adjust to 10 V into 4 ohms/channel.

Output (signal) voltage and volume control

Aux 1, 4 CH, Vc 1, Tc 2, Fr 2, Re 2
Supply 1000 Hz, app. 280 mV to the AUX 1 inputs, and select all four inputs or two followed by the other two.

Output voltage:	
FRONT and REAR into 4 ohms/channel	11.5 - 16 V
Headphone sockets into 400 Ohms/channel	3 - 4.8 V
Tape outputs (contact springs 1/2 and 4/2) Terminated with 10 kohms TAPE-FRONT, TAPE-REAR	2 - 3.2 mV

Checking parallel action of control tracks of volume control over full control range.

Channel deviation ch 1-/ch 2 FRONT
in range between Vc 1 and Vc 2 max. 3 dB
in range between Vc 2 and Vc 40 max. 3 dB

Channel deviation ch 1-/ch 2 REAR
in range between Vc 1 and Vc 2 max. 4 dB
in range between Vc 2 and Vc 40 max. 4 dB

Harmonic Distortion

Aux 1, 4 CH, Vc 1, Tc 2, Fr 2, Re 2
Apply a 1000 Hz signal and adjust to 38 W (12.3 V) into 4 ohms at outputs

Distortion factor ≦ 1.5 %

Adjust to 30 W (11 V) into 4 ohms at outputs.

Distortion factor at 1000 Hz ≦ 0.5 %
Distortion factor at 40 Hz ≦ 0.5 %
Distortion factor at 12.5 kHz ≦ 0.7 %

Adjust to 1 W (2 V) into 4 ohms at outputs.

Distortion factor at 1000 Hz ≦ 0.2 %
Distortion factor at 40 Hz ≦ 0.3 %
Distortion factor at 12.5 kHz ≦ 0.2 %

Tone controls

Aux 1, 4 CH, Vc 1, Tc 2, Fr 2, Re 2
Supply approx. 30 mV to input AUX 1.

Bass control
Bass lift at 40 Hz 16 - 20 dB
Bass cut at 40 Hz 16 - 20 dB
Channel deviation ch 1-/ch 2 max. 3 dB

Treble control
Treble lift at 12.5 kHz 16 - 20 dB
Treble cut at 12.5 kHz 17 - 21 dB
Channel deviation ch 1-/ch 2 max. 3 dB

Lo-Hi filter

Aux 1, 4 CH, Vc 1, Tc 2, Fr 2, Re 2
Supply app. 100 mV to input AUX 1.

Lo filter
Cut at 50 Hz 2 - 5 dB
Cut at 25 Hz 13 - 17 dB
≙ 12 - 13 dB/octave
Lift at 100 Hz 0 - 3 dB

Hi filter
Cut at 6.5 kHz 0 - 3 dB
Cut at 13 kHz 13 - 16 dB
≙ 12 - 13 dB/octave
lift at 4 kHz
related to 1000 Hz level 0 - 3 dB

Presence

Aux 1, 4 CH, Vc 1, Tc 2, Fr 2, Re 2
Supply app. 100 mV to AUX 1 input

Lift at 1 kHz 1 - 2 dB
Lift at 4 kHz 4 - 6 dB
Lift at 12.5 kHz 2 - 4 dB

Physiological loudness control

Aux 1, 4 CH, Lou, Vc 40, Tc 2, Fr 2, Re 2
Supply 1000 Hz, app. 280 mV to the AUX 1 input

Treble lift at 12.5 kHz 3 - 7 dB
Bass lift 12 - 16 dB
related to 1000 Hz level
Channel deviation ch 1-/ch 2 max. 3 dB

Amplifier linearity

Aux 1, 4 CH Vc 6, Tc 2, Fr 2, Re 2

Deviation from 0 dB line
(Front and Rear)

between 40 Hz and 12.5 kHz ± 1.5 dB
Deviation between channels ch 1-/ch 2 3 dB

Vc 40
Deviation from the 0 dB line
between 40 Hz and 12.5 kHz ± 1.5 dB
Deviation between channels ch 1-/ch 2 3 dB

Gain control FRONT, REAR

Control range the + 3 at + 6 dB
Front control - 50 at - 60 dB
Control range the + 3 at + 6 dB
Rear control - 50 at - 60 dB
measured 1000 Hz

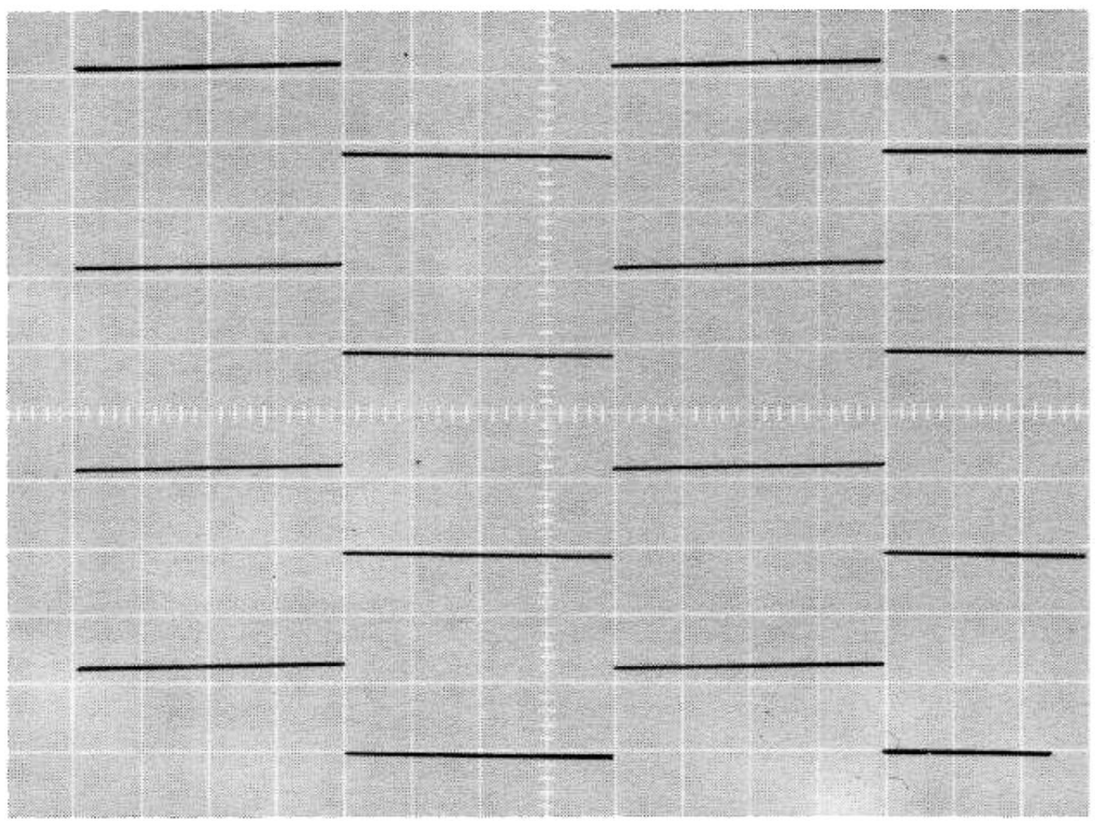
Square wave performance

Vc 1, Tc 2, Fr 2, Re 2
Impulse frequency 500 Hz, adjust to 1 V at front output into 4 ohms/channel.
Check via all linear inputs and in all operating modes except SQ.
Examine and evaluate square wave impulses (oscillogram Fig. 10).

SQ decoder

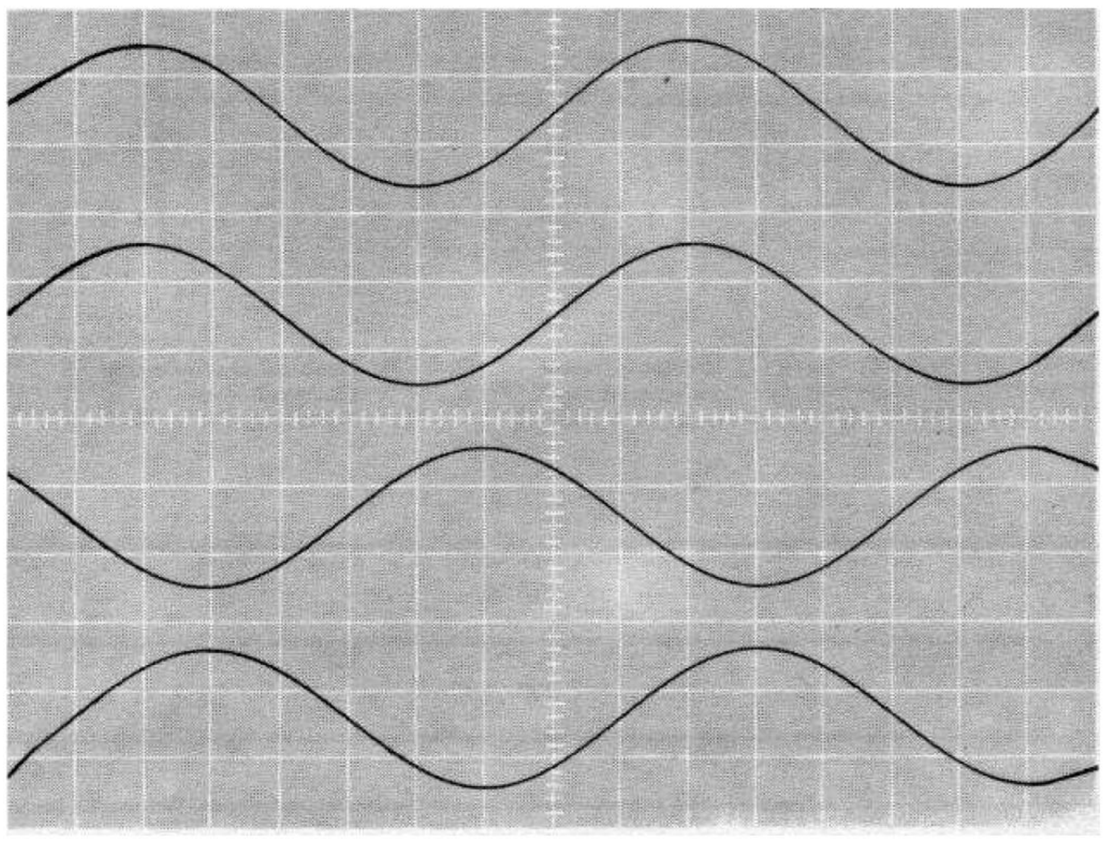
Tu, St, Vc 2, Fr 2, Re 2
Supply 1000 Hz, app. 300 mV to the TUNER input, run both channels and adjust to 4 V into 4 ohms/channel at FRONT.
(oscillogram Fig. 11)

Fig. 10 Square wave performance
(measured at output)



SQ
Output voltage
at 4 ohms/FRONT channel 3 - 4 V
at 4 ohms/REAR channel 1.3 - 2.3 V
Channel deviation ch 1-/ch 2 max. 3 dB

Fig. 11 SQ decoder
(measured at output)



Only right channel run
Output voltage
at 4 ohms FRONT right 3 - 4 V
at 4 ohms FRONT left 0.2 - 0.4 V
at 4 ohms REAR right 1.5 - 2.5 V
at 4 ohms REAR left 1.5 - 2.5 V
Channel deviation max. 3 dB

Only left channel run
Output voltage
at 4 ohms FRONT right 0.2 - 0.4 V
at 4 ohms FRONT left 3 - 4 V
at 4 ohms REAR right 1.5 - 2.5 V
at 4 ohms REAR left 1.5 - 2.5 V
Channel deviation max. 3 dB

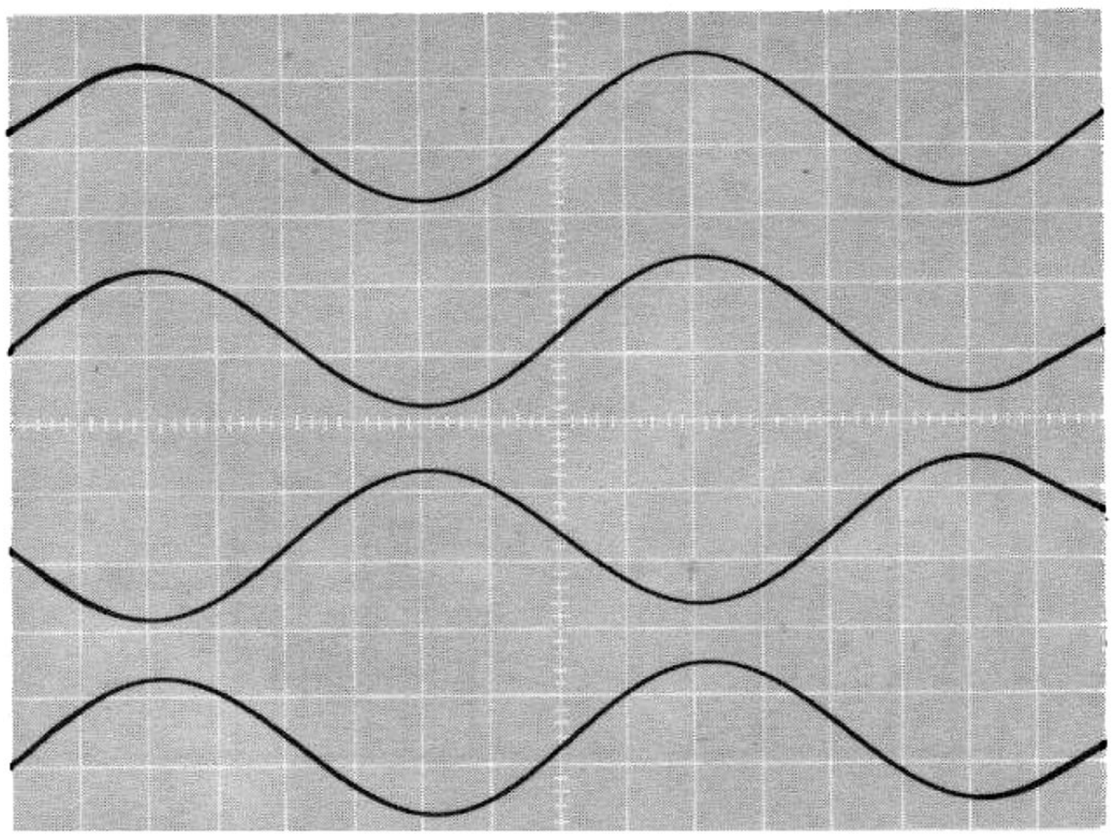
Both channels run
Deviation from 0 dB line
between 40 Hz and 12.5 kHz
at 4 ohms FRONT right ± 1.5 dB
at 4 ohms FRONT left ± 1.5 dB
at 4 ohms REAR right ± 3 dB
at 4 ohms REAR left ± 3 dB

Multiphony decoder

Tu, St, Vc 2, Fr 2, Re 2
Supply 1000 Hz, app. 300 mV to the TUNER input, run both channels, adjust to 4 V at 4 ohms/channel FRONT with volume control.

Mu
Output voltage
at 4 ohms/channel REAR 2 - 3 V
Phase relationship R-/-L 180°
(oscillogram Fig. 12)

Fig. 12 Multi matrix
(measured at output)



Only left channel input
Output voltage
at 4 ohms REAR left 3.6 - 4.6 V
at 4 ohms REAR right 1.5 - 2.5 V

Only right channel input
Output voltage
at 4 ohms REAR right 3.6 - 4.6 V
at 4 ohms REAR left 1.5 - 2.5 V

Pre-amplifier symmetry

Ph, St, Vc 1, Tc 2, Fr 2, Re 2
Supply a 1000 Hz signal of app. 1 mV to the PHONO input
With R 526, adjust until the output voltages of FRONT left and FRONT right are symmetrical.

Pre-amplifier frequency response

Ph, St, Vc 1, Tc 2, Fr 2, Re 2
Supply 1000 Hz, app. 0.4 mV to the PHONO input.

Bass lift at 40 Hz 17.5 dB ± 2 dB
Treble cut at 12.5 kHz 15 dB ± 2 dB
related to 1000 Hz level
Channel deviation ch 1-/ch 2 max. 3 dB

Input sensitivity

for 4 x 38 W output
12.3 V into 4 ohms/channel
Phono (PU) 2 - 3 mV
Linear inputs 260 - 320 mV

Pre-amplifier overdrive stability

2 St, Vc 2, Tc 2, Fr 2, Re 2
PHONO input, related to 2.5 mV ≧ 22 dB
Linear inputs, related to 290 mV ≧ 22 dB

Noise signal

AUX 1, 4 CH, Vc 1, Tc 2, Fr 2, Re 2
Inputs AUX 1 terminated with 47 kohms

Noise signal
at FRONT and REAR outputs max. 6 mV

Vc 3
Noise
at FRONT and REAR outputs max. 1 mV

Tu, St, Vc 1, Tc 2, Fr 2, Re 2
TUNER input terminated with 47 kohms

Noise signal
at FRONT outputs max. 5 mV
at REAR outputs max. 5 mV

Vc 3
Noise signal
at FRONT and REAR outputs max. 1 mV

Tu, SQ, Vc 1, Tc 2, Fr 2, Re 2

Noise signal
at FRONT and REAR outputs max. 10 mV

Vc 3
Noise signal
at FRONT and REAR outputs max. 1 mV

The same test values must be obtained for switch setting Mu.

Ph, St, Tc 2, Fr 2, Re 2
PHONO input terminated with 1 kohms

Noise signal
at FRONT outputs and Vc 1 max. 20 mV
at FRONT outputs and Vc 3 max. 1 mV

at REAR outputs and Vc 1 max. 5 mV
at REAR outputs and Vc 3 max. 1 mV

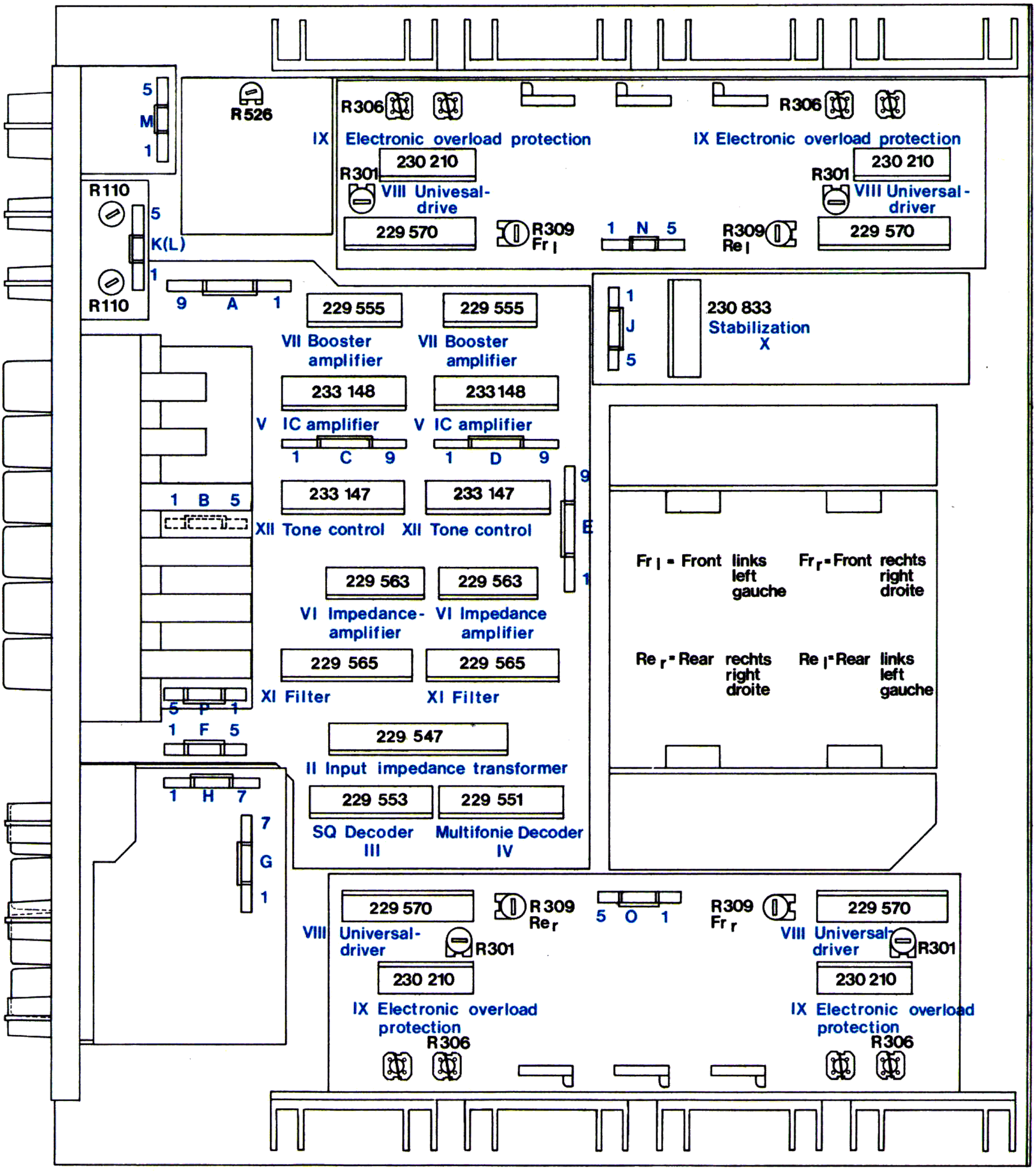
Ph, SQ, Vc 1, Tc 2, Fr 2, Re 2
PHONO input terminated with 1 kohms

Noise signal
at FRONT outputs max. 20 mV
at REAR outputs max. 20 mV

Ph, Mu, Vc 1, Tc 2, Fr 2, Re 2
PHONO input terminated with 1 kohms

Noise signal
at FRONT outputs max. 20 mV
at REAR outputs max. 25 mV

Fig. 13 Balancing positions, module and connector layout chart



The identification numbers are given only for location of the modules and should not be used when ordering !

When ordering spare parts please take the Article Numbers from the Spare Parts List pages 26 to 31.

The modules are identified by Roman numerals and the connectors by letters, these are identical with the references given in the circuit diagram.

Fig. 14

Dual
CV 240
Phono
Tuner
Monitor
Tape
Aux 1
Aux 2
Aux 3
Stereo
2xStereo
4 CH
SQ
Multi
Mode-Schalter
Mode-switch
Sélecteur
Speaker Front
Speaker Rear 1
Speaker Rear 2
Thermoschalter 95° C
Thermo switch
Thermo-rupteur
PHONO TUNER TAPE 4 CH AUX 1 4 CH AUX 2 4 CH AUX 3
LOUDNESS MONITOR MONO PRESENCE LO-FILTER HI-FILTER
SPEAKER FRONT SPEAKER REAR 1 SPEAKER REAR 2 POWER
II Eingangsimpedanzwandler / Input impedance transducer / Transducteur d'impédance d'entrée
III SQ Decoder / SQ Decoder / SQ Décodeur
IV Multifonie-Decoder / Multiphonie-Decoder / Décodeur multiphonique
V IC-Verstärker / Operation amplifier / Ampfificateur régulateur
VI Impedanzwandler / Impedance transducer / Transducteur d'impédance
VII Zwischenverstärker / Intermediate amplifier / Amplificateur intermédiaire
VIII Universal-Treiber / Universal-driver / Driver universel
IX Elektronische Sicherung / Electronic fuse / Protection électronique
X Stromversorgung (Stabilisierung) / Power supply (stabilization) / Alimentation en courant (stabilisation)
XI Filter / Filter / Filtre
XII Klangregler / Tone control / Régulateur de tonalité
Fernbedienung / Remote Control / Télécommande
TJ 2499
BC 141-10
BC 161-10
BC 207 B
BC 172 B
BC 251 B
Änderungen vorbehalten
Alterations reserved
sous réserve de modifications
Z.Nr. 232 584
Ausgabe 6/Juli 1974

Fig. 15 Control amplifier 233 968 (conductor side)

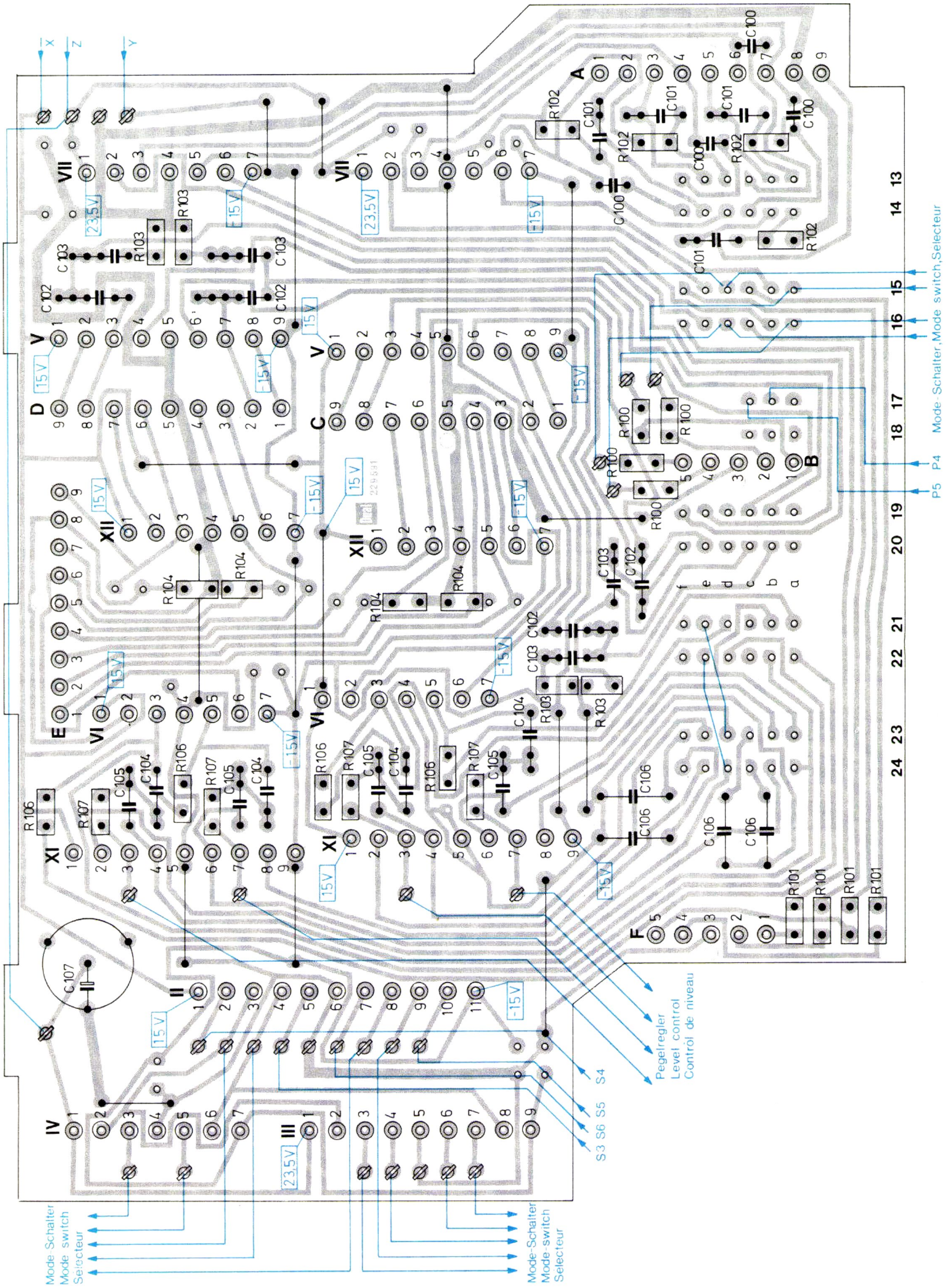


Fig. 16 Pre-amplifier 233 052 (conductor side)

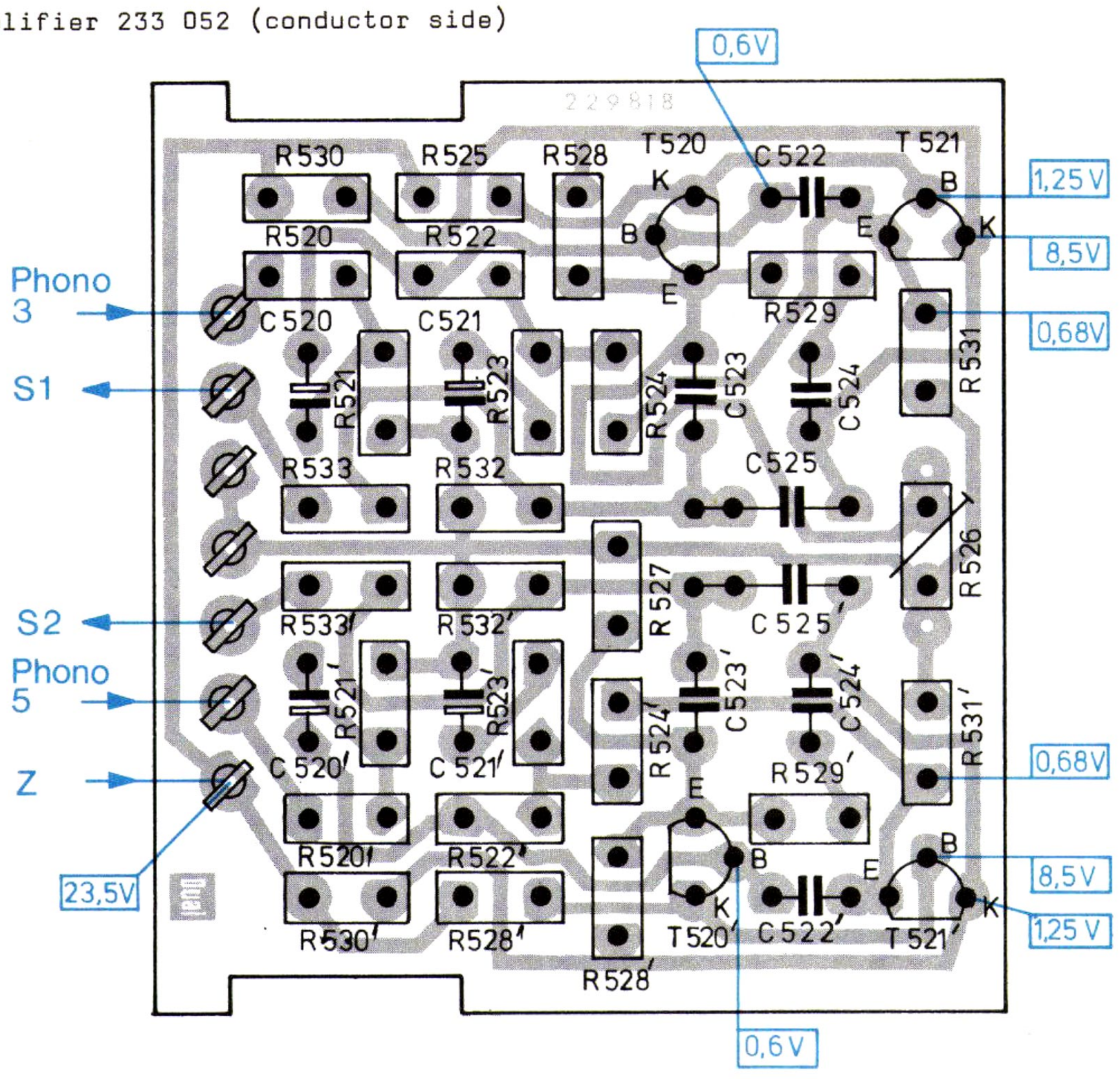


Fig. 17 AGC amplifier 233 049 (conductor side)

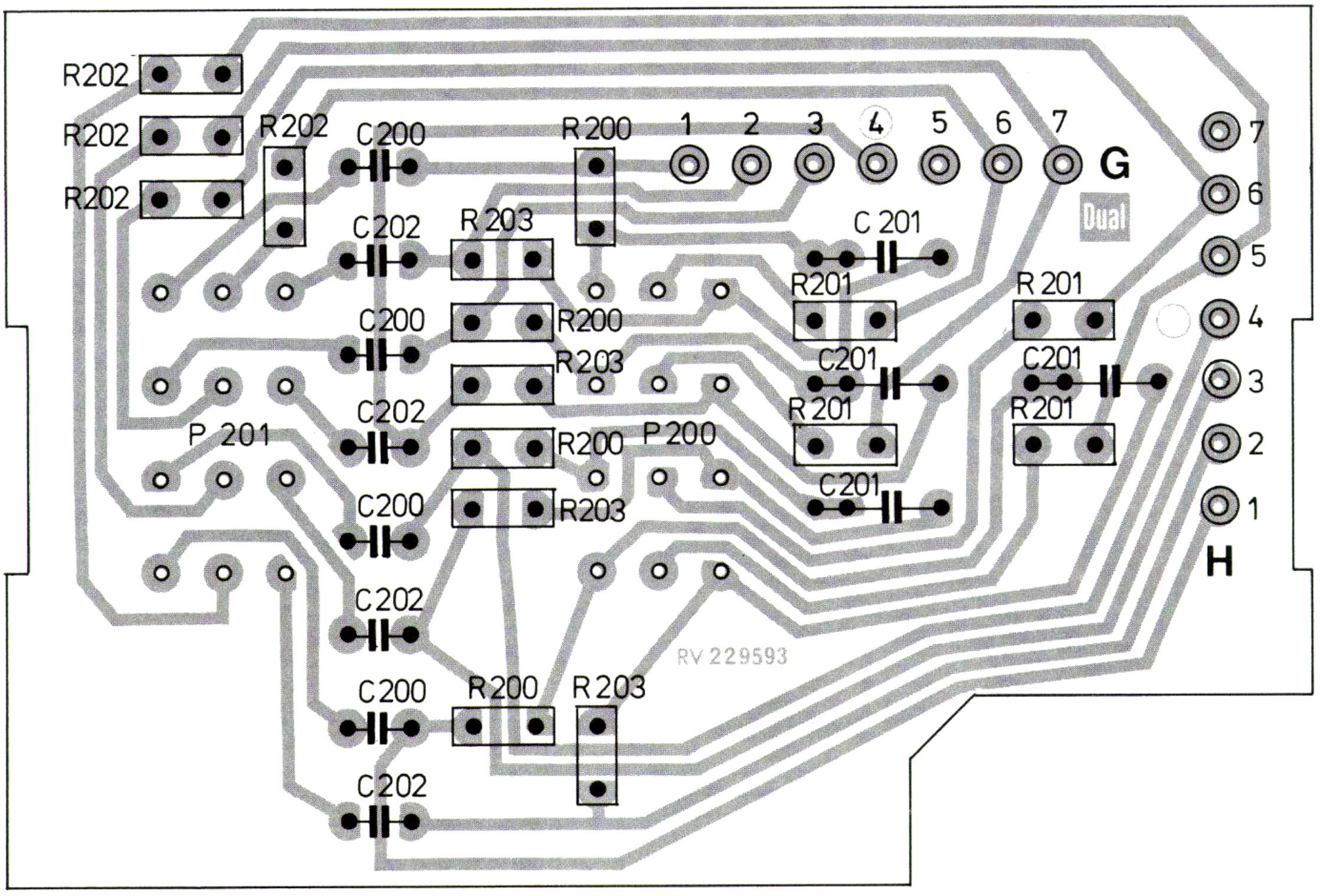


Fig. 18 Output-stage amplifier 233 967 (conductor side)

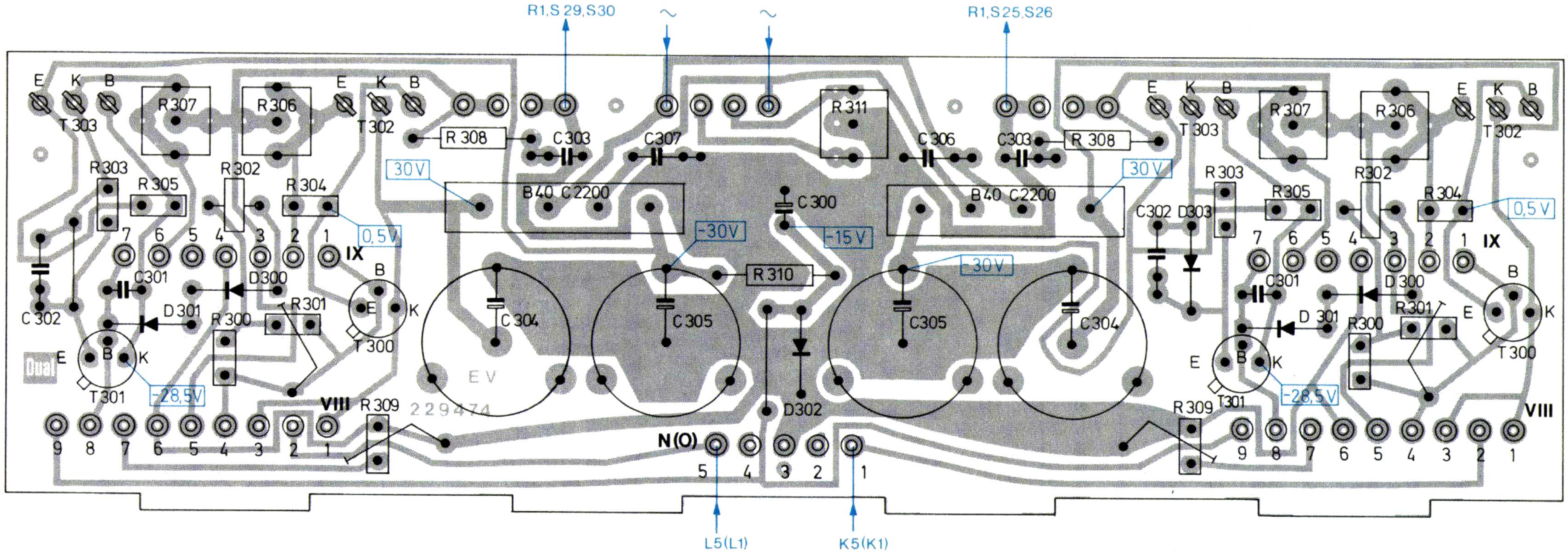


Fig. 19 Input selector switch 233 050 (conductor side)

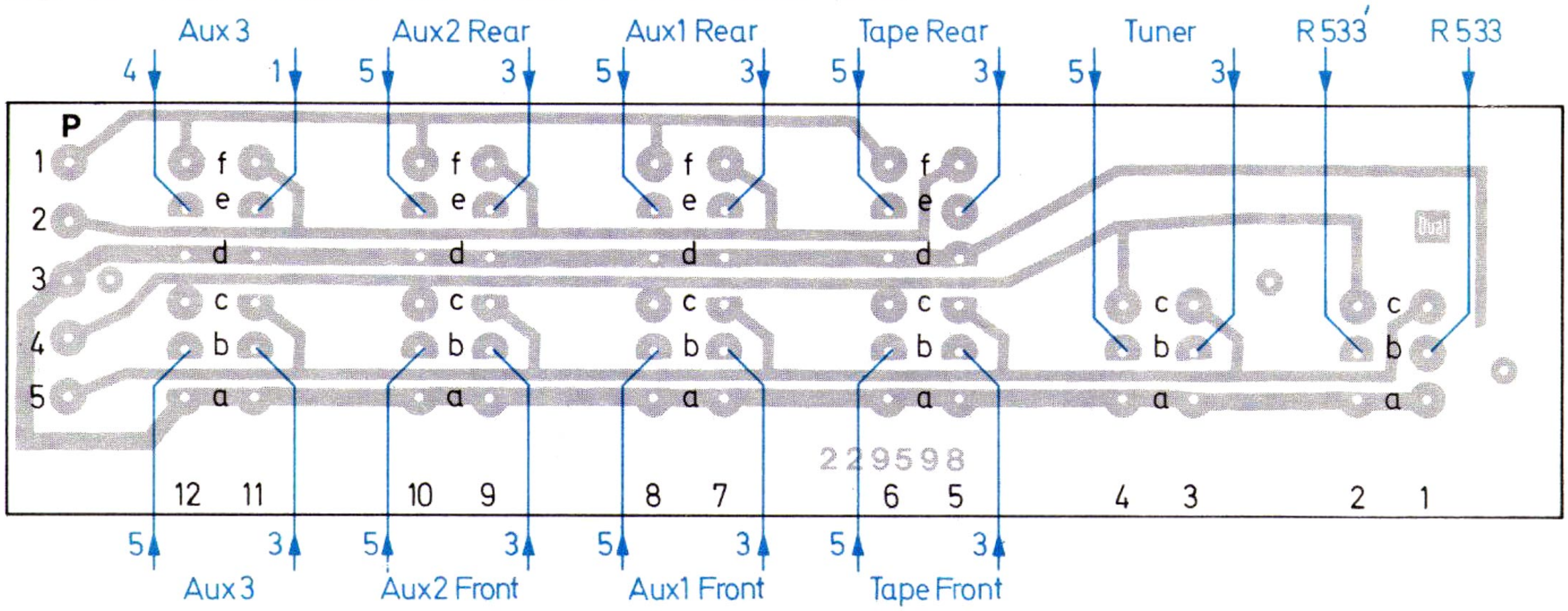


Fig. 20 Headphones connecting board 233 041 (conductor side)

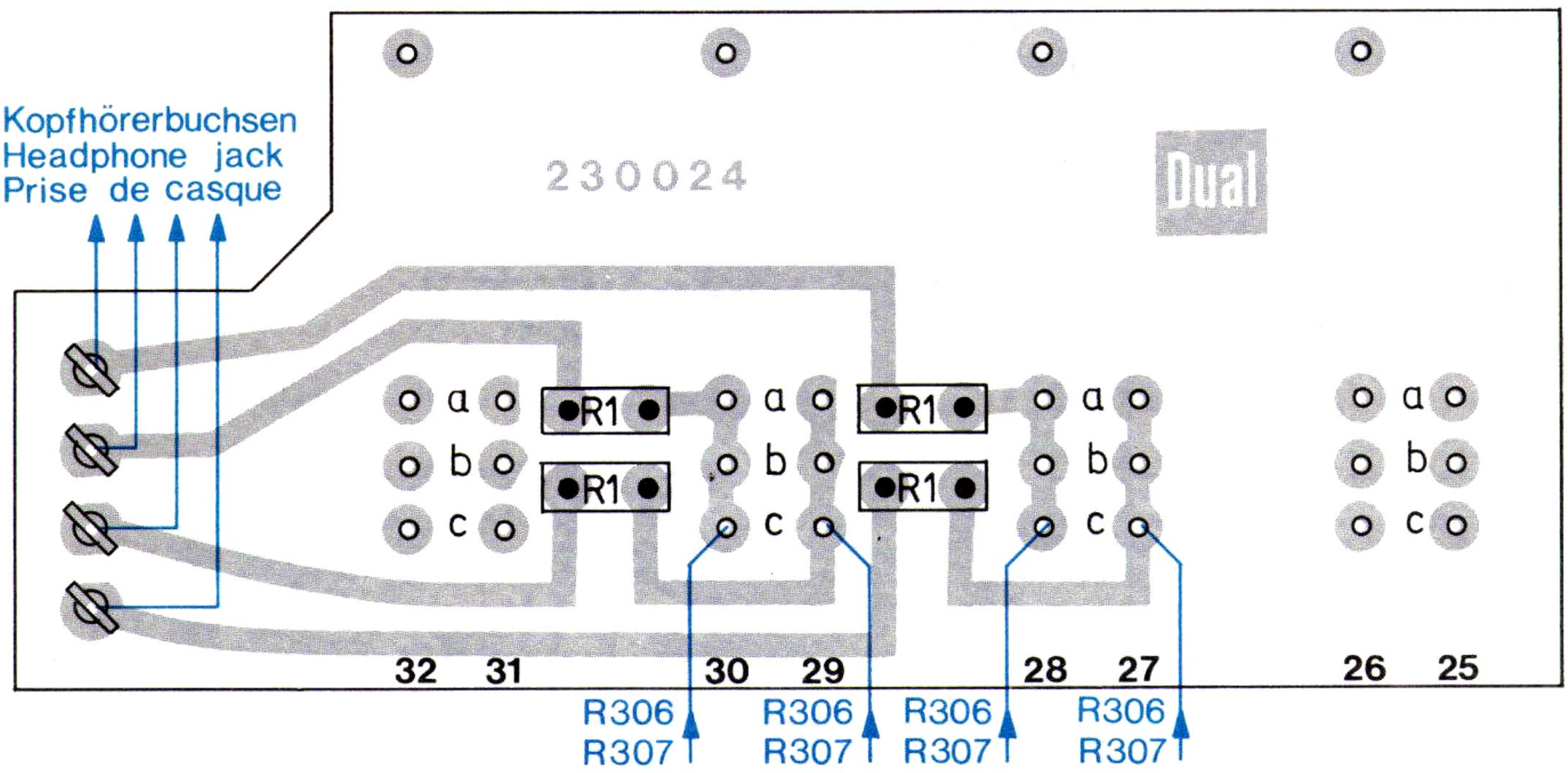


Fig. 21 Volume control 233 051 (conductor side)

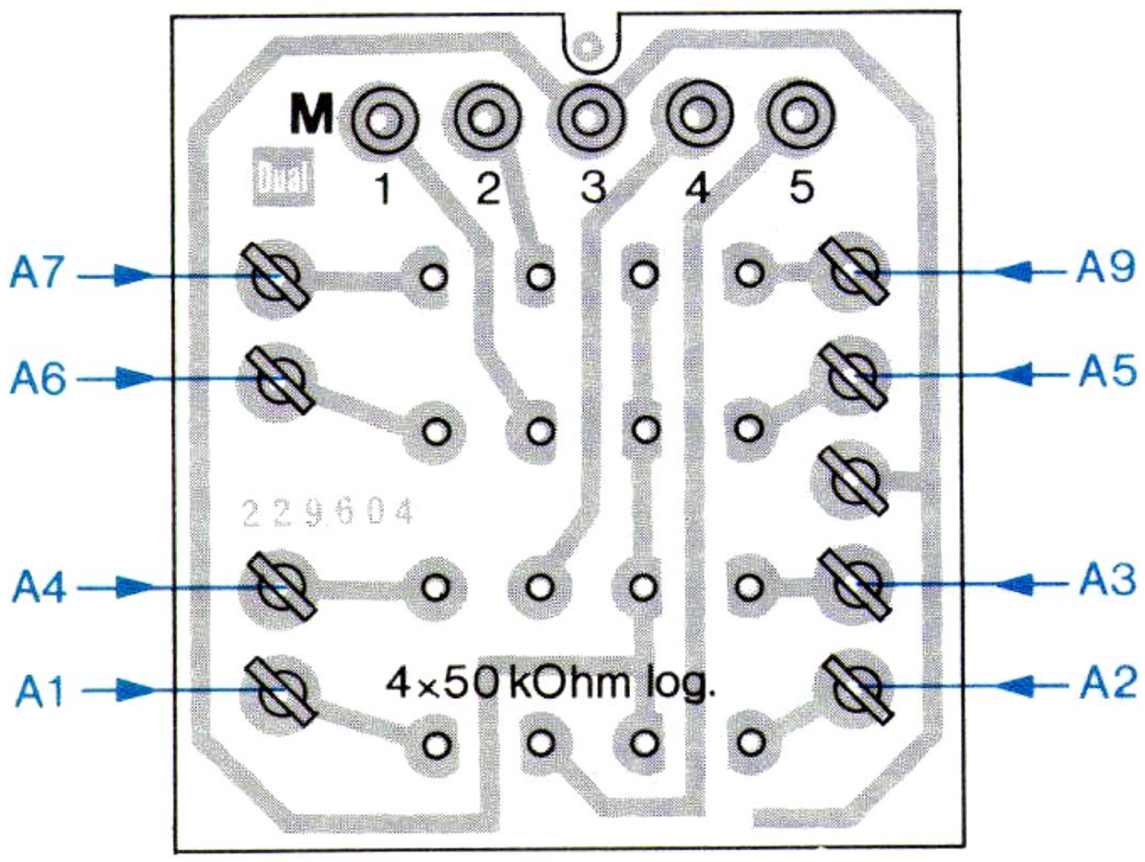


Fig. 22 Gain controls 233 048 (conductor side)

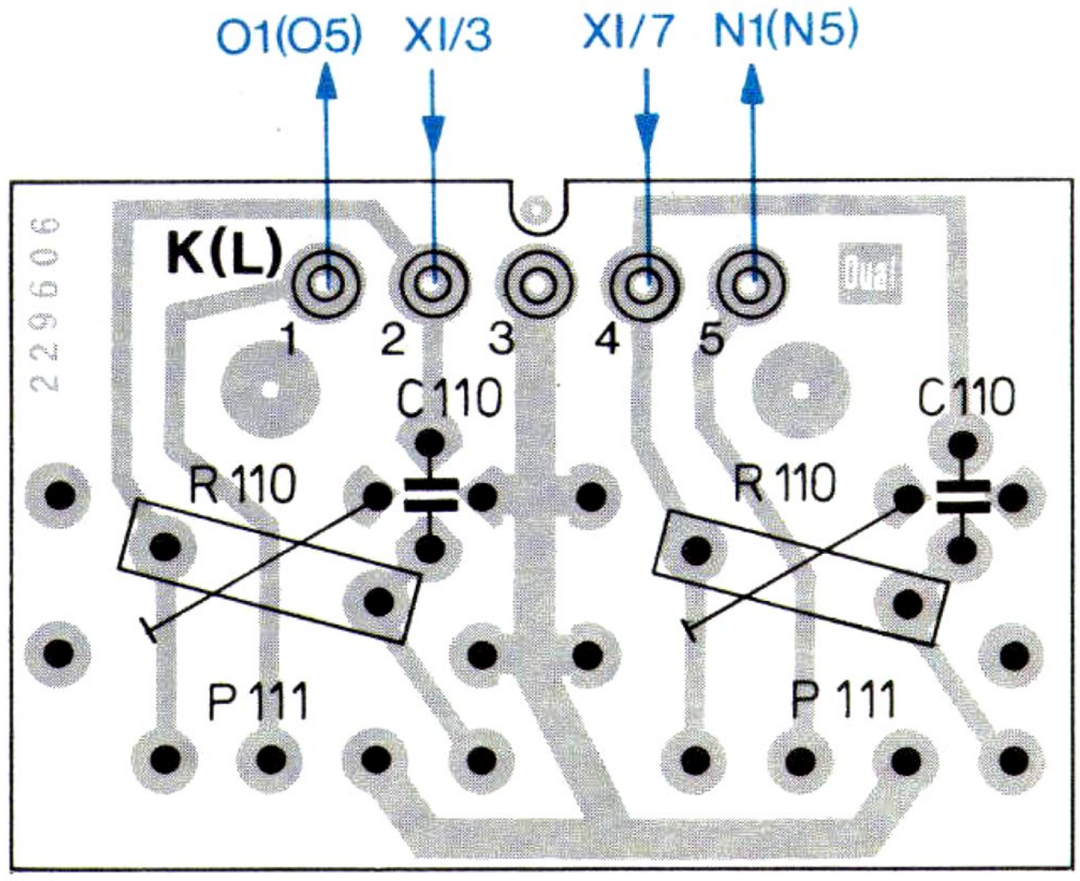


Fig. 23 Transformer connecting board, primary 229 603 (component side)

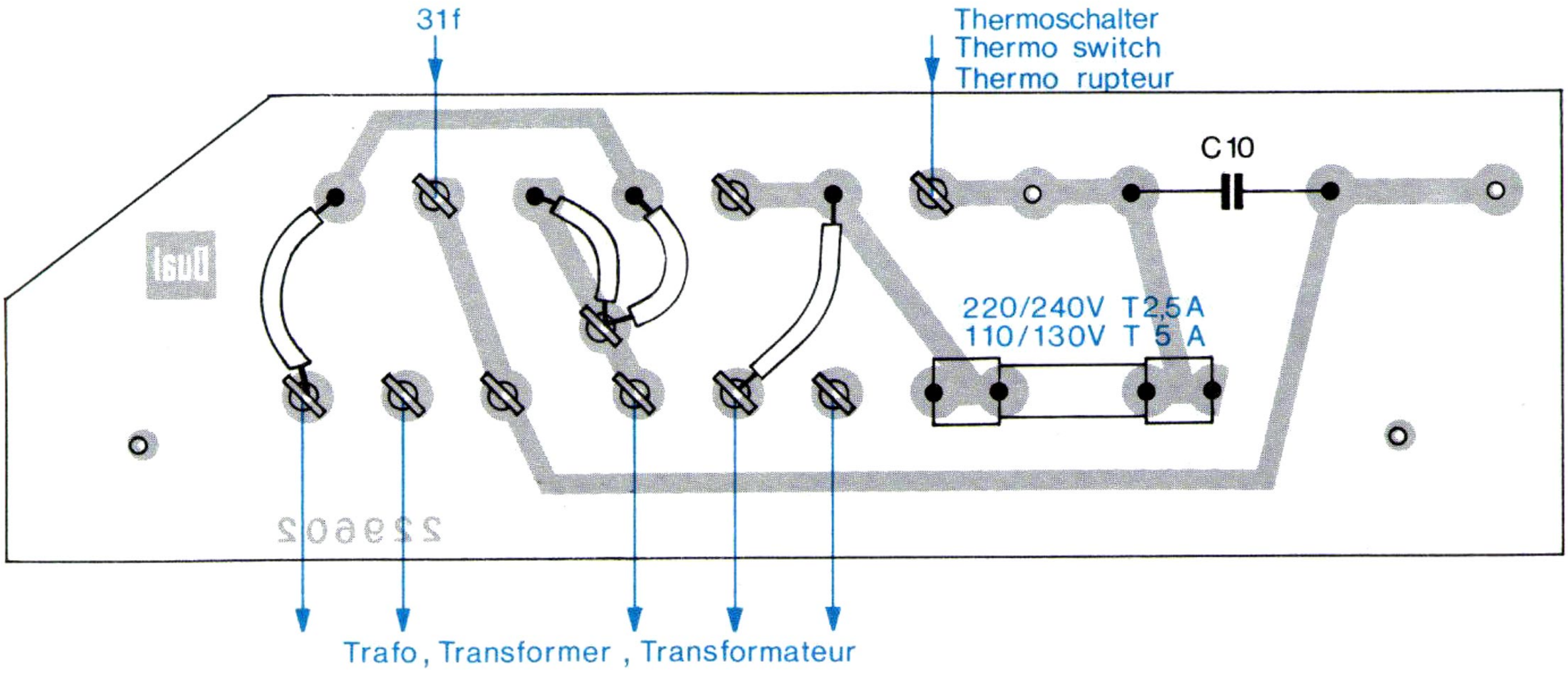


Fig. 24 Tapping scheme, 110, 117, 220, 240 V

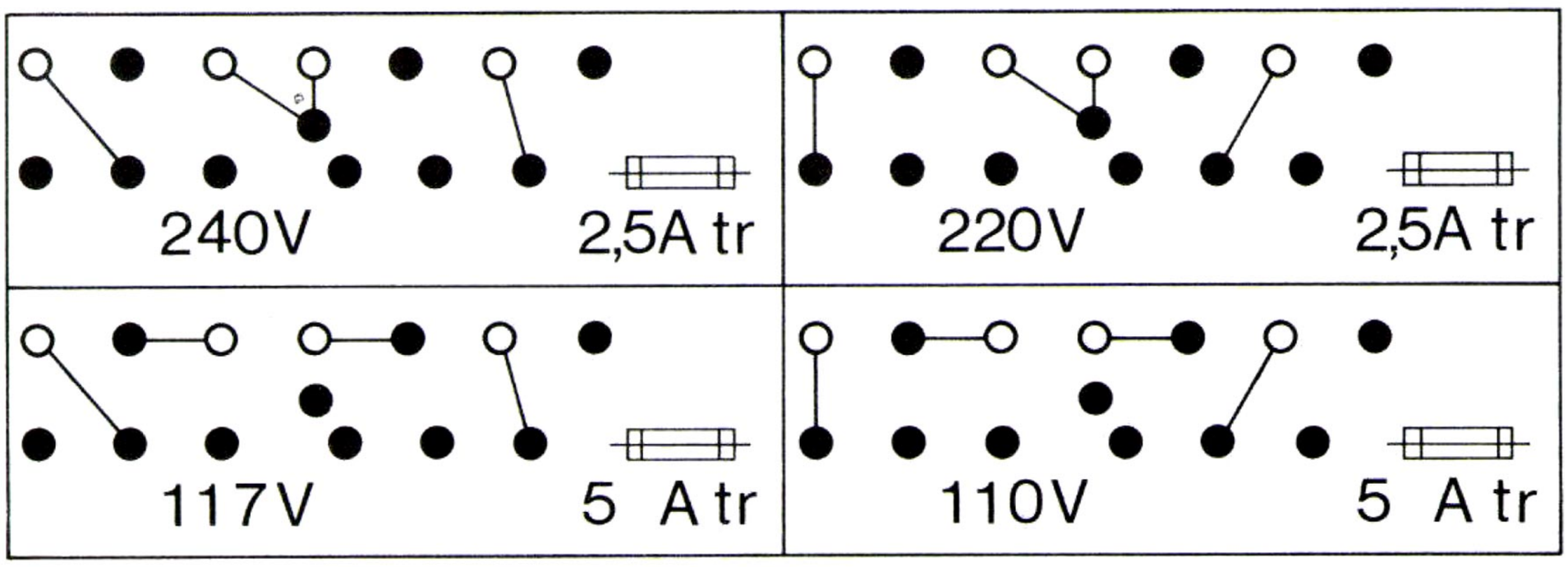


Fig. 25 Transformer connecting board, secondary 229 609 (component side)

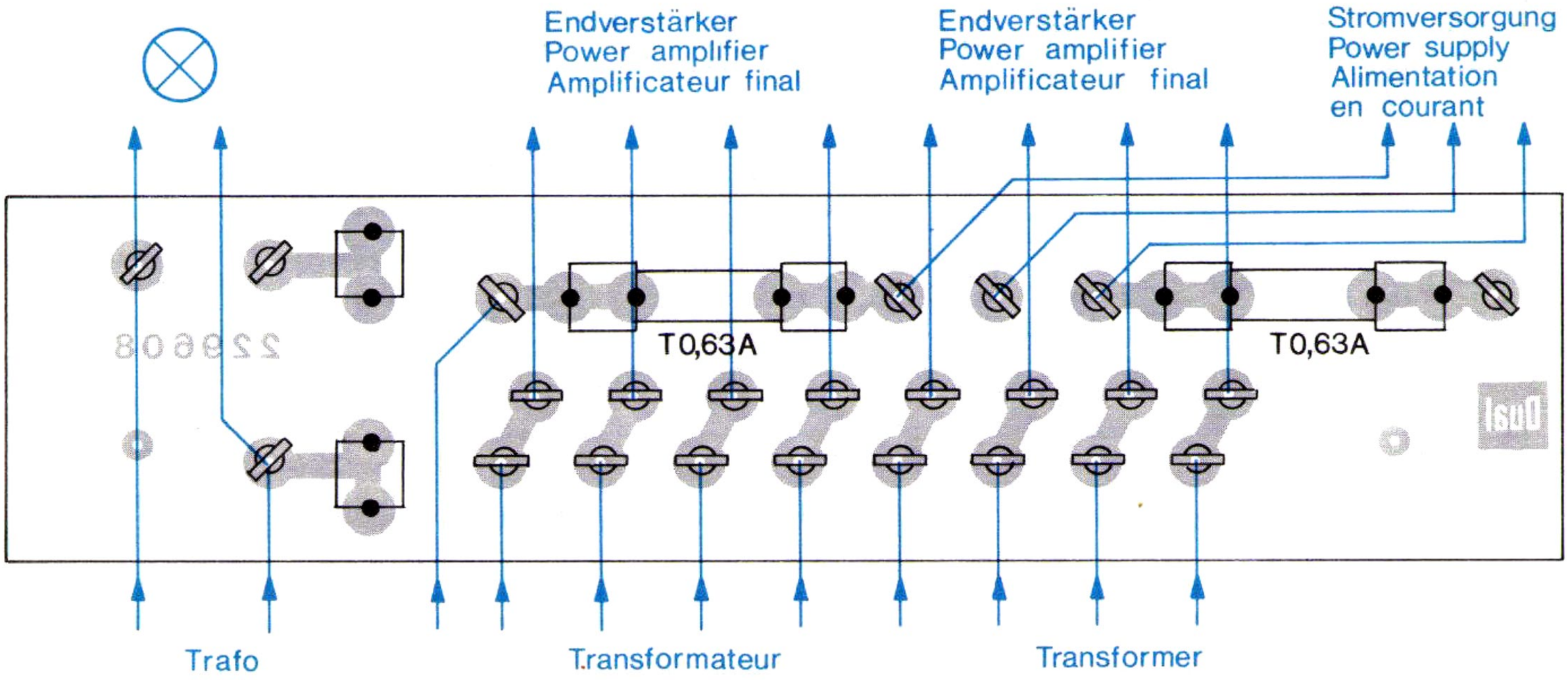


Fig. 26 Input impedance transducer II - circuit diagram

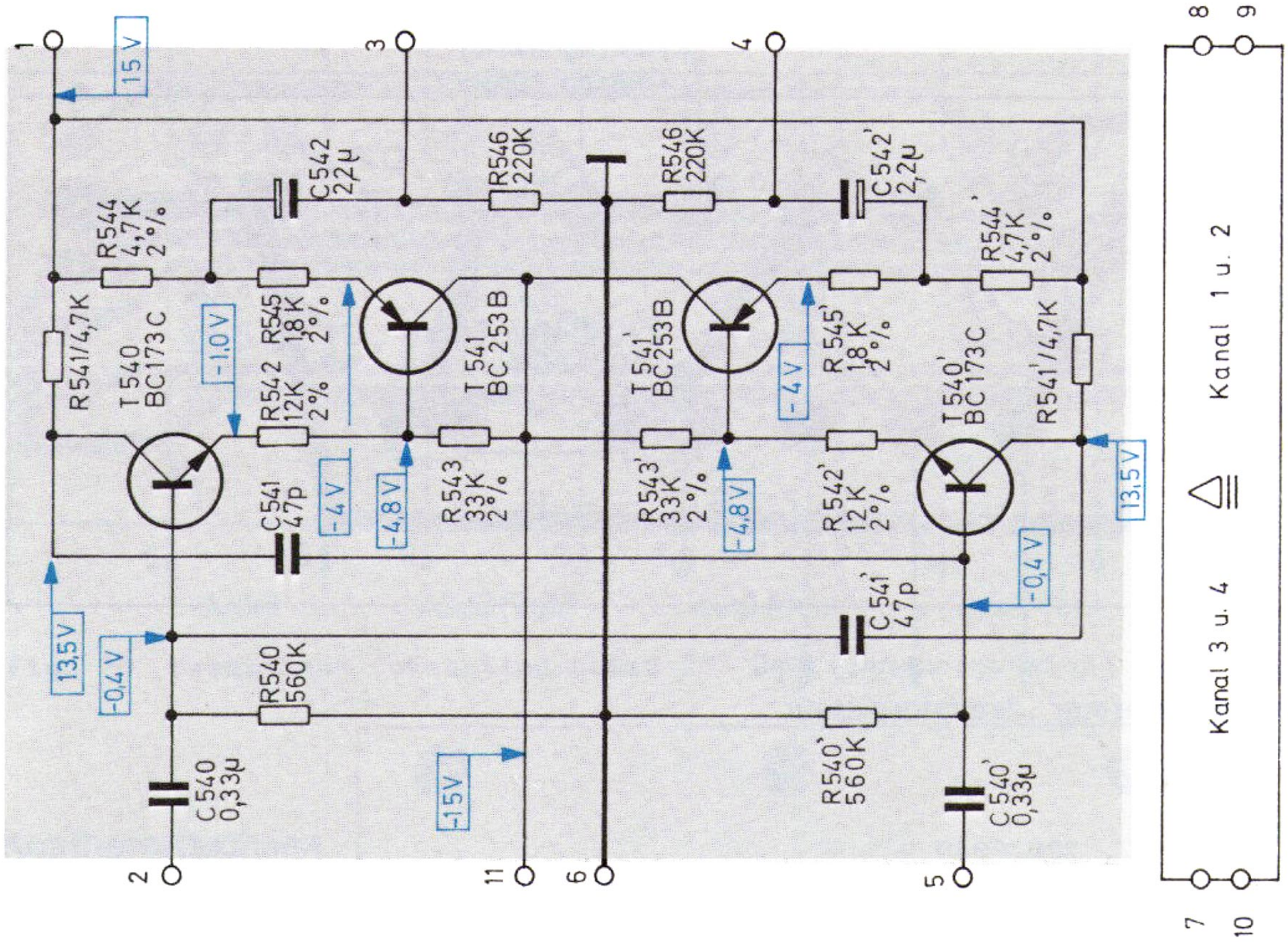


Fig. 27 Input impedance transducer 232 463 (conductor side)

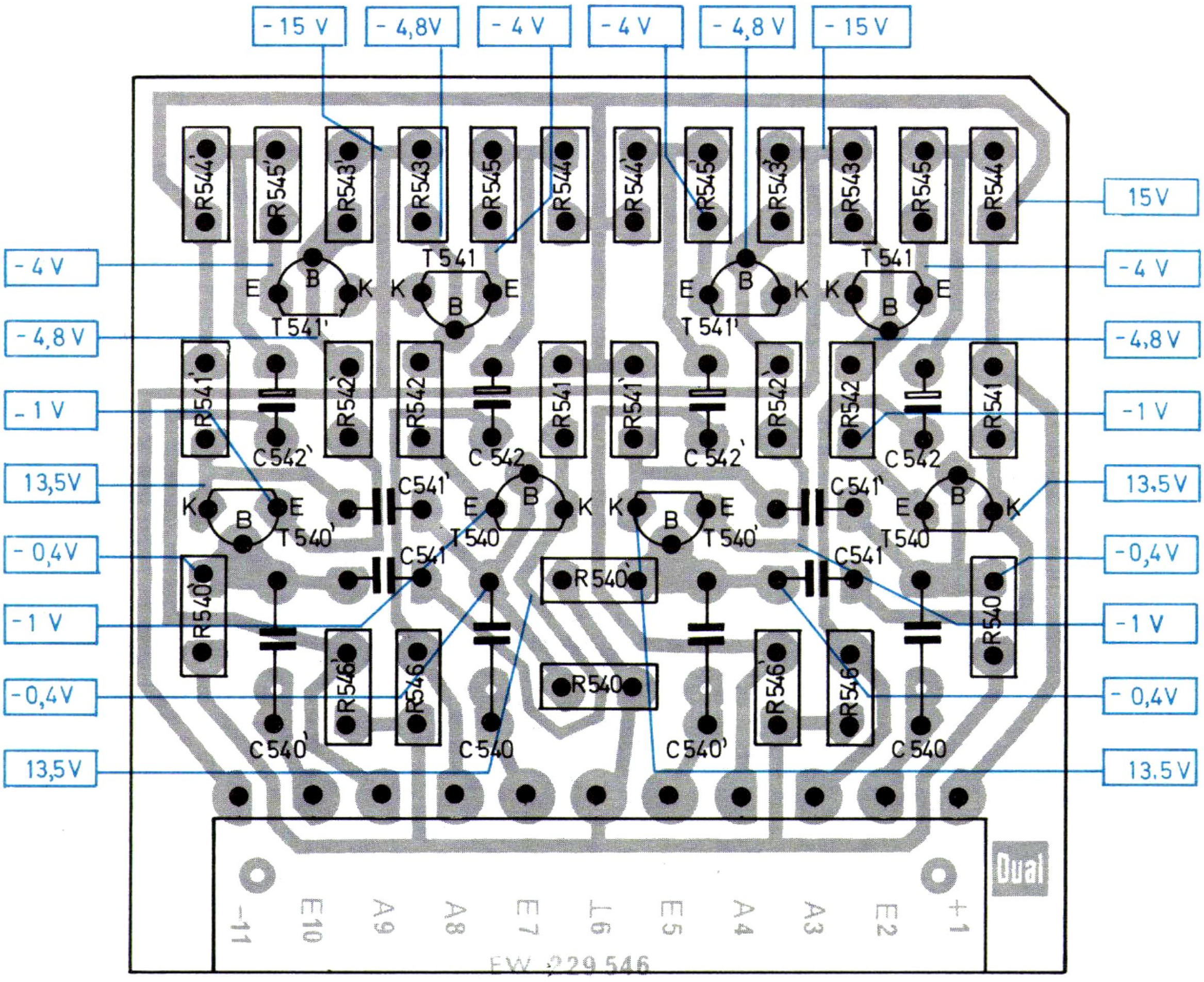


Fig. 28 SQ decoder III - circuit diagram

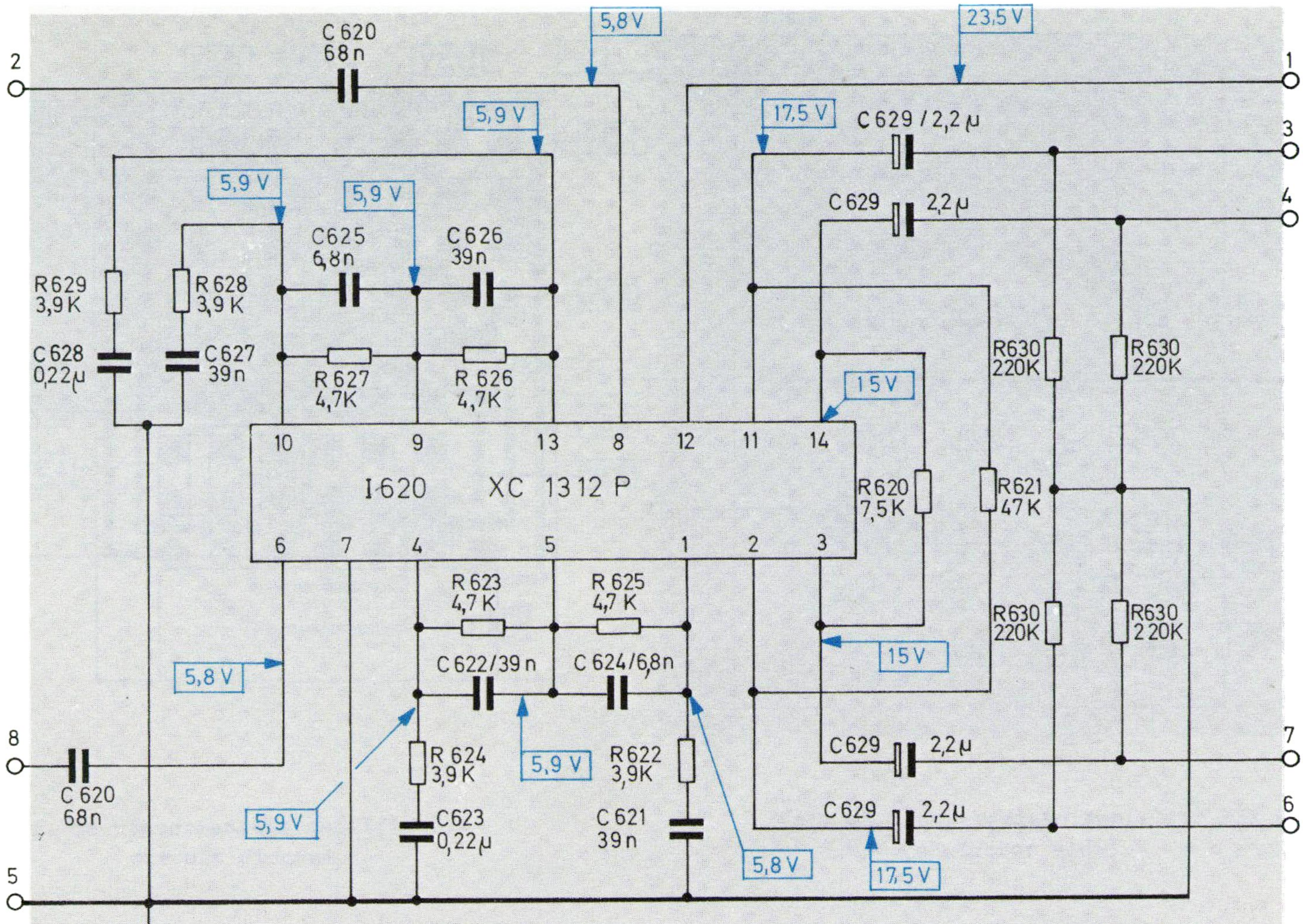


Fig. 29 SQ decoder 232 461 (conductor side)

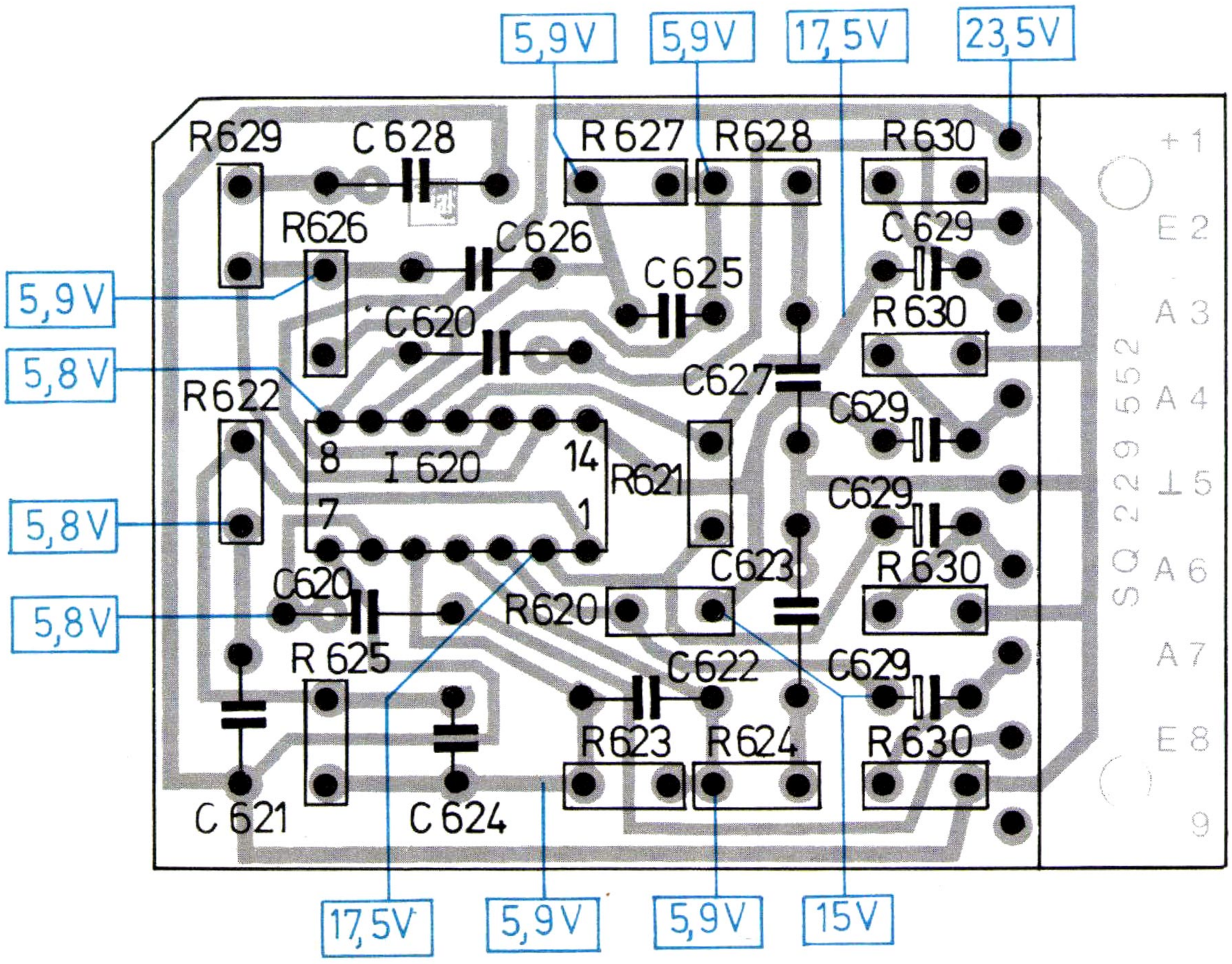


Fig. 30 Multiphony decoder IV
circuit diagram

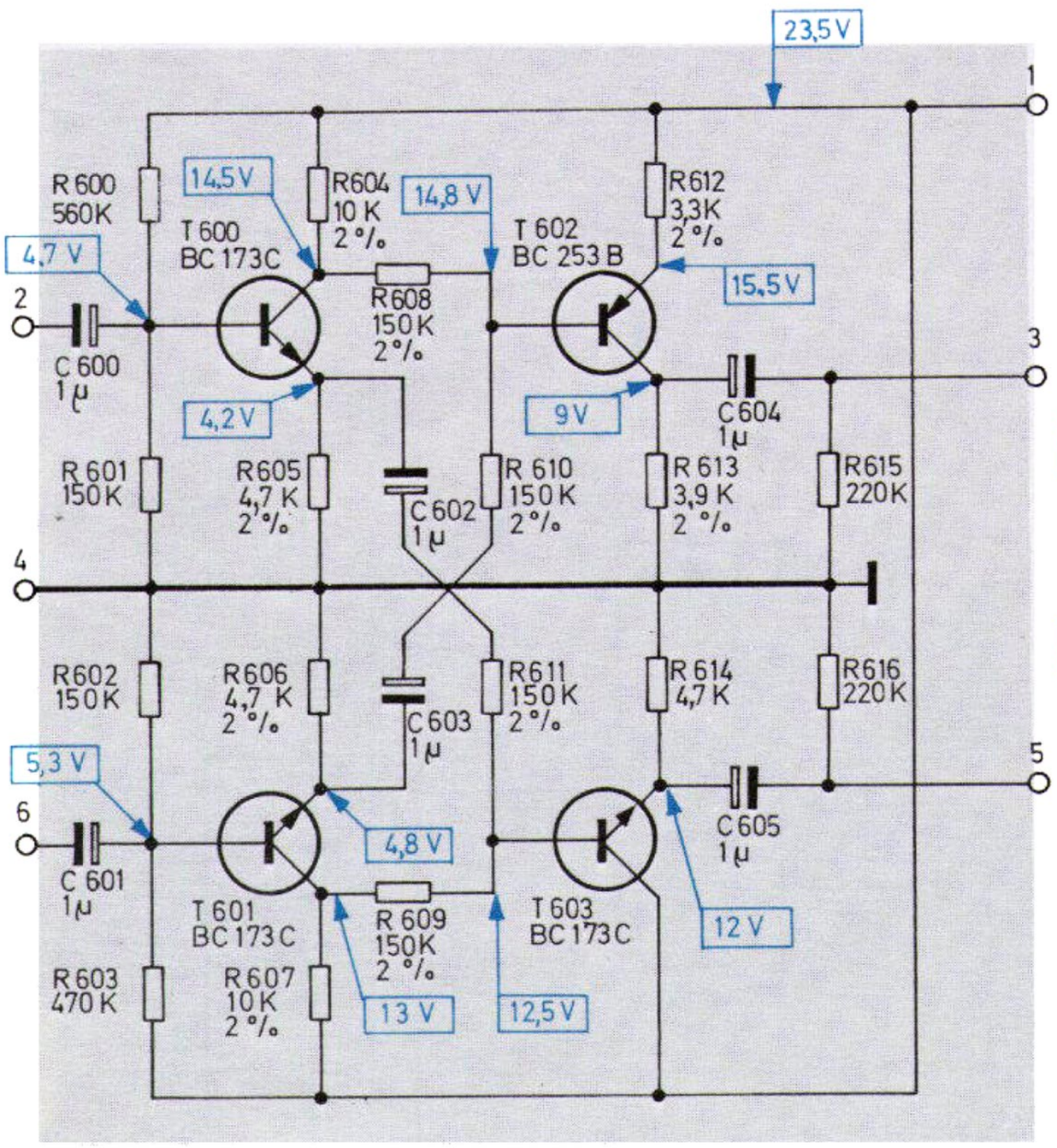


Fig. 31 Multiphony decoder 232 462
(conductor side)

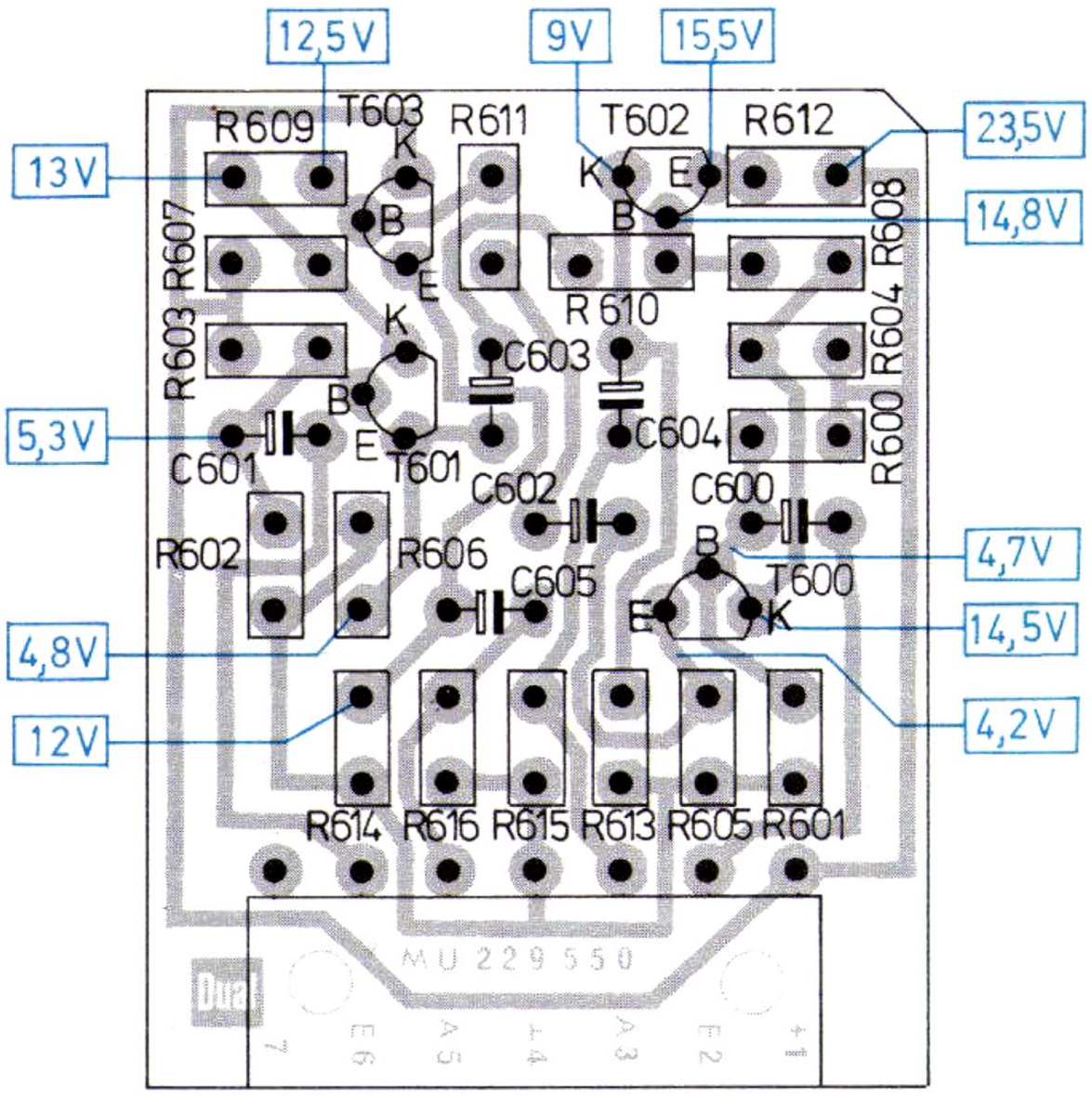


Fig. 32 IC amplifier V
circuit diagram

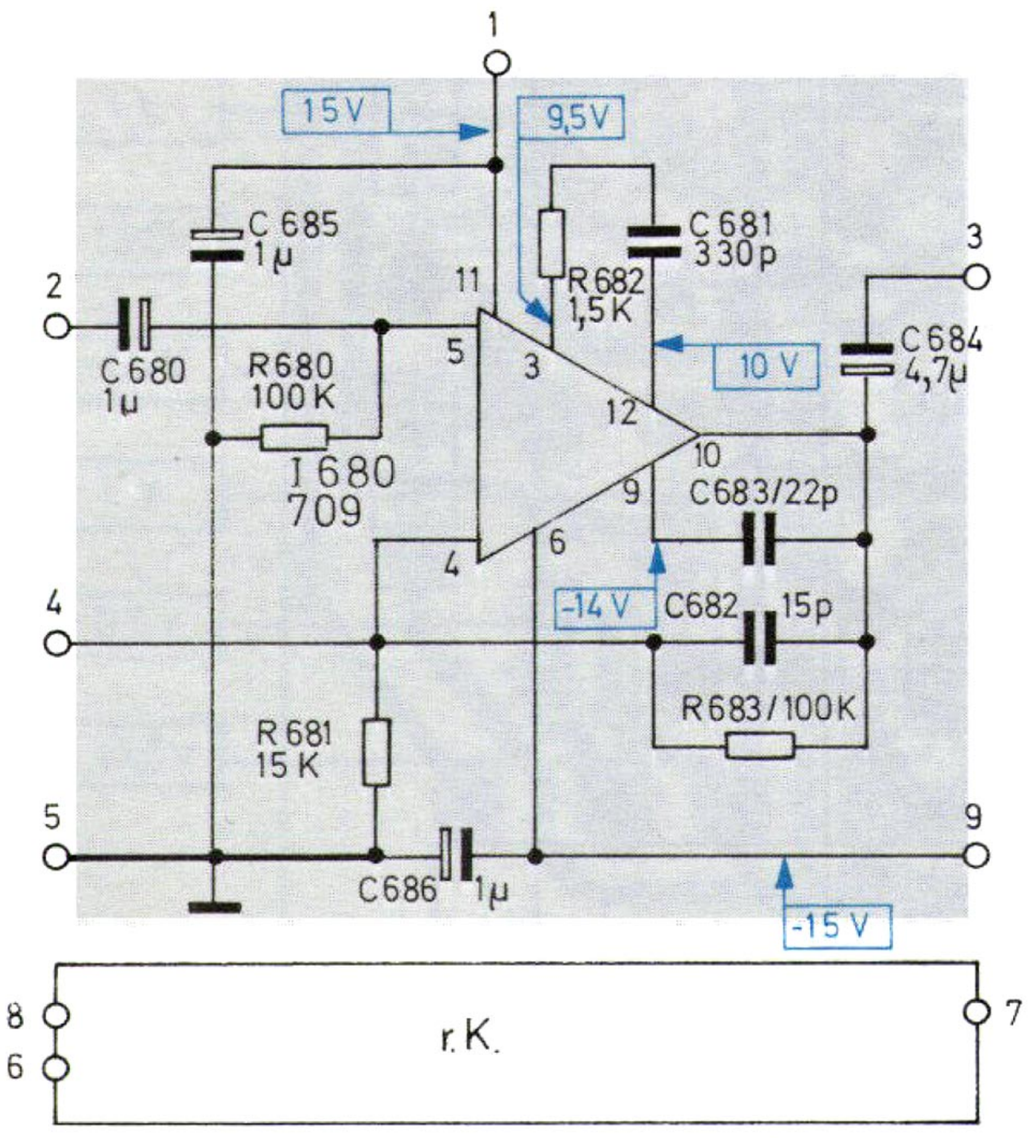


Fig. 33 IC amplifier 232 459 (conductor side)

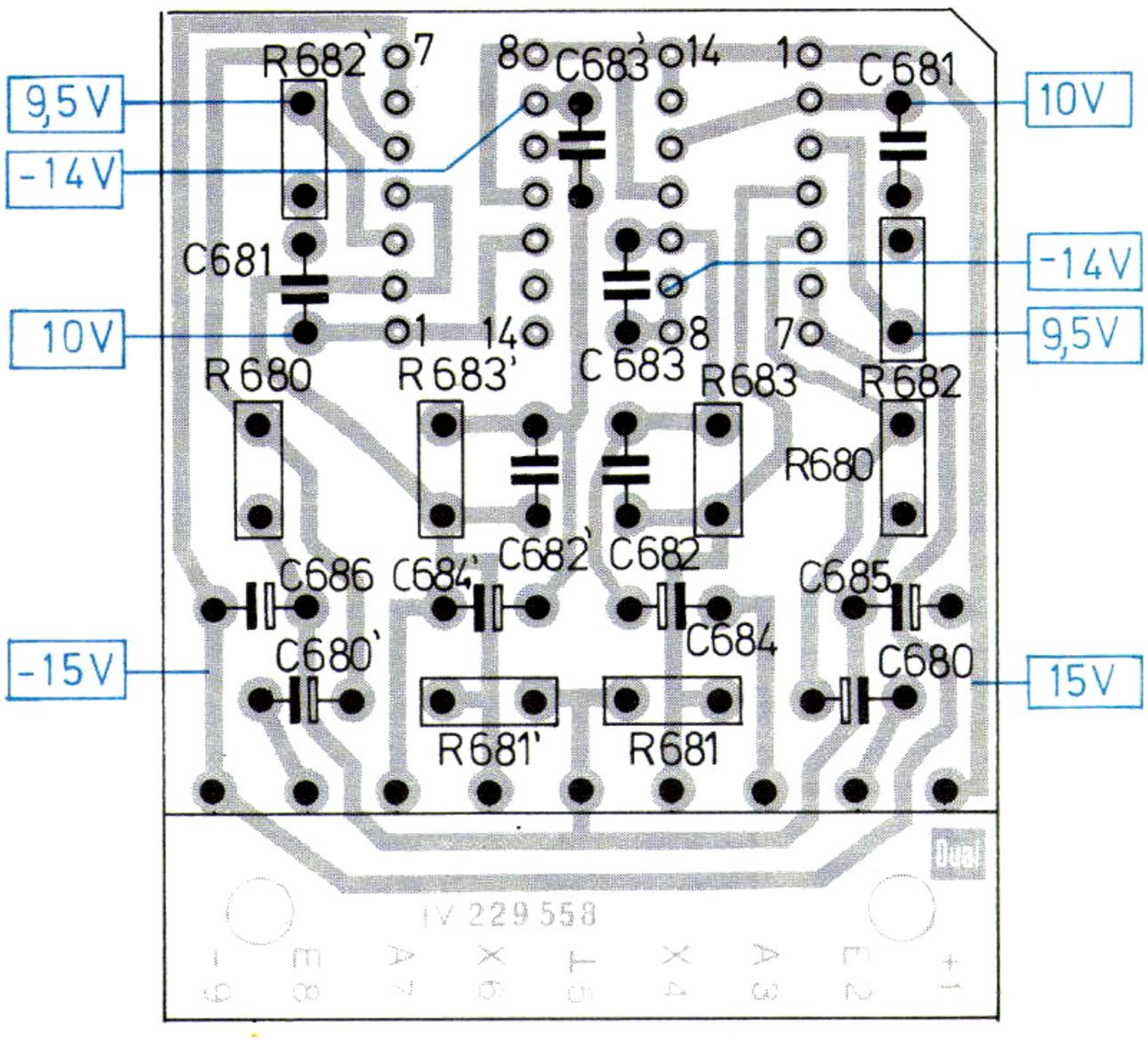


Fig. 34 Impedance transducer VI
circuit diagram

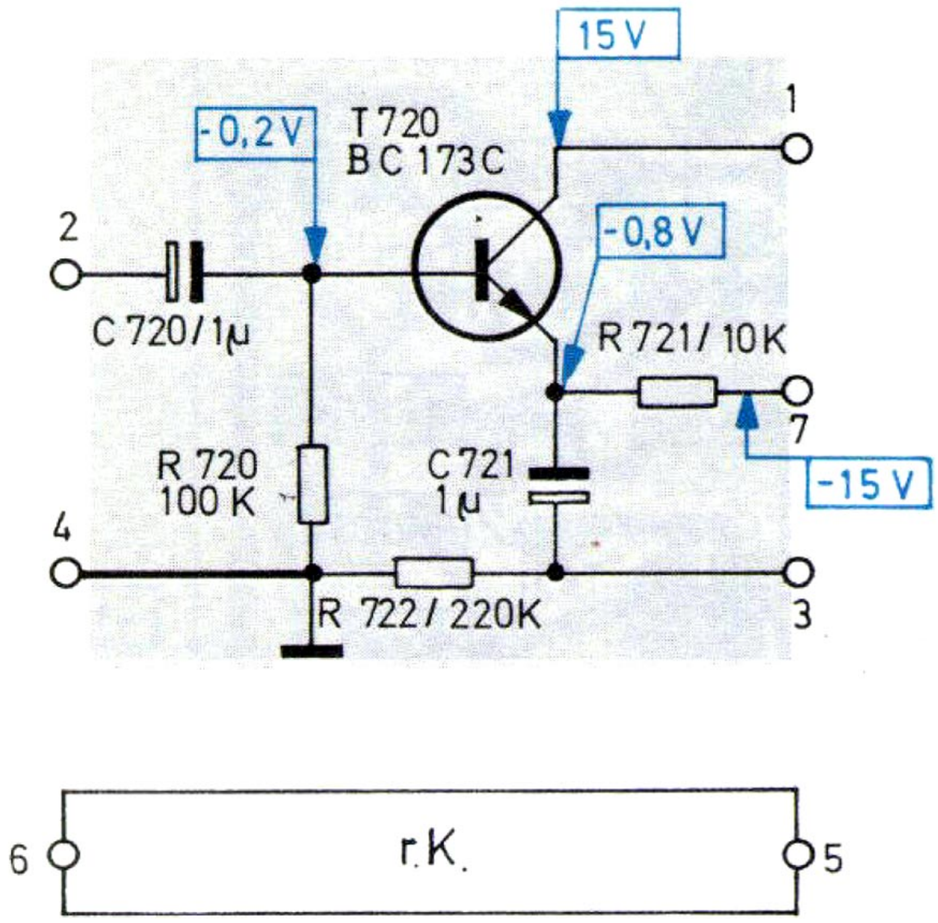


Fig. 35 Impedance transducer 232 457
(conductor side)

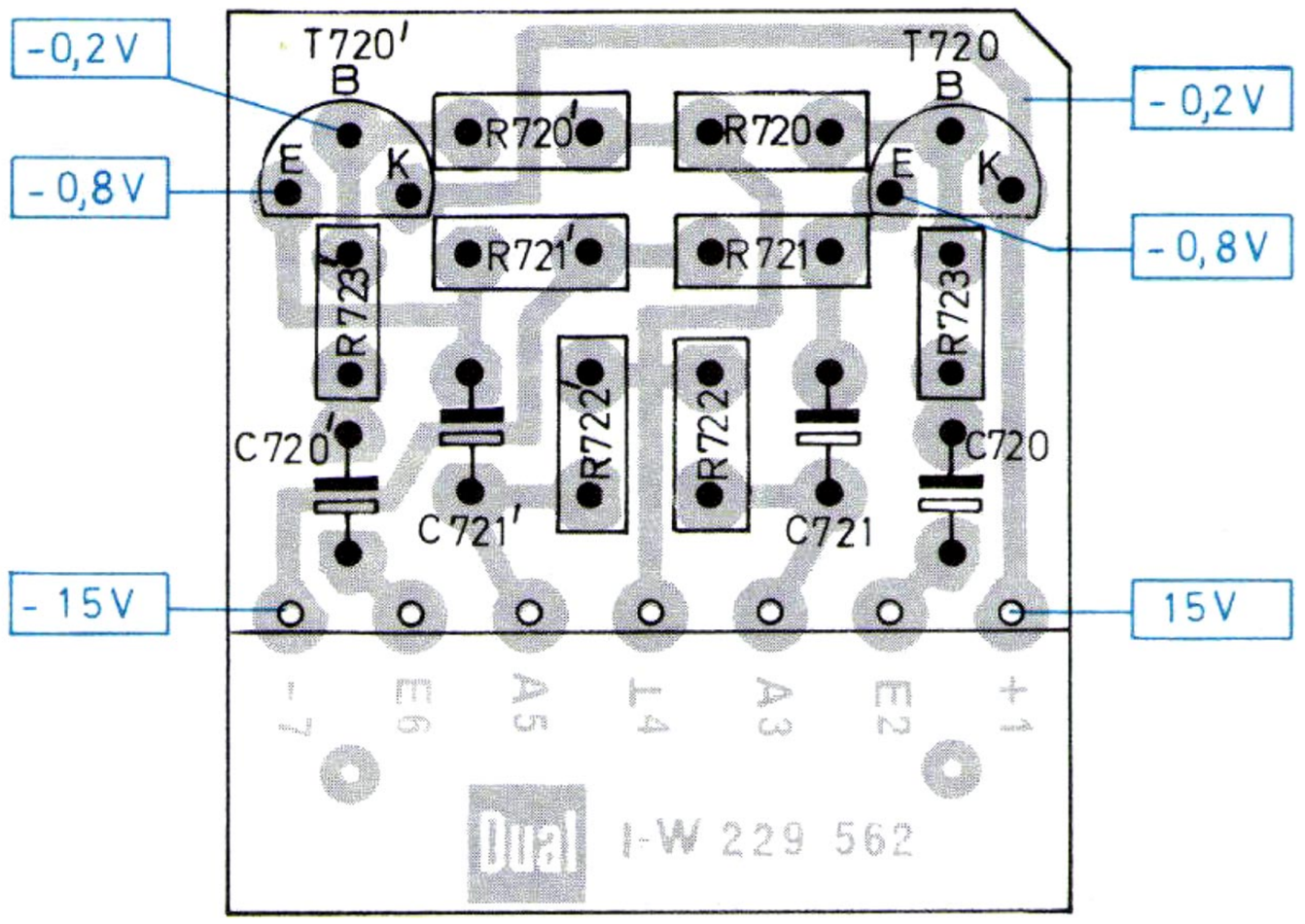


Fig. 36 Intermediate amplifierVII
circuit diagram

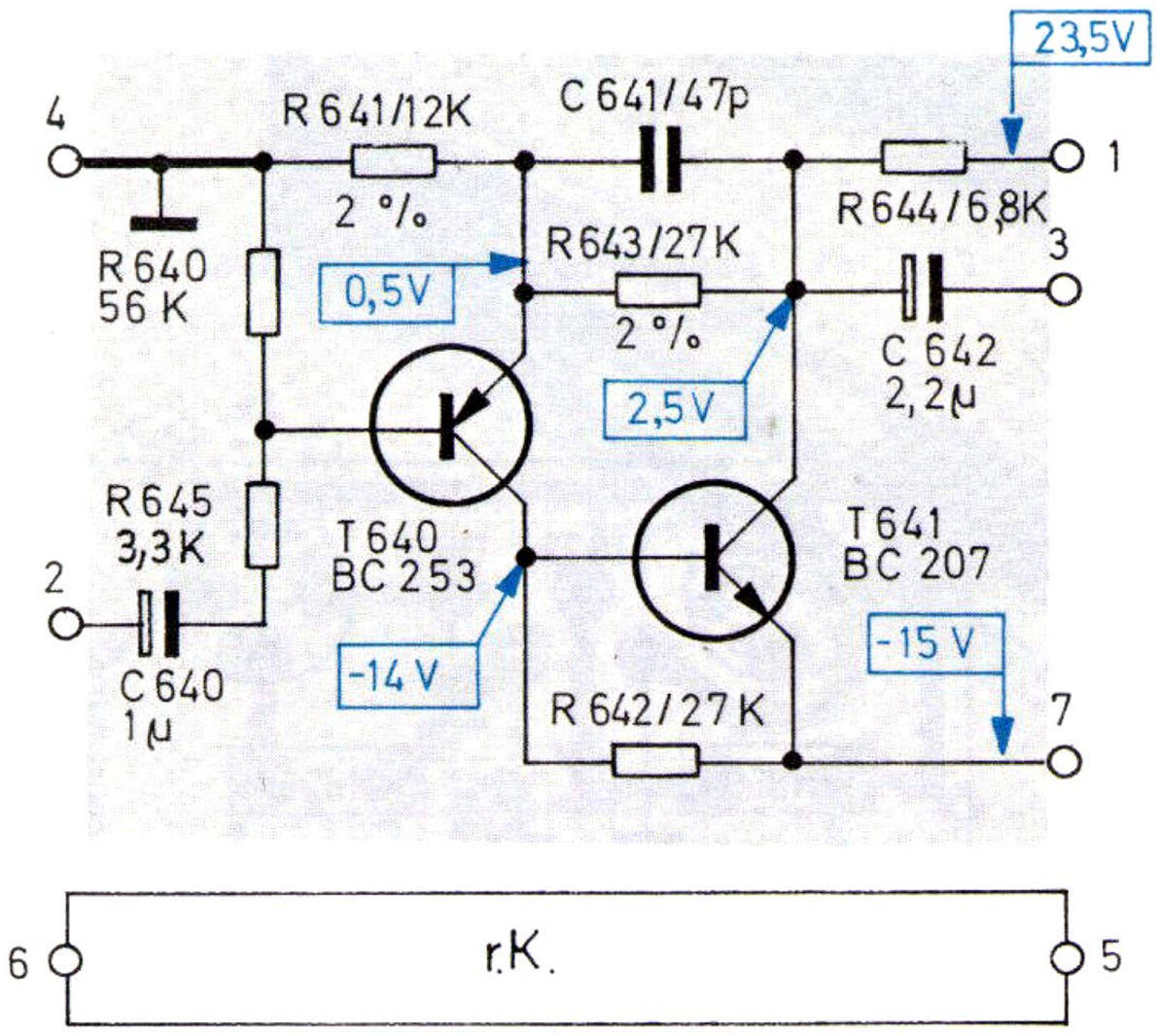


Fig. 37 Intermediate amplifier 232 460
(conductor side)

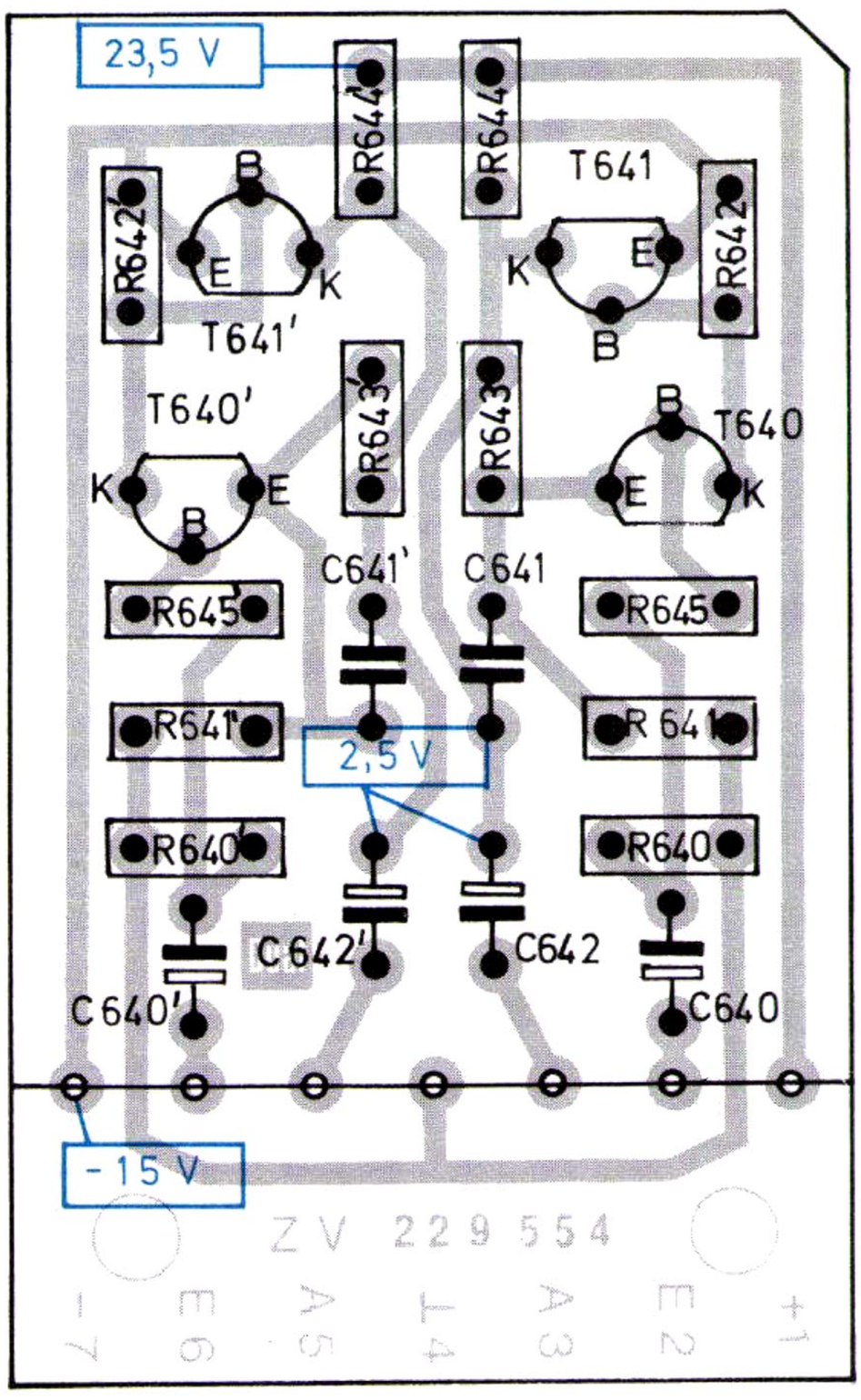


Fig. 38 Universal driver VIII
circuit diagram

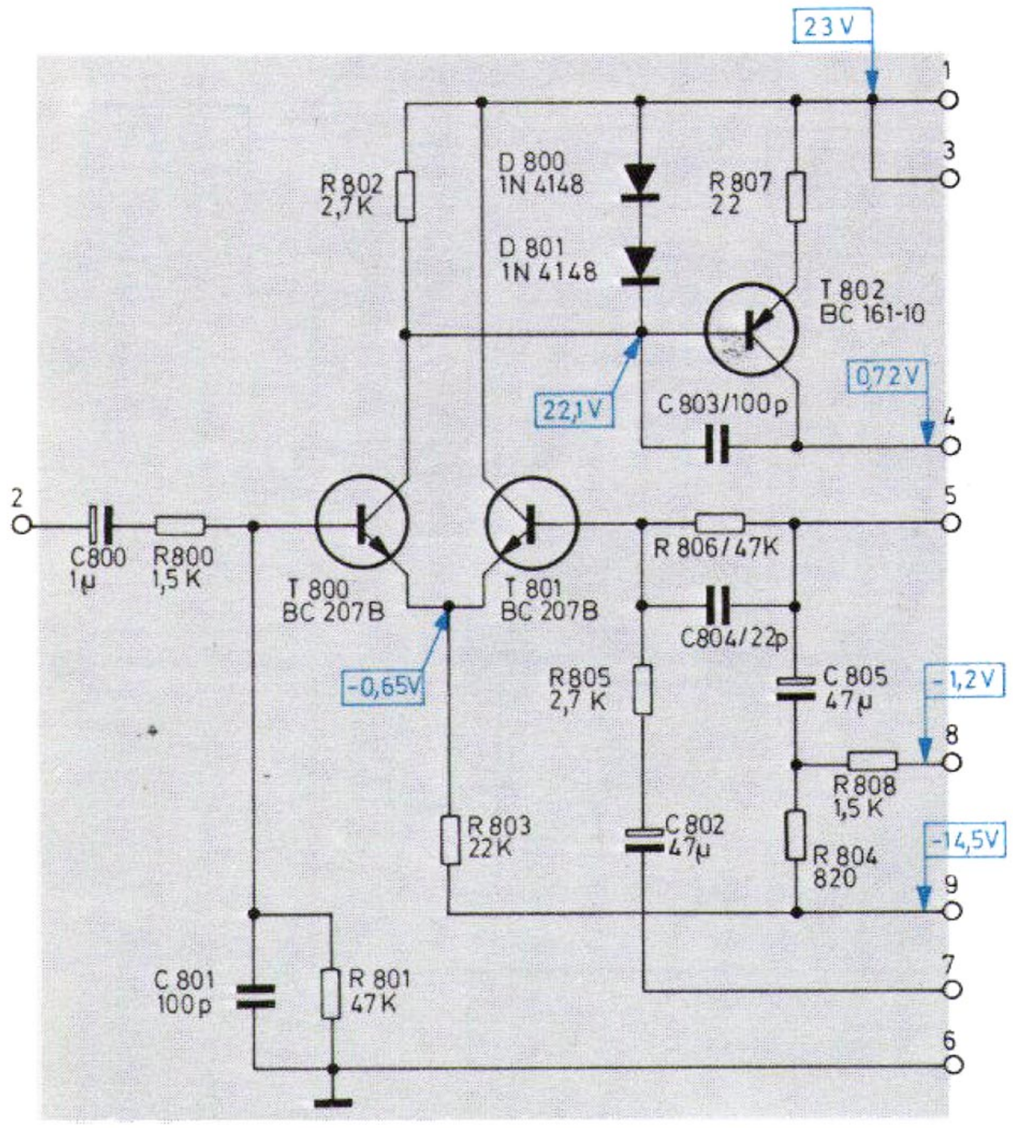


Fig. 39 Universal driver 232 452 (conductor side)

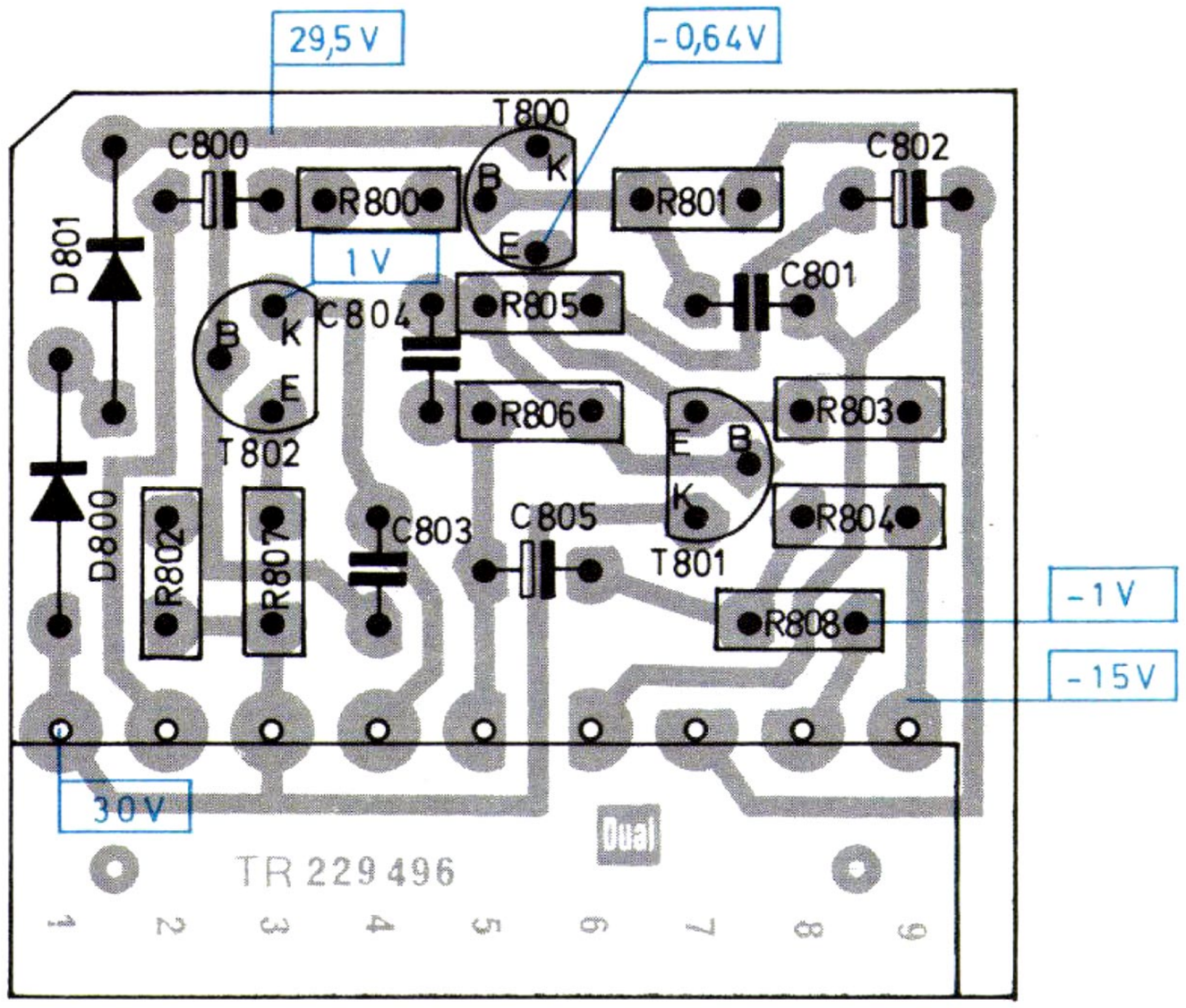


Fig. 40 Electronic fuse IX - circuit diagram

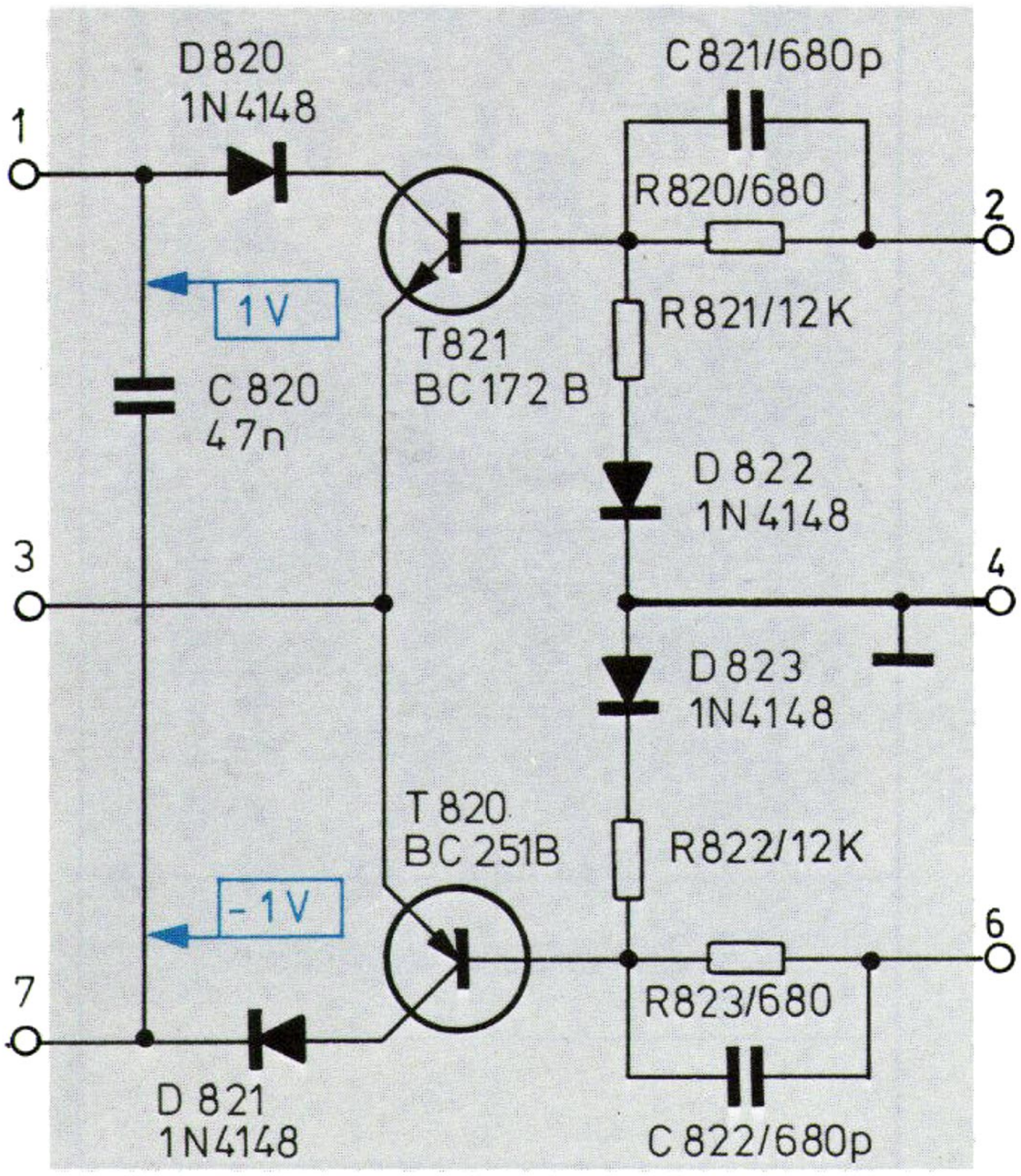


Fig. 41 Electronic fuse 233 056
(conductor side)

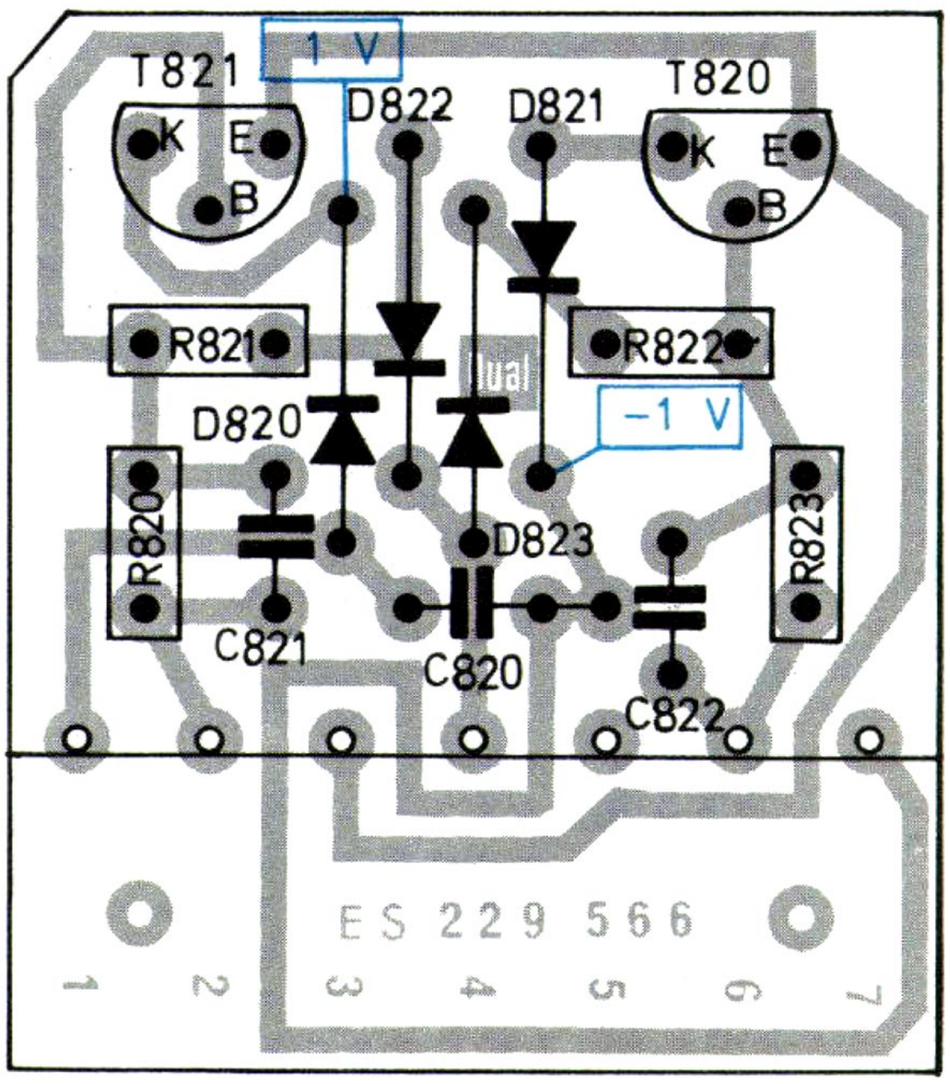


Fig. 42 Power supply with stabilizer X - circuit diagram

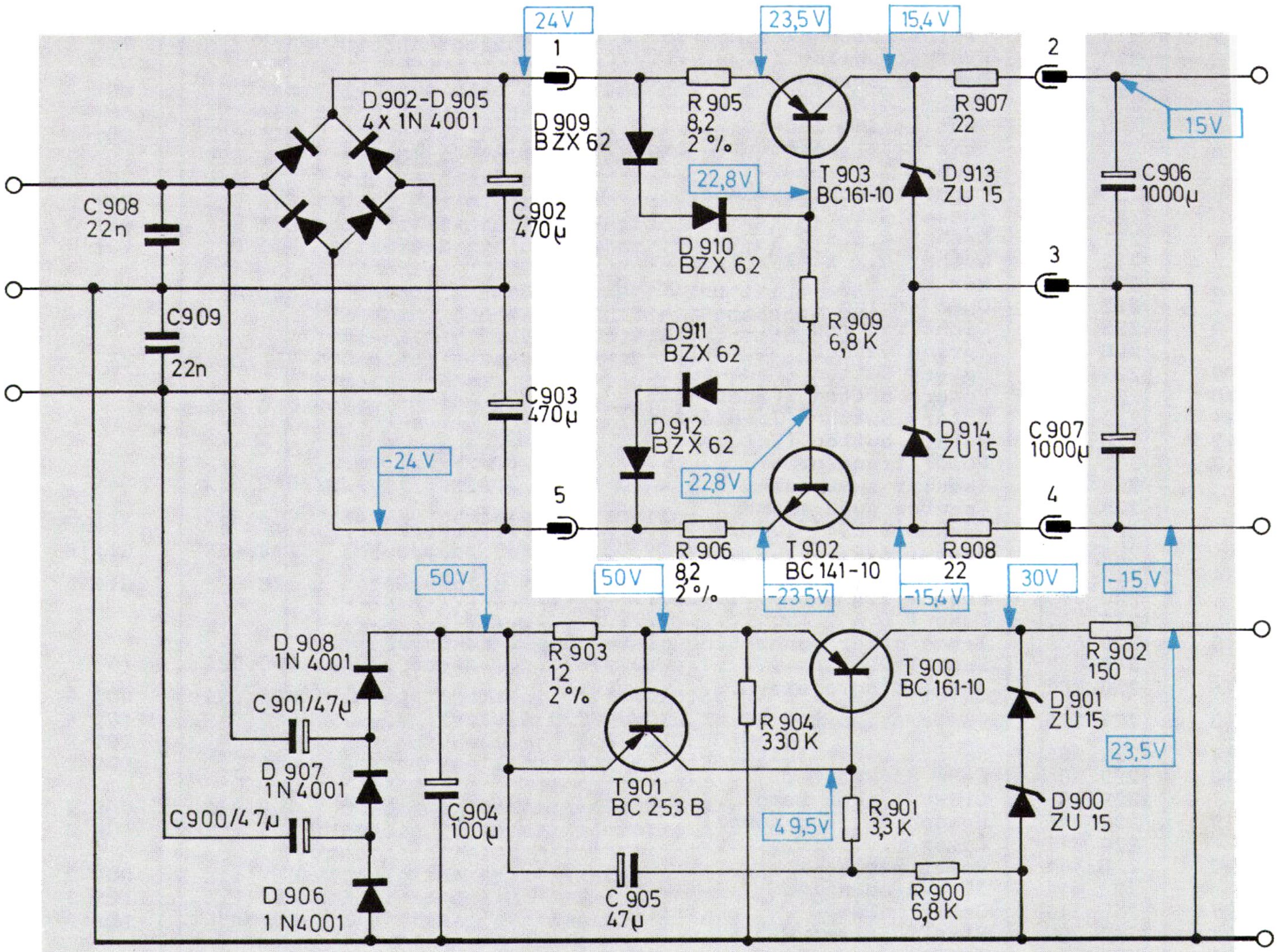


Fig. 43 Power supply 233 974 (conductor side)

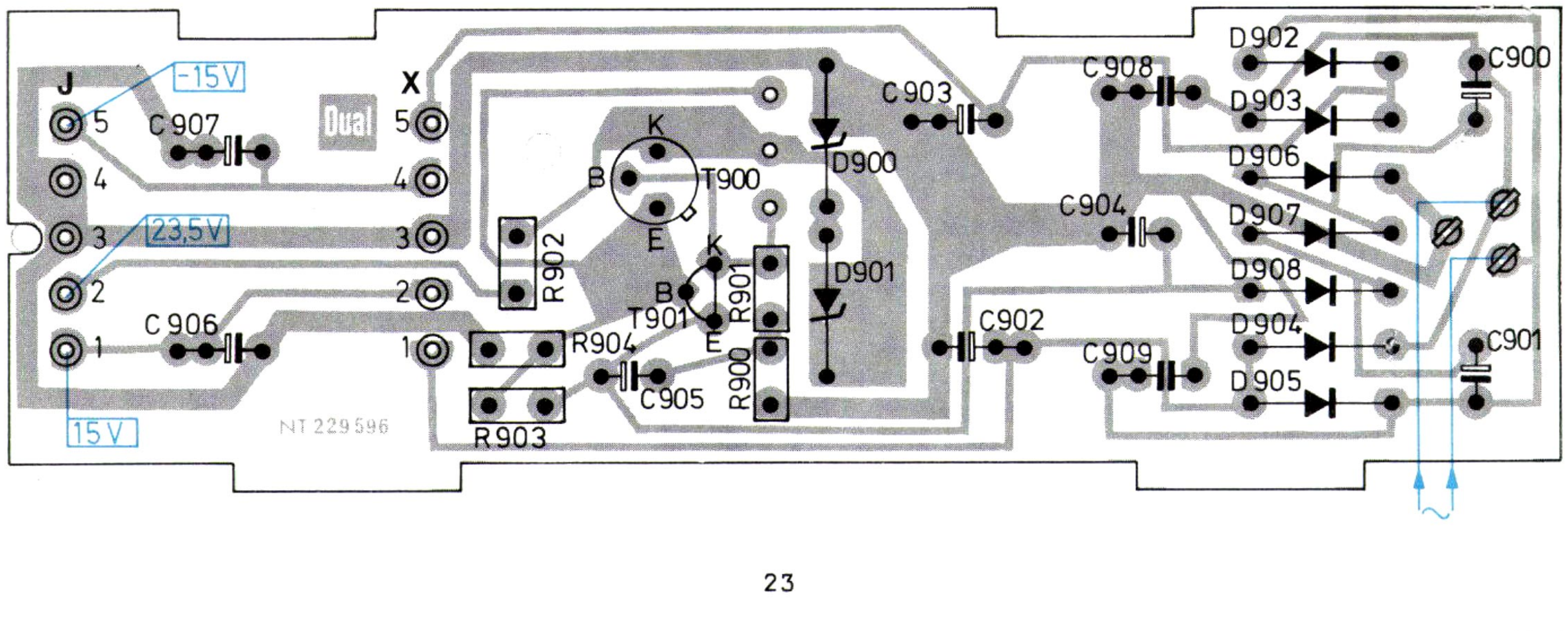


Fig. 44 Stabilizer X
233 057
(conductor side)

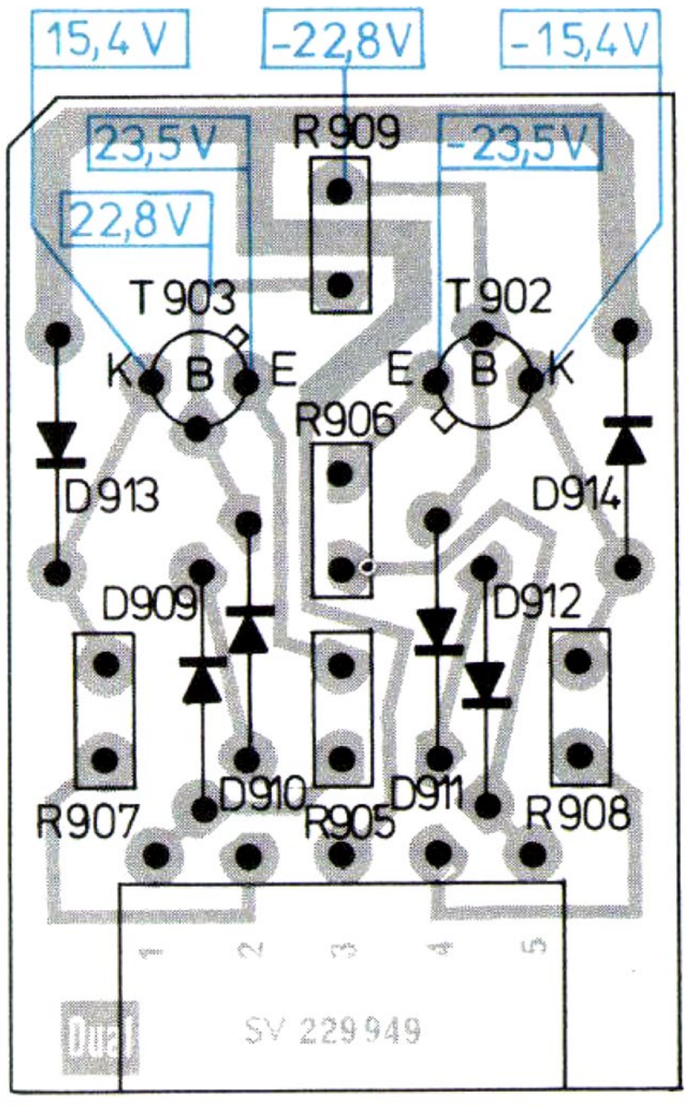


Fig. 45 Filter XI
circuit diagram

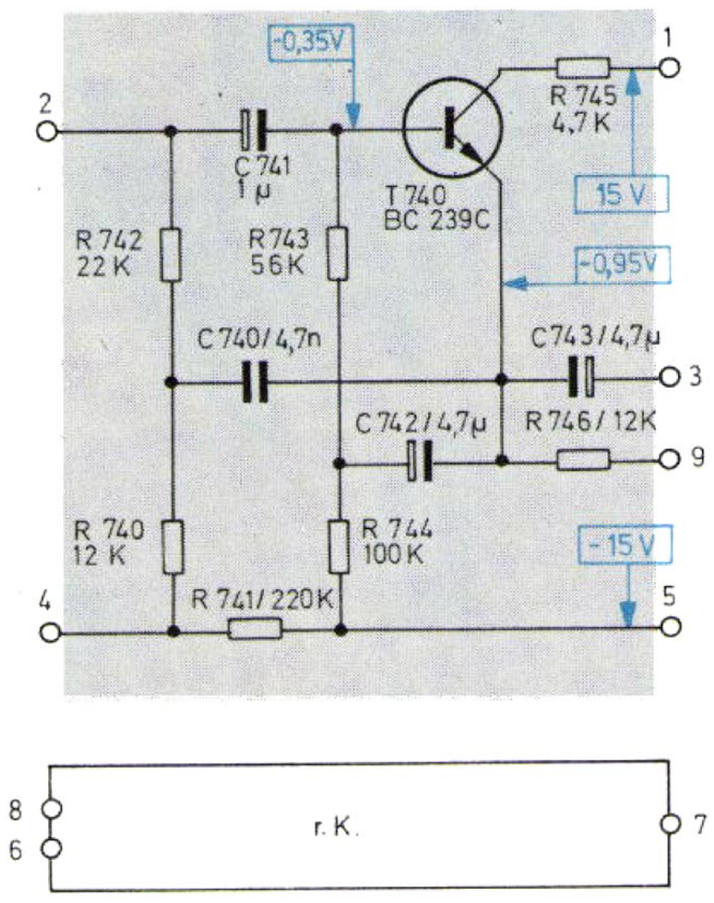


Fig. 46 Filter 233 053
(conductor side)

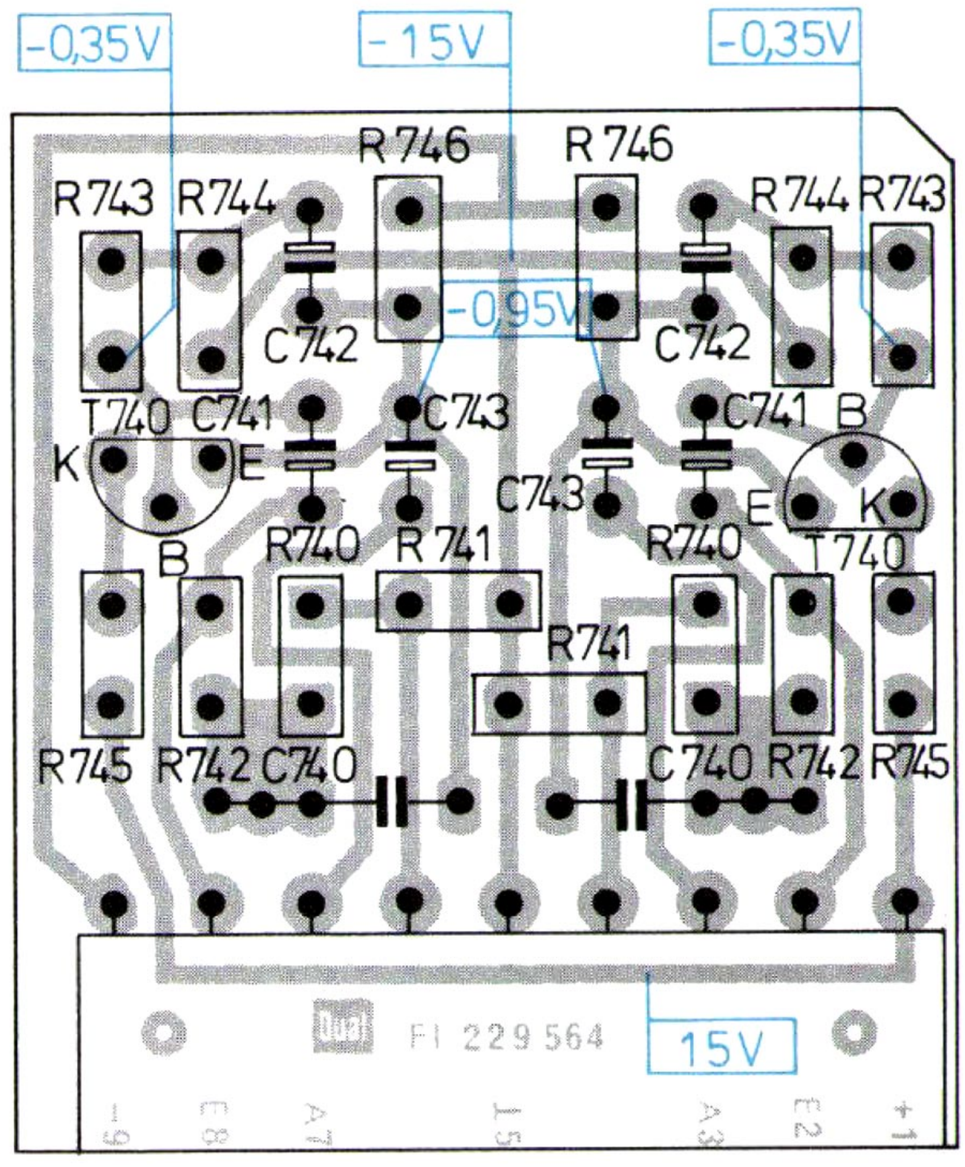


Fig. 47 Tone control XII
circuit diagram

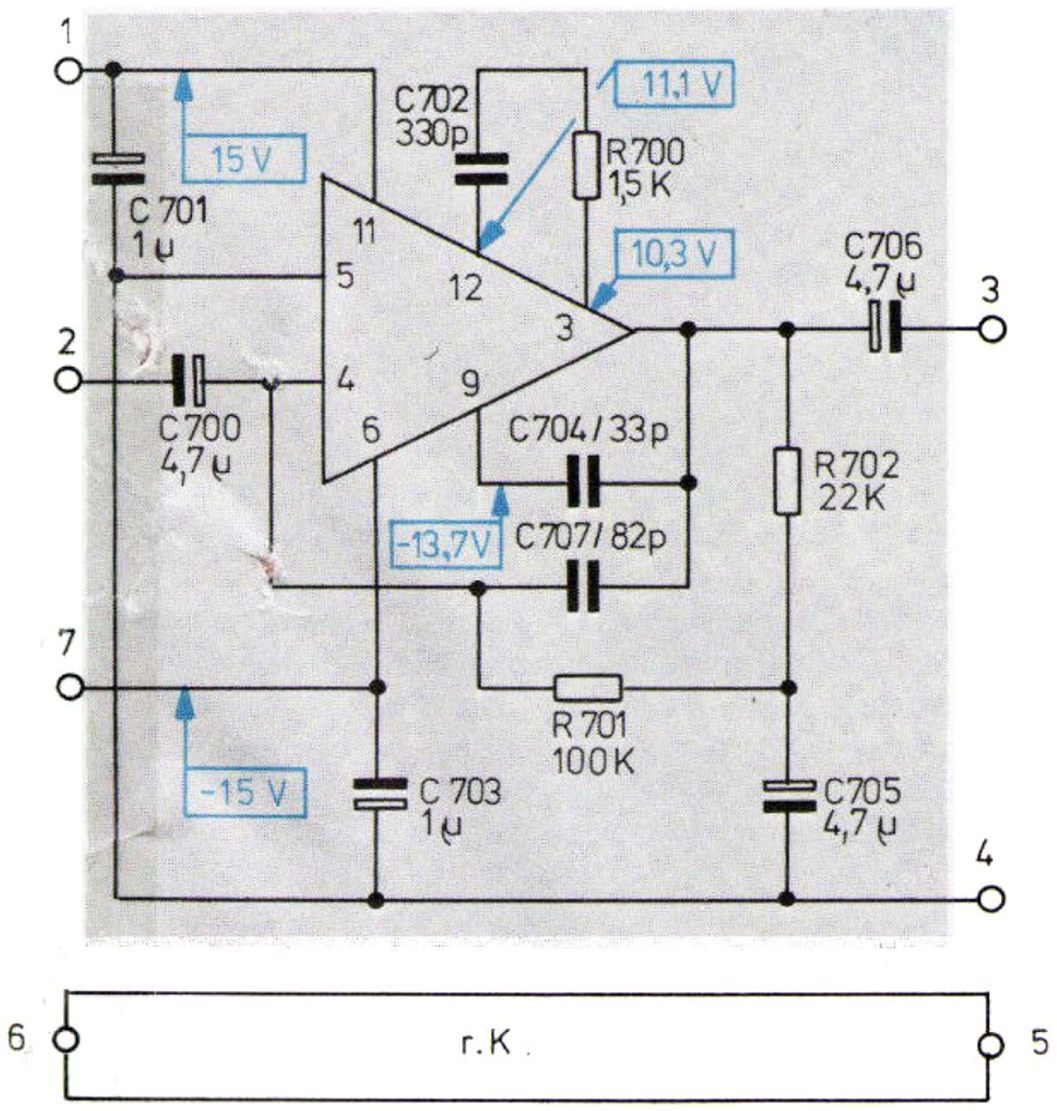


Fig. 48 Tone control 233 054
(conductor side)

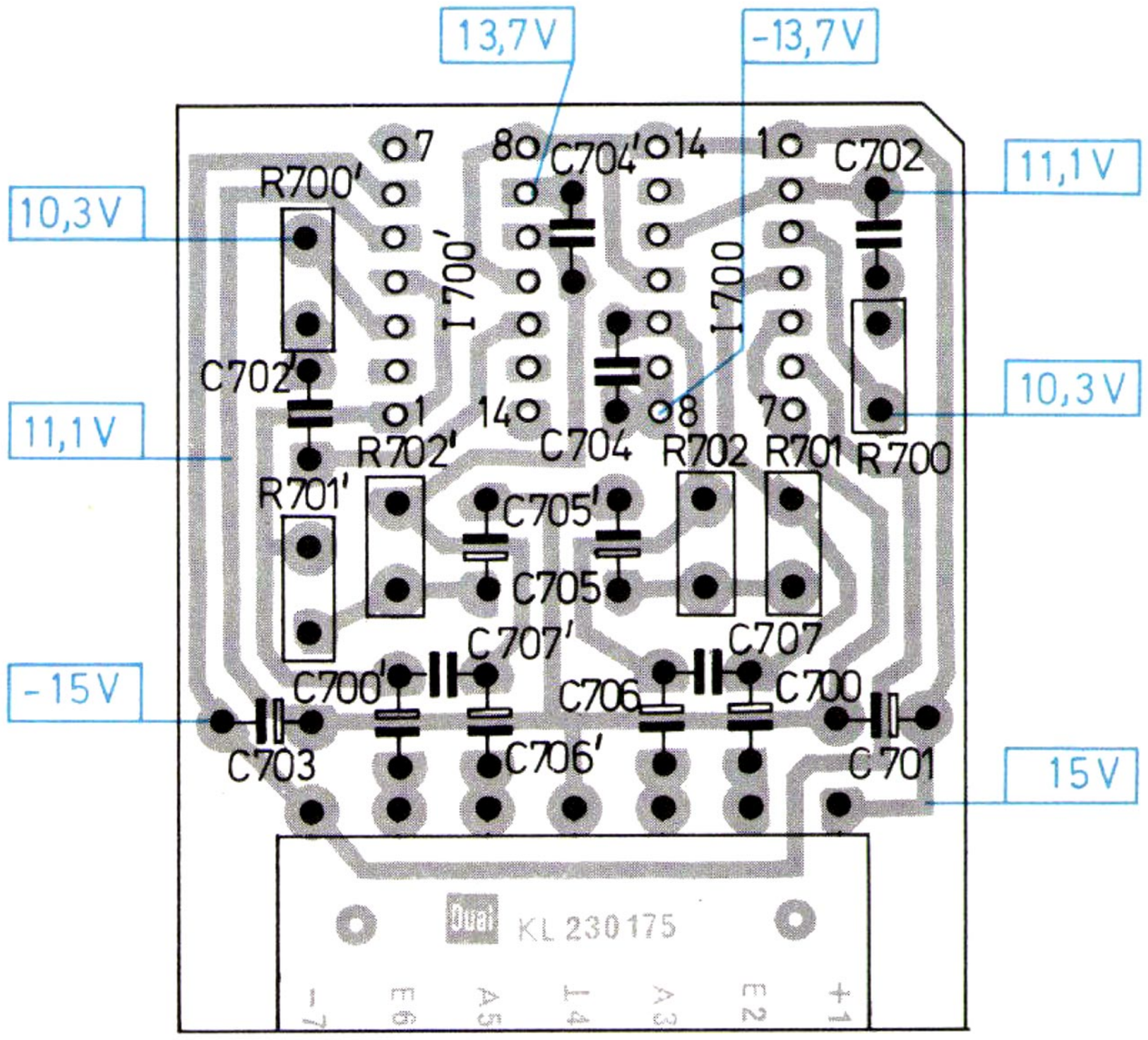
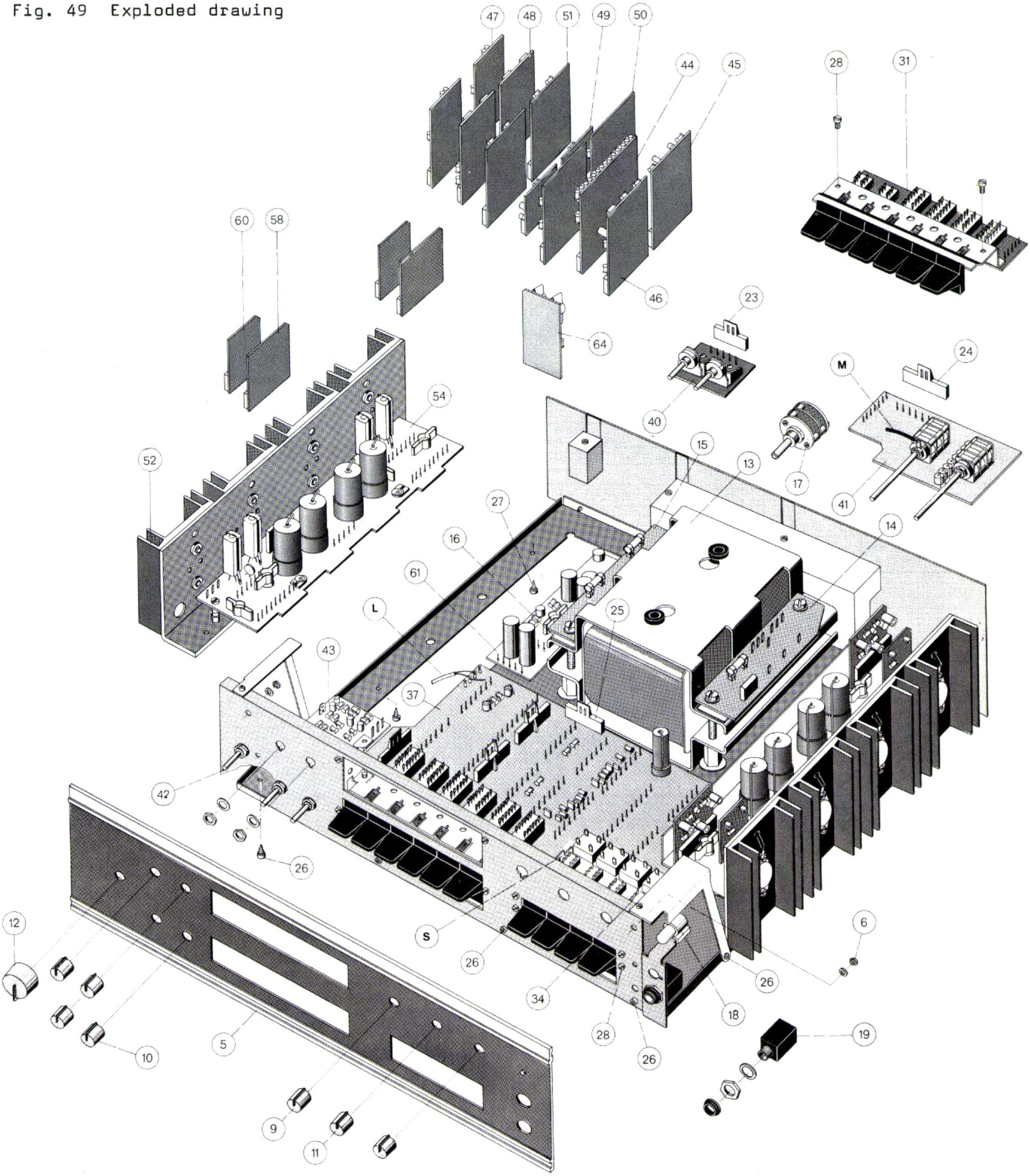


Fig. 49 Exploded drawing



Instructions for the removal of key switch assembly, tone controls and control amplifier

Unscrew control knobs and undertray, remove the two screws (26) on the base of the chassis and the two nuts (6), and take off the front panel (5).

Disconnect the cable connecting plug, unscrew and remove the two screws (28) on the input selector switch (31) and pull the key switch assembly (31) out to the rear.

Unsolder earth (ground) lead (M), disconnect the cable plugs, bend the lugs straight and take off the tone control (41).

Pull off the bulb holder (18), unsolder or detach the headphones connecting sockets (19), unscrew and remove the four screws (28) and the six screws (26), pull away the plug connectors, unsolder the leads (L) to the pre-amplifier (43) and the earth (ground) lead to the output amplifier (54), and remove the control amplifier (37) with front panel, mode switch, volume and level controls.

Re-assemble in the reverse sequence.

Replacement parts

Pos.	Pos.-No.	Discription	Qty.	
1	230 407	Cabinet walnut, complete	1	
	230 409	Cabinet white	1	
2	230 954	Machine screw	2	
	211 556	Washer 4.3 x 9 x 0.8	2	
3	225 892	Ventilating louvres	1	
4	210 284	Sheetmetal screw with cross head B 2,9 x 6,5 ...	7	
	210 601	Washer 3.2 x 8 x 1	7	
5	233 042	Front trimplate compl.	1	
	230 328	Spacer	2	
	211 556	Washer 4.3 x 9 x 0.8	2	
	216 319	Washer 6.2 x 12 x 1,5	2	
6	210 366	Hex nut M 4	4	
7	222 335	Dual emblem	1	
8	223 532	Light rod red	1	
	200 444	Spring washer	1	
9	221 913	Rotary button (Mode-switch)	1	
10	221 982	Rotory button (Front-Rear)	4	
11	223 148	Rotary button (Treble-Bass)	2	
12	225 959	Rotary button (Volume)	1	
13	233 043	Power transformer	1	
	221 728	Counter sunk screw M 5 x 10	4	
	225 293	Counter sunk washer	4	
	225 295	Washer B 8.4	4	
	209 939	Sleeving	4	
14	229 603	Transformer connectingplate compl. primär	1	
	230 819	Fuse T 2.5 A	1	
	233 157	Fuse T 5 A	1	
15	229 609	Transformer connecting plate compl. sekundär ...	1	
	217 883	Fuse T 0.63 A	2	
16	230 283	Insulating plate	2	
C 10	224 886	Paper capacitor 47 nF 250 V~/20 %	1	
17	229 505	Rotary wafer switch	1	
18	229 906	Lamp socket for	1	
	229 905	Glass socket lamp	1	
19	226 346	Headphone jack compl.	2	
	224 377	Cover	2	
20	220 141	Power cable compl.	1	
	223 811	Sleeve mounting	1	
21	230 311	Cable holder	3	
22	210 099	Plastic clamp H 3 V	3	
23	226 514	Spring strip 5 pole	7	
24	223 834	Spring strip 7 pole	2	
25	230 158	Spring strip 9 pole	4	
26	227 468	Hexagon sheetscrew BZ 2,9 x 6,5	15	
27	210 288	Cross head self-tapping screw B 3,5 x 6,5	11	
28	210 472	Machine screw M 3 x 4	10	
29	230 448	Operating instructions	1	
30	230 419	Shipping carton compl.	1	
		<u>Input selector switch</u>		
31	233 050	Input selector switch compl.	1	
32	233 670	Contact case compl. with slide and press button Tuner, Mono	2	
33	233 669	Contact case compl. with slide and press button Tape 4 CH Aux 1, 4 CH Aux 2, 4 CH Aux 3, ...	4	
	224 913	Key button	6	
		<u>Headphone connection plate</u>		
34	233 041	Headphone connection plate compl.	1	
R 1	223 259	Carbon resistor 470 Ω/0.30 W/ 5 %	4	
35	233 672	Contact case compl. with slide and press button Speaker Front, Speaker Rear 1, Speaker Rear 2	3	
35	233 671	Contact case compl. with slide and press button	1	
	224 913	Power, key button	4	
		<u>Control amplifier</u>		
37	233 047	Control amplifier plate compl. with connection plate and rotary moter switch (Pos. 17) with out module	1	
R 100	227 262	Carbon resistor 470 kohms/0.30 W/5 %	4	
R 101	225 592	Carbon resistor 56 kohms/0.30 W/5 %	4	
R 102	223 211	Carbon resistor 1.5 kohms/0.30 W/5 %	4	
R 103	223 267	Carbon resistor 12 kohms/0.30 W/5 %	4	

Pos.	Part.-No.	Discription	Qty.	
R 104	223 212	Carbon resistor 47 kΩ/0,30 W/ 5 %	4	
R 106	223 214	Carbon resistor 2,7 kΩ/0.30 W/ 5 %	4	
R 107	223 215	Carbon resistor 22 kΩ/0.30 W/ 5 %	4	
C 100	228 496	Ceramic disc capacitor 560 pF/500 V/ 5 %	4	
C 101	222 499	Foil capacitor 0.22µF/100 V/ 5 %	4	
C 102	230 323	Styroflex foil capacitor 120 pF/ 63 V/ 5 %	4	
C 103	228 703	Styroflex foil capacitor 4,7 pF/ 63 V/ 5 %	4	
C 104	222 495	Foil capacitor 0,1 µF/250 V/ 5 %	4	
C 105	223 885	Foil capacitor 15 nF/250 V/ 5 %	4	
C 106	216 229	Styroflex foil capacitor 680 pF/ 63 V/ 5 %	4	
C 107	230 028	Electrolytic capacitor 1000 µF/ 40 V	1	
38	233 668	Contact assembly compl. with slide and press button Loudness, Monitor, Presence, Lo,-Filter, Hi-Filter	5	
39	233 667	Contact assembly compl. with slide and press button Mono	1	
	224 913	Key button	6	
		<u>Level control</u>		
40	233 048	Level control plate compl.	2	
P 111	229 539	Rotary resistor 50 kΩ/lin.	2	
R 110	229 911	Adjustment control 50 kΩ	2	
C 110	230 826	Ceramic disc capacitor 470 pF/500 V/ 10 %	2	
		<u>AGC. Amplifier</u>		
41	233 049	AGC. Amplifier plate compl.	2	
R 200	223 884	Carbon resistor 4.7 kΩ/0.30 W/ 5 %	8	
R 201	223 898	Carbon resistor 10 kΩ/0.30 W/ 5 %	4	
R 202	223 216	Carbon resistor 2.2 kΩ/0.30 W/ 5 %	4	
R 203	223 884	Carbon resistor 4.7 kΩ/0.30 W/ 5 %	8	
P 200	229 536	Quadruple rotary resistor 4 x 50 kΩ lin	2	
P 201	229 536	Quadruple rotary resistor 4 x 50 kΩ lin	2	
C 200	228 703	Styroflex foil capacitor 4.7 nF/ 63 V/ 5 %	8	
C 201	229 529	Foil capacitor 68 nF/100 V/ 5 %	4	
C 202	228 703	Styroflex foil capacitor 4.7 nF/ 63 V/ 5 %	8	
		<u>Volume control</u>		
42	233 051	Volume control plate compl.	1	
P 1	229 534	Quadruple rotary resistor 50 kΩ pos. log.	1	
		<u>Pre-amplifier</u>		
43	233 052	Pre-amplifier compl.	1	
T 500	209 863	Transistor BC 173 C	4	
T 501	209 863	Transistor BC 173 C	4	
R 520	223 216	Carbon resistor 2.2 kΩ/0.30 W/ 5 %	4	
R 521	223 258	Carbon resistor 220 kΩ/0.30 W/ 5 %	4	
R 522	223 218	Carbon resistor 82 kΩ/0.30 W/ 5 %	4	
R 523	223 257	Carbon resistor 8.2 kΩ/0.30 W/ 5 %	2	
R 524	223 260	Carbon resistor 150 kΩ/0.30 W/ 5 %	4	
R 525	223 258	Carbon resistor 220 kΩ/0.30 W/ 5 %	4	
R 526	229 914	Justage control 1 kΩ/0.30 W/ linear	1	
R 527	223 259	Carbon resistor 470 kΩ/0.30 W/ 5 %	1	
R 528	223 263	Carbon resistor 1 MΩ/0.30 W/ 5 %	2	
R 529	223 218	Carbon resistor 82 kΩ/0.30 W/ 5 %	4	
R 530	224 059	Carbon resistor 33 kΩ/0.30 W/ 5 %	2	
R 531	223 211	Carbon resistor 1.5 kΩ/0.30 W/ 5 %	2	
R 532	223 260	Carbon resistor 150 kΩ/0.30 W/ 5 %	4	
R 533	223 216	Carbon resistor 2.2 kΩ/0.30 W/ 5 %	4	
C 520	222 219	Electrolytic capacitor 4.7 µF/ 25 V	4	
C 521	222 219	Electrolytic capacitor 4.7 µF/ 25 V	4	
C 522	217 862	Ceramic disc capacitor 22 pF/500 V/10 %	2	
C 523	229 915	Styroflex foil capacitor 1.2 nF/ 63 V/ 5 %	2	
C 524	229 916	Styroflex foil capacitor 3.9 nF/ 63 V/ 5 %	2	
C 525	216 671	Foil capacitor 0.1 nF/100 V/20 %	2	
		<u>Input impedance transformer</u>		
44	232 463	Input impedance transformer compl.	1	
T 540	209 863	Transistor BC 173	4	

Pos.	Part.-No.	Description	Qty.	
T 541	216 042	Transistor BC 253 B	4	
R 540	227 263	Carbon resistor 560 kΩ/0.30 W/ 5 %	4	
R 541	223 884	Carbon resistor 4.7 kΩ/0.30 W/ 5 %	4	
R 542	229 920	Carbon resistor 12 kΩ/0.30 W/ 2 %	4	
R 543	229 921	Carbon resistor 33 kΩ/0.30 W/ 2 %	4	
R 544	227 253	Carbon resistor 4.7 kΩ/0.30 W/ 2 %	4	
R 545	229 922	Carbon resistor 1.8 kΩ/0.30 W/ 2 %	4	
R 546	223 258	Carbon resistor 220 kΩ/0.30 W/ 5 %	4	
C 540	229 933	Foil capacitor 0.33 nF/100 V/ 5 %	4	
C 541	213 498	Ceramic disc capacitor 47 pF/500 V/ 10 %	4	
C 542	229 923	Electrolytic capacitor 2.2 µF/ 50 V	4	
		<u>Multiphony-decoder</u>		
45	232 462	Multiphony-decoder compl.	1	
T 600	209 863	Transistor BC 173 C	3	
T 601	209 863	Transistor BC 173 C	3	
T 602	216 042	Transistor BC 253 B	1	
T 603	209 863	Transistor BC 173 C	3	
R 600	227 263	Carbon resistor 560 kΩ/0.30 W/ 5 %	2	
R 601	223 260	Carbon resistor 150 kΩ/0.30 W/ 5 %	2	
R 602	223 260	Carbon resistor 150 kΩ/0.30 W/ 5 %	2	
R 603	227 262	Carbon resistor 470 kΩ/0.30 W/ 5 %	1	
R 604	227 256	Carbon resistor 10 kΩ/0.30 W/ 2 %	2	
R 605	227 253	Carbon resistor 4.7 kΩ/0.30 W/ 2 %	2	
R 606	227 253	Carbon resistor 4.7 kΩ/0.30 W/ 2 %	2	
R 607	227 256	Carbon resistor 10 kΩ/0.30 W/ 2 %	2	
R 608	227 260	Carbon resistor 150 kΩ/0.30 W/ 2 %	4	
R 609	227 260	Carbon resistor 150 kΩ/0.30 W/ 2 %	4	
R 610	227 260	Carbon resistor 150 kΩ/0.30 W/ 2 %	4	
R 611	227 260	Carbon resistor 150 kΩ/0.30 W/ 2 %	4	
R 612	227 251	Carbon resistor 3.3 kΩ/0.30 W/ 2 %	1	
R 613	227 252	Carbon resistor 3.9 kΩ/0.30 W/ 2 %	1	
R 614	223 884	Carbon resistor 4.7 kΩ/0.30 W/ 5 %	1	
R 615	223 258	Carbon resistor 220 kΩ/0.30 W/ 5 %	2	
R 616	223 258	Carbon resistor 220 kΩ/0.30 W/ 5 %	2	
C 600	222 213	Electrolytic capacitor 1 µF/ 50 V	6	
C 601	222 213	Electrolytic capacitor 1 µF/ 50 V	6	
C 602	222 213	Electrolytic capacitor 1 µF/ 50 V	6	
C 603	222 213	Electrolytic capacitor 1 µF/ 50 V	6	
C 604	222 213	Electrolytic capacitor 1 µF/ 50 V	6	
C 605	222 213	Electrolytic capacitor 1 µF/ 50 V	6	
		<u>SQ-Decoder</u>		
46	232 461	SQ-Decoder compl.	1	
I 620	229 516	Intergrated circuit XC 1312 P	1	
R 620	229 926	Carbon resistor 7.5 kΩ/0.30 W/ 5 %	1	
R 621	223 212	Carbon resistor 47 kΩ/0.30 W/ 5 %	1	
R 622	229 927	Carbon resistor 3.9 kΩ/0.30 W/ 5 %	4	
R 623	223 884	Carbon resistor 4.7 kΩ/0.30 W/ 5 %	4	
R 624	229 927	Carbon resistor 3.9 kΩ/0.30 W/ 5 %	4	
R 625	223 884	Carbon resistor 4.7 kΩ/0.30 W/ 5 %	4	
R 626	223 884	Carbon resistor 4.7 kΩ/0.30 W/ 5 %	4	
R 627	223 884	Carbon resistor 4.7 kΩ/0.30 W/ 5 %	4	
R 628	229 927	Carbon resistor 3.9 kΩ/0.30 W/ 5 %	4	
R 629	229 927	Carbon resistor 3.9 kΩ/0.30 W/ 5 %	4	
R 630	223 258	Carbon resistor 220 kΩ/0.30 W/ 5 %	1	
C 620	216 402	Foil capacitor 68 nF/160 V/20 %	2	
C 621	229 530	Foil capacitor 39 nF/250 V/ 5 %	4	
C 622	229 530	Foil capacitor 39 nF/250 V/ 5 %	4	
C 623	222 499	Foil capacitor 0.22 µF/100 V/ 5 %	2	
C 624	229 929	Foil capacitor 6.8 nF/ 63 V/ 5 %	2	
C 625	229 929	Foil capacitor 6.8 nF/ 63 V/ 5 %	2	
C 626	229 530	Foil capacitor 39 nF/250 V/ 5 %	4	
C 627	229 530	Foil capacitor 39 nF/250 V/ 5 %	4	
C 628	222 499	Foil capacitor 0.22 µF/100 V/ 5 %	2	
C 629	229 923	Electrolytic capacitor 22 µF/50 V	4	

Pos.	Part.-No.	Description	Qty.	
		Booster amplifier		
47	232 460	Booster amplifier compl.	2	
T 640	216 042	Transistor BC 253 B	2	
T 641	223 223	Transistor BC 207 B	2	
R 640	225 592	Carbon resistor 56 kΩ/0.30 W/ 5 %	2	
R 641	229 920	Carbon resistor 12 kΩ/0.30 W/ 5 %	2	
R 642	223 262	Carbon resistor 27 kΩ/0.30 W/ 5 %	2	
R 643	226 492	Carbon resistor 27 kΩ/0.30 W/ 2 %	2	
R 644	224 058	Carbon resistor 6.8kΩ/0.30 W/ 5 %	2	
R 645	223 211	Carbon resistor 1.5kΩ/0.30 W/ 5 %	2	
C 640	222 213	Electrolytic capacitor 1 µF/ 50 V	2	
C 641	213 498	Ceramic disc capacitor 47 pF/500 V/10 %	2	
C 642	229 923	Electrolytic capacitor 2.2µF/ 50 V	2	
		IC-Amplifier		
48	232 459	IC-Amplifier compl.	2	
I 680	223 308	Integrated circuit	2	
R 680	223 897	Carbon resistor 100 kΩ/0.30 W/ 5 %	4	
R 681	223 261	Carbon resistor 15 kΩ/0.30 W/ 5 %	2	
R 682	223 211	Carbon resistor 1.5 kΩ/0.30 W/ 5 %	2	
R 683	223 897	Carbon resistor 100 kΩ/0.30 W/ 5 %	4	
C 680	223 213	Electrolytic capacitor 1 µF/ 50 V	2	
C 681	223 278	Ceramic disc capacitor 330 pF/500 V/10 %	2	
C 682	216 406	Ceramic disc capacitor 15 pF/500 V/10 %	2	
C 683	217 862	Ceramic disc capacitor 22 pF/500 V/10 %	2	
C 684	222 219	Electrolytic capacitor 4.7 µF/ 25 V	2	
C 685	216 664	Electrolytic capacitor 1 µF/ 35 V	2	
C 686	216 664	Electrolytic capacitor 1 µF/ 35 V	2	
		Impedance transformer		
49	232 457	Impedance transformer compl.	2	
T 720	209 863	Transistor BC 173 C	2	
R 720	223 897	Carbon resistor 100 kΩ/0.30 W/ 5 %	2	
R 721	227 256	Carbon resistor 10 kΩ/0.30 W/ 2 %	2	
R 722	223 258	Carbon resistor 220 kΩ/0.30 W/ 5 %	2	
R 723	223 211	Carbon resistor 1.5 kΩ/0.30 W/ 5 %	2	
C 720	222 213	Electrolytic capacitor 1 µF/50 V	2	
C 721	222 219	Electrolytic capacitor 4.7 µF/25 V	2	
		Filter		
50	233 053	Filter compl.	2	
T 740	221 942	Transistor BC 239 C	2	
R 740	223 267	Carbon resistor 12 kΩ/0.30 W/ 5 %	4	
R 741	223 258	Carbon resistor 220 kΩ/0.30 W/ 5 %	2	
R 742	223 215	Carbon resistor 22 kΩ/0.30 W/ 5 %	2	
R 743	225 592	Carbon resistor 56 kΩ/0.30 W/ 5 %	2	
R 744	223 897	Carbon resistor 100 kΩ/0.30 W/ 5 %	2	
R 745	223 884	Carbon resistor 4.7 kΩ/0.30 W/ 5 %	2	
R 746	223 267	Carbon resistor 12 kΩ/0.30 W/ 5 %	4	
C 740	217 981	Styroflex foil capacitor 4.7 nF/ 63 V/ 5 %	2	
C 741	222 213	Electrolytic capacitor 1 µF/ 50 V	2	
C 742	222 219	Electrolytic capacitor 4.7 µF/ 25 V	4	
C 743	222 219	Electrolytic capacitor 4.7 µF/ 25 V	4	
		Tone control		
51	233 054	Tone control compl.	2	
J 700	233 308	Integrated circuit	2	
R 700	223 211	Carbon resistor 1.5 kΩ/0.30 W/ 5 %	2	
R 701	223 897	Carbon resistor 100 kΩ/0.30 W/ 5 %	2	
R 702	223 215	Carbon resistor 22 kΩ/0.30 W/ 5 %	2	
C 700	222 219	Electrolytic capacitor 4.7 µF/ 25 V	6	
C 701	216 664	Electrolytic capacitor 1 µF/ 35 V	2	
C 702	223 278	Ceramic disc capacitor 330 pF/500 V/10 %	2	
C 703	216 664	Electrolytic capacitor 1 µF/ 35 V	2	

Pos.	Part.-No.	Description	Qty.	
C 704	216 405	Ceramic disc capacitor 33 pF/500 V/10 %	2	
C 705	222 219	Electrolytic capacitor 4.7 µF/ 25 V	6	
C 706	222 219	Electrolytic capacitor 4.7 µF/ 25 V	6	
C 707	216 404	Ceramic disc capacitor 82 pF/500 V/10 %	2	
		<u>Power amplifier</u>		
52	233 967	Power amplifier compl. with out Triverplate and electronic overlood protection with Output transistor and heat sink	2	
	204 777	Spacing hexagon nut	4	
	210 480	Machine screw M 3 x 6	8	
	222 199	Machine screw AM 3.5 x 15	8	
	222 200	Hex nut BM 3.5	8	
	209 826	Mica washer	4	
	210 161	Toothed washer 4.3	8	
	209 980	Solder lug	4	
	229 508	Insulating disc	8	
53	230 029	Thermo switch	1	
54	233 055	Power amplifier plate with out heat sink final transistor electronic fuse and universal driver		
55	223 867	Resistor holder		
56	222 497	Antithermal washer	4	
T 300	224 581	Transistor BC 141-10 compl.	2	
T 301	224 582	Transistor BC 141-10 compl.	2	
T 302	224 572	Transistor TJ 2499 compl.		
T 303	224 572	Transistor TJ 2499 compl.		
D 300	216 027	Diode BZ x 62	4	
D 301	216 027	Diode BZ x 62	4	
D 302	223 224	Z-Diode BZ x 85 - C 15	1	
D 303	227 344	Diode 1 N 4001	2	
57	218 414	Silicon rectifier B 40 C 2200	2	
R 300	223 268	Carbon resistor 150 ohms/0.30 W/5 %	2	
R 301	230 719	Adjustment control 500 kohms lin.	2	
R 302	209 902	Thermistor	2	
R 303	226 483	Carbon resistor 100 ohms/0.30 W/5 %	2	
R 304	226 477	Carbon resistor 220 ohms/0.30 W/5 %	4	
R 305	226 477	Carbon resistor 220 ohms/0.30 W/5 %	4	
R 306	230 030	Wire wound resistor with unsolder fuse	2	
R 307	230 030	Wire wound resistor with unsolder fuse	2	
R 308	223 833	Carbon resistor	2	
R 309	223 786	Adjustment control 25 kohms lin.	2	
R 310	223 908	Carbon resistor 470 ohms/0.50 W/5 %	1	
R 311	228 049	Wire wound resistor with unsolder fuse	1	
C 300	223 900	Electrolytic capacitor 470 µF/ 16 V	1	
C 301	223 221	Ceramic disc capacitor 150 pF/500 V/10 %	2	
C 302	216 401	Foil capacitor 33 nF/250 V/10 %	2	
C 303	216 389	Ceramic disc capacitor 47 nF/ 50 V	2	
C 304	225 777	Electrolytic capacitor 2200 µF/ 40 V	4	
C 305	225 777	Electrolytic capacitor 2200 µF/ 40 V	4	
C 306	216 671	Foil capacitor 0.1 µF/100 V/20 %	2	
C 307	216 671	Foil capacitor 0.1 µF/100 V/20 %	2	
		<u>Universal-Triver</u>		
58	232 452	Universal-Triver compl.	4	
T 800	223 223	Transistor BC 207 B	2	
T 801	223 223	Transistor BC 207 B	2	
T 802	224 582	Transistor BC 161-10 compl.	1	
59	222 497	Antithermal washer	1	
D 800	223 906	Diode 1 N 4148	2	
D 801	223 906	Diode 1 N 4148	2	
R 800	223 211	Carbon resistor 1.5 kΩ/0.30 W/ 5 %	2	
R 801	223 212	Carbon resistor 47 kΩ/0.30 W/ 5 %	2	
R 802	223 214	Carbon resistor 2.7 kΩ/0.30 W/ 5 %	2	
R 803	223 215	Carbon resistor 22 kΩ/0.30 W/ 5 %	1	
R 804	229 952	Carbon resistor 820 Ω/0.30 W/ 5 %	1	
R 805	223 214	Carbon resistor 2.7 kΩ/0.30 W/ 5 %	2	
R 806	223 212	Carbon resistor 47 kΩ/0.30 W/ 5 %	2	
R 807	223 219	Carbon resistor 22 Ω/0.30 W/ 5 %	1	
R 808	223 211	Carbon resistor 1.5 kΩ/0.30 W/ 5 %	2	

Pos.	Part.-No.	Description	Qty.	
C 800	222 213	Electrolytic capacitor 1 µF/50 V	1	
C 801	223 221	Ceramic disc capacitor 150 pF/500 V/ 10 %	1	
C 802	220 265	Electrolytic capacitor 47 µF/ 16 V	2	
C 803	213 498	Ceramic disc capacitor 47 pF/500 V/ 10 %	1	
C 804	217 862	Ceramic disc capacitor 22 pF/500 V/ 10 %	1	
C 805	220 265	Electrolytic capacitor 47 µF/ 16 V	2	
		<u>Electronic overload protection</u>		
60	233 056	Electronic overload protection compl.	4	
T 820	220 609	Transistor BC 251 B	1	
T 821	229 511	Transistor BC 172 B	1	
D 820	223 906	Diode 1 N 4148	4	
D 821	223 906	Diode 1 N 4148	4	
D 822	223 906	Diode 1 N 4148	4	
D 823	223 906	Diode 1 N 4148	4	
R 820	223 264	Carbon resistor 1 kΩ/0.30 W/ 5 %	2	
R 821	223 267	Carbon resistor 12 kΩ/0.30 W/ 5 %	2	
R 822	223 267	Carbon resistor 12 kΩ/0.30 W/ 5 %	2	
R 823	223 264	Carbon resistor 1 kΩ/0.30 W/ 5 %	2	
C 820	216 389	Ceramic disc capacitor 47 nF/ 50 V	1	
C 821	203 474	Ceramic disc capacitor 680 pF/ 50 V/20 %	2	
C 822	203 474	Ceramic disc capacitor 680 pF/ 50 V/20 %	2	
		<u>Power supply</u>		
61	233 974	Power supply plate compl. (with out stabilization-plate)	1	
62	222 497	Antithermal washer	1	
63	223 904	Heat sink		
T 900	224 582	Transistor BC 161-10 compl.	1	
T 901	216 042	Transistor BC 253 B	1	
D 900	229 945	Stabilization diode ZU 15	2	
D 901	229 945	Stabilization diode ZU 15	2	
D 902	227 344	Diode 1 N 4001	7	
D 903	227 344	Diode 1 N 4001	7	
D 904	227 344	Diode 1 N 4001	7	
D 905	227 344	Diode 1 N 4001	7	
D 906	227 344	Diode 1 N 4001	7	
D 907	227 344	Diode 1 N 4001	7	
D 908	227 344	Diode 1 N 4001	7	
R 900	224 058	Carbon resistor 6.8 kΩ/0.30 W/ 5 %	1	
R 901	229 940	Carbon resistor 3.3 kΩ/0.30 W/ 5 %	1	
R 902	223 268	Carbon resistor 150 Ω/0.30 W/ 5 %	1	
R 903	229 942	Carbon resistor 12 Ω/0.30 W/ 2 %	1	
R 904	226 486	Carbon resistor 330 kΩ/0.30 W/ 5 %	1	
C 900	216 334	Electrolytic capacitor	2	
C 901	216 334	Electrolytic capacitor	2	
C 902	229 943	Electrolytic capacitor	2	
C 903	229 943	Electrolytic capacitor	2	
C 904	229 944	Electrolytic capacitor	1	
C 905	220 265	Electrolytic capacitor	1	
C 906	230 827	Electrolytic capacitor	2	
C 907	230 827	Electrolytic capacitor	2	
C 908	216 388	Ceramic disc capacitor 22 nF/ 250 V/ 20 %	2	
C 909	216 388	Ceramic disc capacitor 22 nF/ 250 V/ 20 %	2	
		<u>Stabilizing</u>		
64	233 057	Stabilization plate compl.	1	
65	222 497	Antithermal washer	2	
66	223 904	Heat sink	2	
T 902	224 581	Transistor BC 141-10 compl.	1	
T 903	224 582	Transistor BC 161-10 compl.	1	
D 909	216 027	Diode BZX 62	4	
D 910	216 027	Diode BZX 62	4	
D 911	216 027	Diode BZX 62	4	
D 912	216 027	Diode BZX 62	4	
D 913	229 945	Stabilization diode ZU 15	2	
D 914	229 945	Stabilization diode ZU 15	2	

Pos.	Part.-No.	Description	Qty.	
R 905	230 834	Carbon resistor 8.2 ohms/0.30 W/2 %	2	
R 906	230 834	Carbon resistor 8.2 ohms/0.30 W/2 %	2	
R 907	223 219	Carbon resistor 22 ohms/0.30 W/5 %	2	
R 908	223 219	Carbon resistor 22 ohms/0.30 W/5 %	2	
R 909	224 058	Carbon resistor 6.8 kohms/0.30 W/5 %	1	
		Rear Wall compl.		
67	230 218	Mounting bush 8 pole	1	
68	230 189	Rod insulator	2	
69	222 041	Loudspeaker socket 2 pole	6	
70	209 461	Flange bush 5 pole	10	
71	230 853	Joining piece VS 1	1	

We reserve the right to delivery and modification

Dual

Dual Gebrüder Steidinger · 7742 St. Georgen/Schwarzwald

920 157 2/1074

Printed in Germany