



TPPS Test Equipment
Measuring Instruments
No. 0 6903 64
Exemplar - Example - Specimen
OJS- I

CARRIER FREQUENCY SIGNAL GENERATOR

TPPS-42

10 kHz to 14 MHz

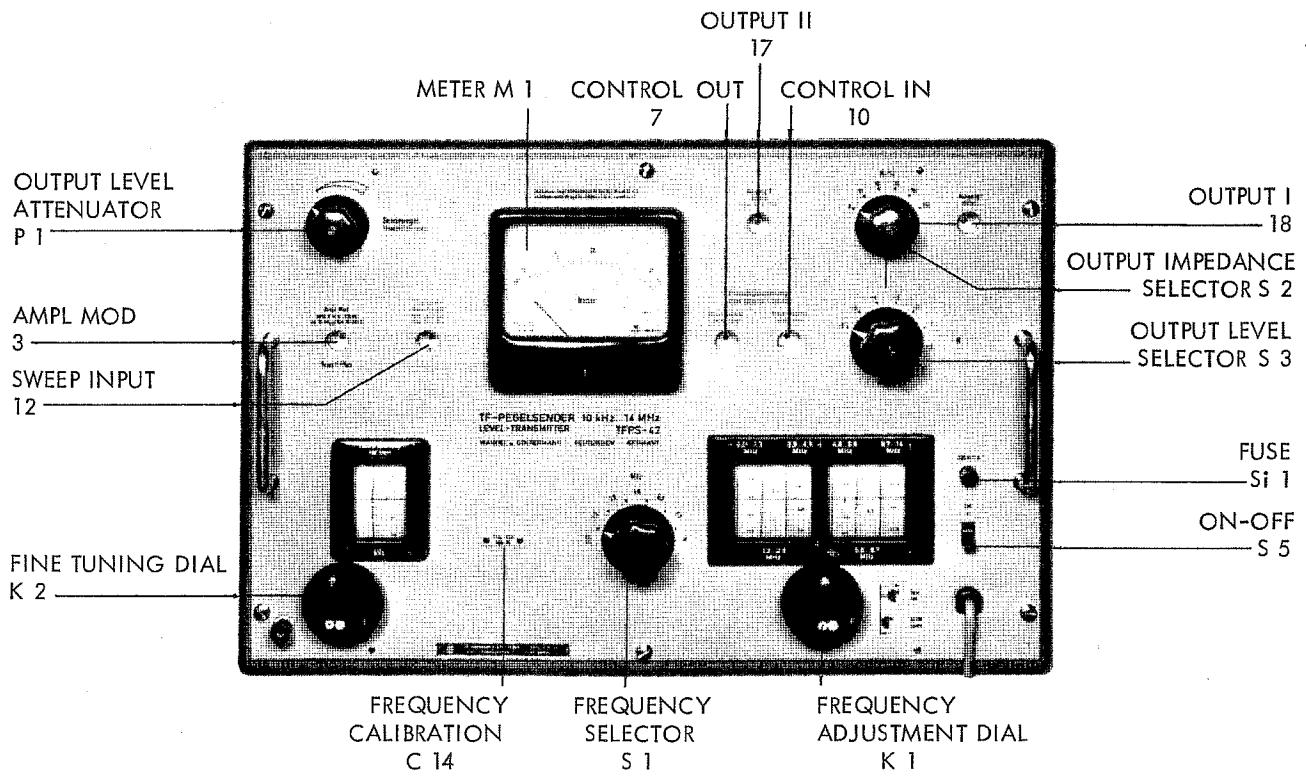
Description and Operating Manual 84 VW
BN 84/0 Np calibration
BN 84/1 dB/V calibration

1.6.61

0.15.12.68 1741 UN v. 1650

Subject to change without notice

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SPECIFICATIONS

dB/V - Version BN 84/1

Np - Version BN 84/0 (compare data in parenthesis)

Frequency range	10 kHz to 14 MHz
6 bands	10 kHz to 1.28 MHz, 1.28 to 2.8 MHz, 2.8 to 4.7 MHz, 4.7 to 7 MHz, 7 to 10 MHz, 10 MHz to 14 MHz
Frequency accuracy (after 2 hours warm-up-time)	$\leq \pm 0.2\% \pm 3$ kHz
Frequency drift (after 2 hours warm-up-time)	$\leq \pm 10^{-4} \pm 500$ Hz/hour
Effect of $\pm 10\%$ mains voltage fluctuation upon frequency deviation	$\leq \pm 1 \times 10^{-5} \pm 50$ Hz
Fine-tuning range	± 25 kHz
Fine-tuning accuracy	$\leq \pm 200$ Hz
Output level (when $R_i = 0$ and $R_L \geq 50 \Omega$, ref. to 0 dB (0 Np)- deflection)	-60, -50, ..., +10 dB (-6, -5, ..., +1 Np) 0,8 mV to 2.5 V
Lowest level adjustable	-80 dB (-8 Np)
Output impedance, switchable	approx. 0, 50, 60, 70, 75, 150 Ω
Output level accuracy at 100 kHz matched to 75 Ω at f.s.d., in range +10 dB (+1 Np)	$\pm 2\%$ or better
Attenuator accuracy (full scale, in ranges -60 dB (-6 Np) through 0 dB (0 Np) ref. to +10 dB (+1 Np) and $f = 100$ kHz when $R_i = R_L = 75 \Omega$)	0.1 dB (0.01 Np) or better
Frequency-response accuracy (in all ranges, ref. to 100 kHz matched to 75 Ω)	0.2 dB (0.02 Np) or better
additionally (when matched to 50, 60, 70, 150 Ω)	0.1 dB (0.01 Np) or better
Frequency response of level reading (at constant control position for all combinations of level and R_i switches, referred to $f = 100$ kHz)	
for $f = 10$ kHz to 5 MHz	0.5 dB (0.05 Np) or better
for $f = 14$ MHz	approx. 1 dB (0.1 Np)
Attenuation of 2nd and 3rd harmonics (ref. to level +10 dB (+1 Np) and matched to 75 Ω)	
for $f = 10$ kHz to 2 MHz	≥ 43 dB (5 Np)
for $f = 14$ MHz	approx. 35 dB (4 Np)

Amplitude modulation	0 to 100 %
Modulating-frequency range	d.c. to 100 kHz
Frequency response (d.c. to 20 kHz)	0.1 dB (0.01 Np) or better
Voltage required in 300 Ω	approx. 26 mV per %
Distortion coefficient (for $m \leq 30\%$, modulating frequencies ≤ 20 kHz output levels $\leq +5$ dB ($+0.5$ Np))	$\leq 1\%$
External control	
Generator may be controlled from Level Meter TFPN-43 or from WO-1 or MMO-3.	
Conversely, the generator may be used to control the Level Meter TFPN-43.	
Tube complement	4 x E 88 CC, 5 x E 180 F, 2 EL 86, 85 A 2, 150 B 2
Mains voltage required	110/ 115/ 220 V, 40 to 60 Hz
Power consumption,	190 VA
Overall dimensions	565 x 381 x 278 mm (23 x 15 x 11 in.)
Weight	33 kg (66 lbs)

Subject to change without notice

CONSTRUCTIONAL DETAILS AND MODE OF OPERATION

The Carrier Frequency Signal Generator TFPS-42 is a beat-frequency generator comprising two oscillators with one buffer stage each, a modulator working into a lowpass filter network (LPFL), a wideband amplifier, an attenuator and meter circuit. The circuit diagram of the complete set is attached to this manual.

2.1

Oscillators and Buffer Stages

The Signal Generator has two LC oscillators. The Oscillator I frequency can be continuously adjusted in the range 20 MHz to 34 MHz by means of the frequency selector and the large drum-type scale. Oscillator II can be detuned in the narrow range $f_{II} = 15 \text{ MHz} \pm 20 \text{ kHz}$ by the fine-tuning control, K 2. The output frequency f is generated in the modulator as the difference of both oscillator frequencies, ($f = f_I - f_{II}$). The oscillator scales are calibrated in the values $f_I - 20 \text{ MHz}$ and $20 \text{ MHz} - f_{II}$ respectively, thus enabling the output frequency $f = f_I - 20 \text{ MHz}$ to be read-off directly if the fine-tuning control is not changed ($20 \text{ MHz} - f_{II} = 0$). If it is, the fine-tuning reading is simply added to the output frequency setting. Both oscillators have resonant circuits made up of ceramic coil formers with an evaporated silver-coating winding and of ceramic capacitors. These components have an extremely long life stability. Their ratings change by very small amounts and in opposite senses, as a result, the natural frequency of the resonant circuit remains unchanged for all practical purposes. The oscillator tubes are effectively decoupled from the resonant circuits, their properties hardly influencing the frequency. Both oscillators are of almost identical design, therefore, their residual frequency changes are unidirectional and, as an effect, their difference frequency (that is, the output frequency) is extremely constant and assumes its final value almost immediately after the set has been switched on.

A buffer stage is inserted between each oscillator and the modulator. Thus, the modulator properties cannot affect the output frequency. Likewise, the oscillators cannot affect each other by frequency pulling and the output voltage remains constant even at low output frequencies. The buffer stage of Oscillator I has a large gain while that of Oscillator II has a small gain which is adjustable through the suppressor grid. In this arrangement, the output voltage amplitude can be modulated via the suppressor grid of buffer stage II.

2.2

Modulator and Lowpass Filter Network

The following stage is a ring modulator comprising four germanium diodes. The modulator is primarily controlled by the frequency f_I and, to a lesser degree, by f_{II} . Possible harmonics of the latter frequency are filtered out by a preceding bandpass filter network. The modulator output contains the desired difference frequency $f = f_I - f_{II}$ and also the sum frequency $f_I + f_{II}$ and the combinations $2 f_I \pm f_{II}$, $3 f_I \pm f_{II}$ etc., all above the output frequency f . These and the oscillator frequencies are filtered out by a lowpass filter network (LPFL) having high attenuation above 14 MHz. The output frequency having an extremely low harmonics content is available at the LPFL output.

The modulator output voltage is in wide limits independent of the no. I control voltage and remains practically stable in the oscillator II full tuning range although the oscillator voltage undergoes some change. The linear relation between the output voltage and the input voltage II from oscillator II (which is highly stable in its narrow detuning range) enables the generator voltage to be modulated in buffer stage II. The advantage of this arrangement as compared with a modulation in the amplifier stage of the set is that the output voltage does not contain additional harmonics of the output frequency nor the modulating frequency itself.

2.3

Amplifier

This wideband amplifier covers the range 10 kHz to 14 MHz. The first two and the last three tubes each have negative feedback, resulting in a flat frequency response characteristic and extremely low distortion. The two last tubes, series-connected in the DC circuit, have a special feature. They are controlled in opposite phase so that their alternating currents add up in the output transformer. Second-harmonic distortion is very low. The overall gain across the output transformer amounts to 50, the maximum output level being +10 dB (2.5 V) or +1 Np in $75\ \Omega$.

2.4

Output attenuator and meter circuit

A voltage step-down transformer arrangement 10 or 20 dB (1 or 2 Np) is provided between amplifier and output socket. The transformers may be switched on in succession so that the voltage can be divided in steps of 10 dB up to 70 dB (1 Np to 7 Np). The resistance of the transformers is so low that the divider ratio is independent of the load.

The meter circuit comprises a full-wave rectifier crystal-diode circuit and a high-precision moving-coil instrument, calibrated in r.m.s. voltage levels. This arrangement permits output level adjustment between +10 dB and -80 dB (+1 Np and -8 Np).

The meter scale is calibrated to give readings of the voltage level across the attenuator output. When switched to zero output impedance (selector S 2), the attenuator output is connected to the output sockets. When $R_i = 50$ to 150Ω , suitable resistors are inserted electrically between the attenuator output and the output socket resulting in a voltage division between the load and output impedances R_L and R_i , the voltage is divided at a ratio 2 : 1 giving an attenuation of 6 dB (0.7 Np). This has been taken into consideration in the calibration of the black meter scale which gives direct readings of the voltage level across the load impedance R_L for the matched condition.

2.5 External tuning facility

Since the instrument is tuned by means of the oscillator 1 control frequency, a number of instruments having identical oscillators can be sync. tuned from a single set.

The control signal required for this purpose can be derived from socket Bu 7. Conversely socket Bu 10 is provided for the control signal input, whereby the internal oscillator is automatically rendered inoperative.

This external tuning facility is especially useful in the carrier frequency test setup incorporating TFPS-42 and TFPM-43, whereby the frequency adjustment of the one instrument automatically effects an identical adjustment to the tuning frequency of the other.

When incorporated in the Sweep Measuring Set WM-1 or WM-3, the signal generator TFPS-42 is tuned by means of a swept control signal derived from either the Sweep Accessory WZ-1 or the Sweep Generator WG-1.

INSTRUCTIONS FOR OPERATION

3.1 Connecting the Signal Generator

The signal generator is designed for 40 to 60 Hz mains operation. The mains voltage required is usually 220 V and is engraved on the front panel. For operation from 110 V mains, the primary windings of the power transformer should be connected in parallel, the fuse should be changed and the inscription altered. This is best done by the instrument supplier.

3.2 Frequency Adjustment

The desired output frequency is selected with the aid of the frequency selector and the frequency dial K 1, leaving the fine-tuning dial K 2 in position 0. The output frequency accuracy is within the range of adjustment accuracy and amounts to $\pm 0.2\% \pm 3\text{ kHz}$.

The fine-tuning dial K 2 permits adjustment of the output frequency setting by $\pm 25\text{ kHz}$ at an accuracy of $\pm 200\text{ Hz}$ or better. Accurate measurements from highly selective circuits such as resonant circuits and filters are thus provided. In addition high-accuracy frequencies may be generated which will differ from a frequency standard by not more than 25 or 50 kHz respectively. To do this, establish an identity of frequencies and then detune the generator frequency by the value desired. In the same way, a much higher reliability of frequency adjustment can be achieved in the range 10 to 25 kHz or 10 to 50 kHz respectively, than would be possible with the coarse scale. Start from the frequency 0 (zero beat) that is readily identified on the meter, and use the fine-tuning dial only to adjust the frequency. If zero beat is adjusted when S 1 is in position +25 kHz and K 2 dial is adjusted to -25 kHz than a range of 50 kHz will be covered at an accuracy of about $\pm 200\text{ Hz}$.

Checking for zero beat is an effective means of testing output frequency accuracy. When the fine-tuning dial K 2 is set to zero, no meter needle deflection should be visible when the coarse setting is again positioned to zero with selector S 1. A closer check of the zero beat is obtained by connecting a headphone to the generator output. If, after prolonged operation, the zero beat no longer coincides with the zero mark of the frequency scale, recalibrate the set. To do this, remove the cover plate marked "FREQ. CAL" and adjust the trimmer capacitor of oscillator II so that zero beat occurs with the frequency scale division 0.

Level Adjustment

Before switching on, check the mechanical zero of the meter needle.

Coarse adjustment of the output level is achieved with switch S 3 and fine adjustment with the control P 1. The true generator level is the sum of the level values indicated by switch S 3 and by the meter. Example: Switch S 3 in position -3 Np and meter reading -0.4 Np result in a generator level -3.4 Np. Example for the dB-version: Switch S 3 in position -30 dB, meter reading -4 dB mean that the generator level is -34 dB. When the output impedance is between 50Ω and 50Ω , a corresponding output impedance is series connected between meter and output. The output voltage then depends on R_L , corresponding to a voltage division between R_L and R_i . Only in the no-load condition ($R_L = \infty$) is the voltage level connected to the output. In the matching condition ($R_L = R_i$), the output voltage is halved, i.e. the output level is decreased by about 6 dB.

Generally the signal generator is connected to the load by a cable. This cable, when it is long and when the output frequency is high, should be terminated for freedom from reflections, otherwise a voltage transformation can take place between generator output and load. Hence, the characteristic impedance Z_o of the cable should correspond to the load impedance R_L and the output impedance R_i or at least to one of them. The most favorable condition is matching ($R_L = R_i = Z_o$) where unavoidable VSWR have the least effect. The meter accuracy is approx. $\pm 2\%$ f.s.d. at 100 kHz output and in switch position 0 dB (0 Np). In all other positions of S 3, the attenuator accuracy 0.1 dB (0.01 Np) becomes effective. The frequency response of the meter and the attenuator is about 0.2 dB (0.02 Np). An additional accuracy range is presented by the distortion coefficient of the amplifier which may rise to as much as 1.5 % for highest generator level and highest frequency. Depending on whether the comparing meter gives a reading of the peak, rms or (selectively) the fundamental frequency value, an additional error may be introduced and have the magnitude of the distortion coefficient.

3.4 Connecting the Load

The voltage transformation on the mismatched cable may assume substantial values at 10 MHz even when the cable is short. The characteristic impedance of the cable should therefore be matched to the load. Coaxial cables are available with characteristic impedances between 50 and 150 Ω . If this requirement cannot be met in certain cases, the cable must be maintained as short as possible. In case of doubt measure the voltage across the load, using a separate level meter.

3.5 Attenuation of Distortion and Interference

The voltage across the amplifier input has a very low harmonic content. The harmonics are 60 to 70 dB (7 to 8 Np) down compared with the fundamental-wave component. The voltage also contains oscillator frequency components, the magnitude which somewhat depends on the amplitude of the oscillator and generator frequencies, respectively. Generally they are attenuated by at least 60 dB (7 Np). The percentage of other combination oscillations and of white noise is still less.

The non-linearity of the amplifier necessarily introduces an additional distortion of the voltage available across the signal output. The attenuation of this distortion depends on the voltage level adjusted, on the load impedance and on the frequency. The harmonics attenuation vs. frequency characteristic is shown in Fig. 2 for the highest output signal level, i.e. +10 dB (1 Np) in 75 Ω . It amounts to approx. 50 dB (5.8 Np) at medium frequencies and is somewhat less at higher and lower frequencies. When a moderate control voltage is applied to the amplifier, the harmonics attenuation will increase, this control voltage is reduced by tuning the control P₁ in counter-clockwise direction, but not if the stepping switch S 3 is operated. Fig. 3 shows the harmonics attenuation distortion as a function of the position of control P₁ (switch S 3 in pos. +10 dB (+1 Np)).

3.6 Amplitude Modulation

Using an external voltage source, the output signal amplitude may be modulated by frequencies from d.c. to greater than 100 kHz. 26 mV are required for each one per cent of the depth of modulation. When the modulating voltage is constant, the depth of modulation will remain constant from d.c. to 20 kHz increasing somewhat towards 100 kHz and decreasing at higher frequencies. The modulating characteristic may be

plotted statically, that is, with a direct voltage across the modulator input, it is also possible to modulate by square-wave keying, i.e. to operate the generator under control of the quantity applied to the modulation jack.

The carrier-voltage component of the output is not affected by a change in the depth of modulation. Proper indication by the built-in meter, however, occurs only when the depth of modulation is zero ($m = 0$).

The distortion coefficient of the modulation (higher-order sidebands) is in most cases less than 3 % when $m = 30\%$ and may increase to about 10 % when $m = 80\%$. For a large depth of modulation it is recommended to turn control P_1 counter-clockwise so that the amplifier can pass the modulating peaks at low distortion.

3.7

Operation with external tuning

To tune the Signal Generator TFPS-42 by means of the Level Meter TFP-43, the control signal output socket Bu 16 is connected to the TFPS-42 control signal input Bu 10. Oscillator I of the level meter then assumes the function of the signal generator oscillator I (see block circuit diagram). Prior to commencing measurement, the signal generator output is connected to the input of the level meter. Maximum needle deflection of the TFP-43 meter is then achieved by adjustment to the fine tuning dial K 2. The test object can then be inserted between generator and level meter. The fine tuning setting must not be changed during the measurement. The sync. condition must be checked from time to time during prolonged measurements or a series of tests.

To provide synchronous tuning of the Level Meter TFP-43 by the Signal Generator TFPS-42, the control signal output at socket Bu 7 of the TFPS-42 is connected to the socket input Bu 18 of TFP-43. Fine tuning, as described above, is also to be undertaken in this case.

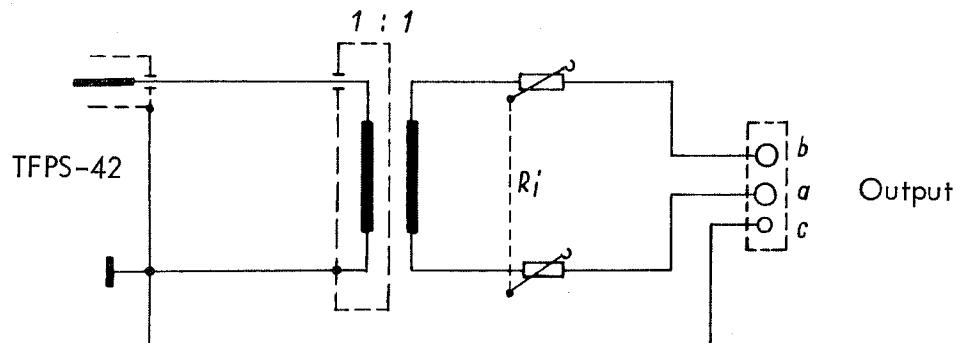
Additional ground leaks are not introduced between the generator and level meter when external tuning is made use of. This is of special importance when testing objects having elevated attenuation figures. Care must thus be taken with such high loss test objects (e.g. in excess of 70 dB (8 Np) that additional ground leaks are not introduced. In critical cases, operation with protective ground or instrument stacking must be avoided. Under extreme conditions the signal generator and the level meter (receiver unit) must be located separately, whereby provision should be made to enable the use of short connecting leads between the receiver unit and the object under test.

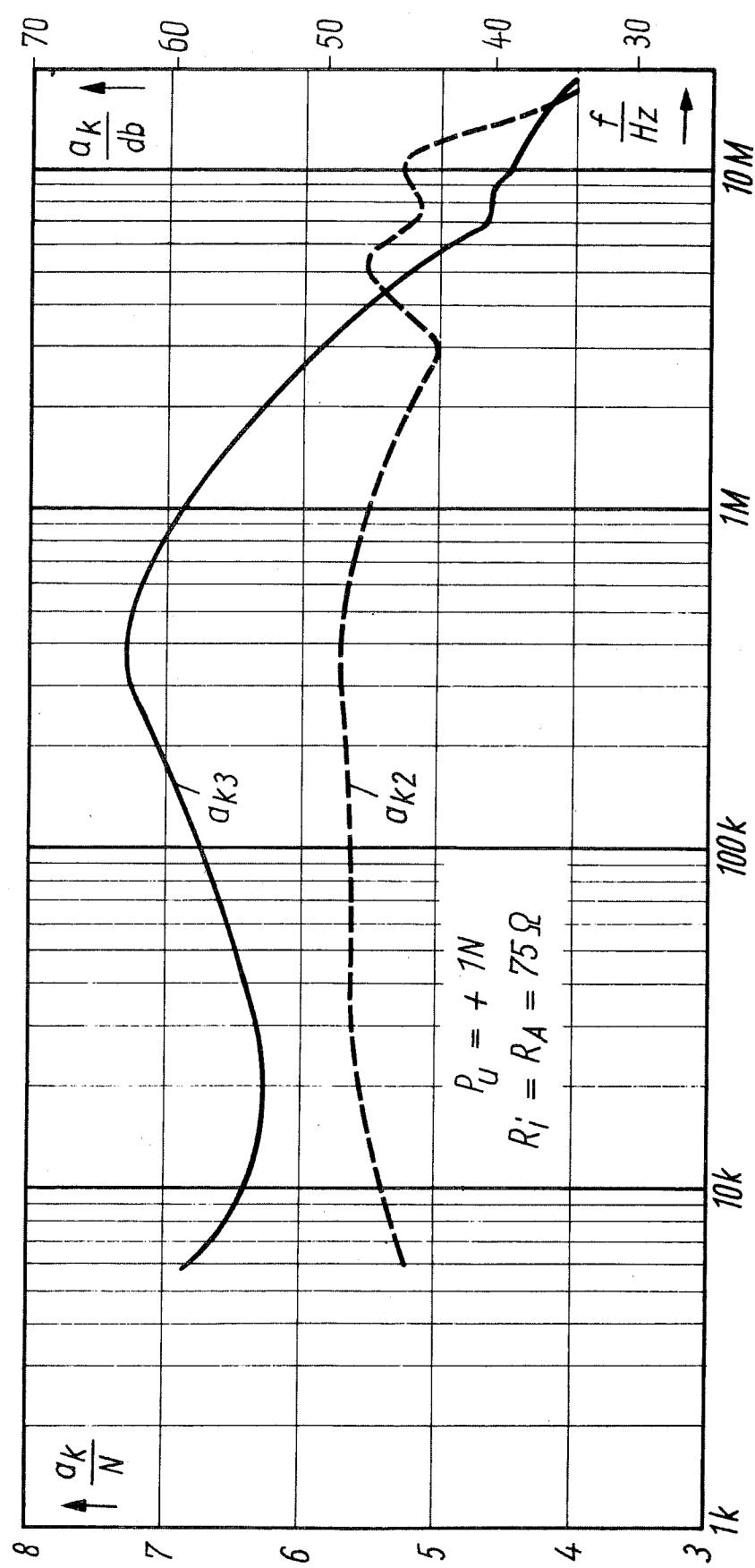
3.8

Unbalanced-to-balanced output transformer SÜ-7031

This device finds application for the provision of a balanced output and for this purpose is inserted into the output socket of the TFPS-42. The output impedance selector S 2 on the generator front panel is then set to zero and the desired output impedance selected with the step switch of the SÜ-7031 transformer.

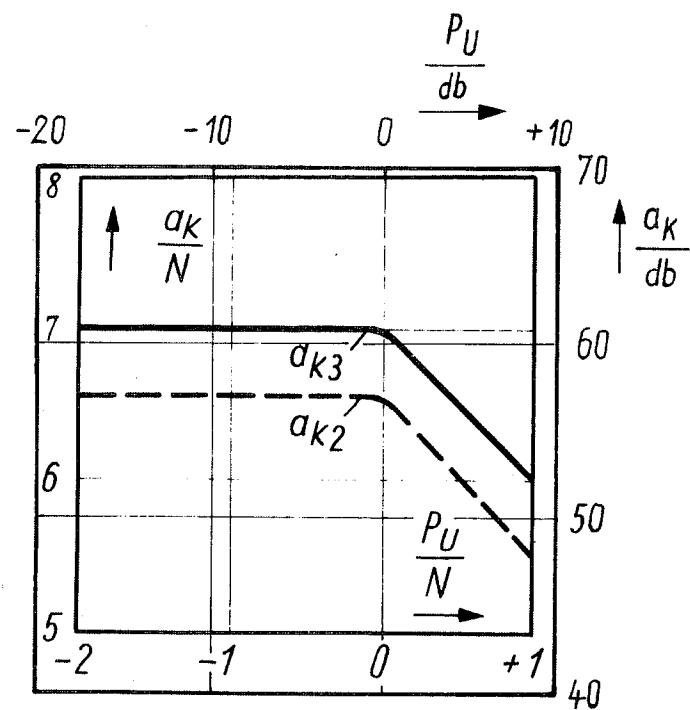
Frequency range	10 kHz to 600 kHz
Transformer ratio	1 : 1
Output impedance, balanced	0, 50, 60, 75 and 150
Frequency response	within $\pm 2\%$
Balance attenuation	min. 40 dB(5 Np)
Dimensions	40 x 70 x 135 mm
Order No.	BN 84/6





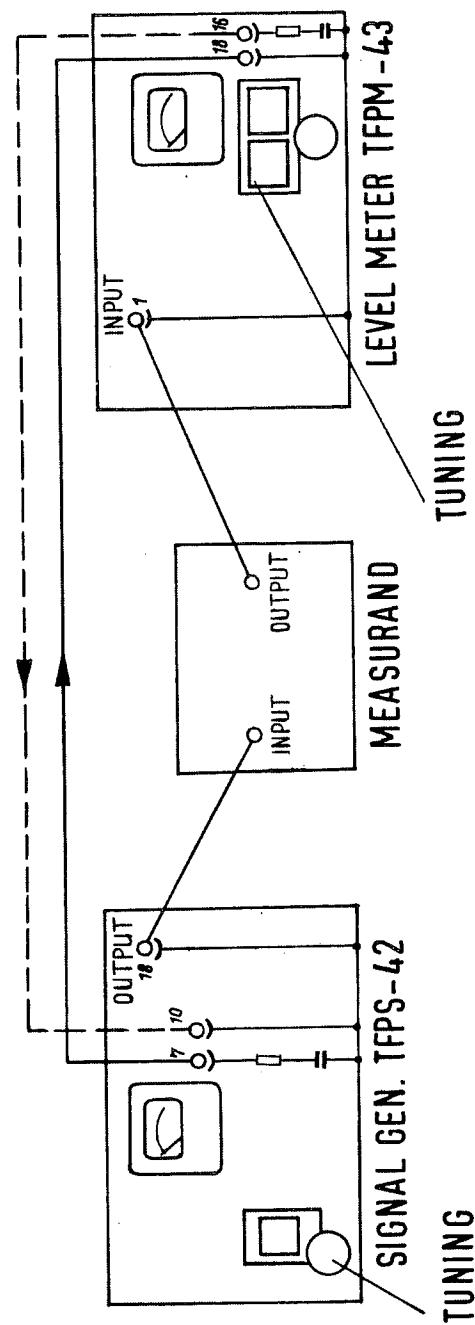
ATTENUATION OF DISTORTION VS. FREQUENCY

Fig. 2



ATTENUATION OF DISTORTION VS. GENERATOR LEVEL P_U FOR $R_i = R_A = 75\Omega$ AND $f = 2 \text{ MC}$

Fig. 3



EXTERNAL CONTROL

Fig. 4

No.	a + feed to ● measure at	b Rated voltage + open ● parallel	c Frequency	d R_i of test voltage or R_i of level meter	e Switch positions S 1 S 2 S 3	f P 1	g Test procedure	h Testing of:
1	● Bu 8 + $\geq 0,9$ V	20-34Mc	150 Ω	-	1-6	-	Diode voltmeter with probe head and parallel resistor.	no. I osc. w/ buffer
2	● Bu 7 + $\geq 0,5$ V	"	75 Ω	"	-	-	-	-
3	● Bu 2 + $\geq 1,1$ V	20 Mc	"	-	-	-	-	no. II osc. w/ buffer
4	● P 1 + ≥ 22 mV (≤ -3.55 N)	100 Kc	≥ 10 k Ω	1	-	-	Adjust generator frequency to 100 kc by no. I osc. Voltage across P 1 should disappear when cable is plugged in jack 12 or 10. Voltage should be present when jack 7 is connected to jack 10.	Amplitude modulator, main modulator, switch buffer
5	+ Bu 12 P 1	250 mV ($\geq -3,65$ N)	20 Mc 100 k Ω	50 Ω ≥ 10 k Ω	1	-	-	Adjust generator frequency to 100 kc by no. I osc.
6	● R 83	● ≥ 67 mV ($\geq -2,45$ N)	100 kc	≥ 10 k Ω	1	-	-	turned on "
7	● R 101	● $\geq 1,2$ V ($\geq +0,42$ N)	"	"	1	-	-	Amplifier I
8	● Bu 18	● $\geq 2,57$ V ($\geq +1,2$ N)	"	≥ 75 Ω	1	+ 1 N 0 + 10 db	"	Amplifier II / Output I
9	● Bu 18	+1N $\pm 0,02$ N +10db $\pm 0,2$ db	"	$75 \Omega \pm 0,2\%$	1	75Ω + 1 N + 10 db	Adjust P 1 to 0 N / 0 db of meter	Level reading
10	● Bu 17	0N $\pm 0,02$ N (0db $\pm 0,2$ db)	"	"	1	-	Adjust P 1 to 0 N / 0 db of meter	Output II

Aligning component

Aligning problem

R 123 Output-level accuracy + 1 N/+ 10 db, $R_i = 75 \Omega$

Generator frequency 100 kc, switch S 2 = 75 Ω , Switch S 3 = + 1 N/+ 10 db, connect calibrating level meter of $R_i = 75 \Omega \pm 0,2\%$ to no. 1 OUTPUT, adjust reading of cal. level meter to exactly + 1 N/+ 10 db by control P 1. Adjust by R 123 generator-level reading on meter M 1 to zero reading (exact 0).

Dismount no. 1 osc. Remove cover plate, no. 1 osc. is mounted on front panel. S 1 = range 0.01 to 1.3 Mc. Adjust C 50 to scale reading 0 c/s. Test oscillator frequency at CONTROL OUT and adjust to exactly 20 Mc by L 13.

Adjust generator frequency to 0 c/s by no. 1 osc. (C 50). Fully turn on generator level at P 1. Adjust no. 2 osc. to 0 c/s by FINE TUNING scale. Adjust by C 14 to minimum generator-level reading.

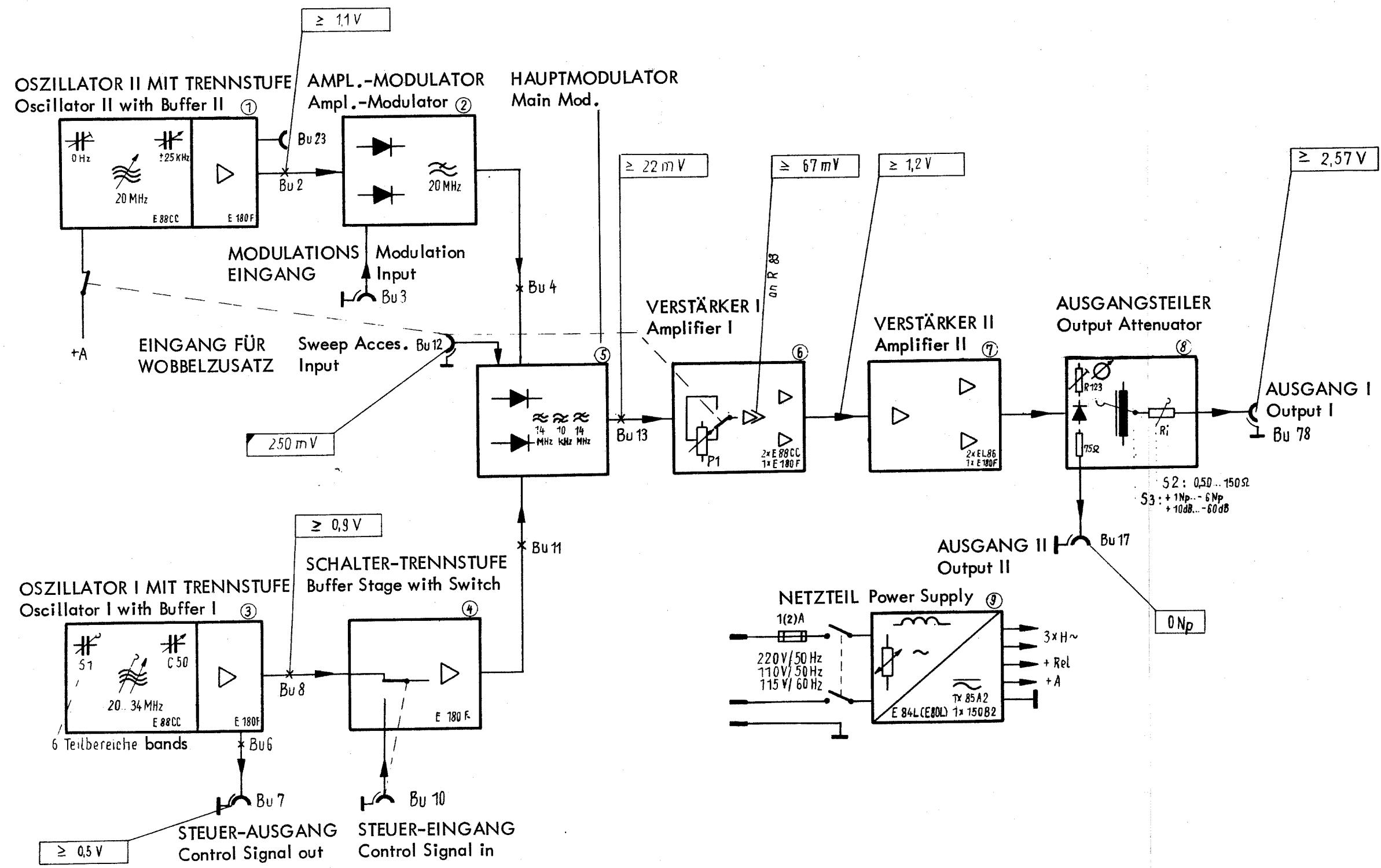
Aligning procedure

Generator frequency 100 kc, switch S 2 = 75 Ω , Switch S 3 = + 1 N/+ 10 db, connect calibrating level meter of $R_i = 75 \Omega \pm 0,2\%$ to no. 1 OUTPUT, adjust reading of cal. level meter to exactly + 1 N/+ 10 db by control P 1. Adjust by R 123 generator-level reading on meter M 1 to zero reading (exact 0).

Dismount no. 1 osc. Remove cover plate, no. 1 osc. is mounted on front panel. S 1 = range 0.01 to 1.3 Mc. Adjust C 50 to scale reading 0 c/s. Test oscillator frequency at CONTROL OUT and adjust to exactly 20 Mc by L 13.

Adjust generator frequency to 0 c/s by no. 1 osc. (C 50). Fully turn on generator level at P 1. Adjust no. 2 osc. to 0 c/s by FINE TUNING scale. Adjust by C 14 to minimum generator-level reading.

VOLTAGE CHART AND DIRECTIONS FOR ALIGNMENT
REFER TO BLOCK DIAGRAM



NR. DER SCHALTBILDER
Indicates Circuit Dia. No.

(1) ... (9)

feed einspeisen

Nähere Angaben
siehe Spannungs-
fahrplan

measure messen

See Test and Alignm.
Chart for Voltage Details

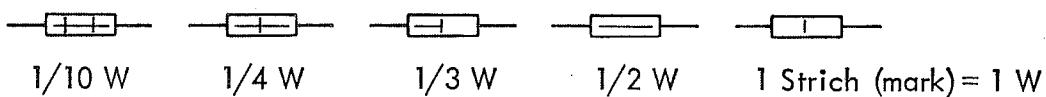
TFPS - 42 / BN 84
Blockschatzplan
Block Circuit Diagram

Anmerkungen zu den Stromlaufplänen (Circuit Diagram Details)

Alle angegebenen Spannungen sind mit einem Instrument $100 \text{ k}\Omega/\text{V}$ gegen 0 V gemessen
(All voltage ratings measured with respect to 0 V with $100 \text{ k}\Omega/\text{V}$ meter)

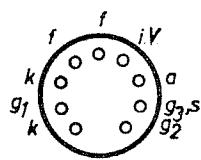
Relais in Ruhestellung
(Relays shown non-excited)

Belastbarkeit der Widerstände (Resistor Ratings)

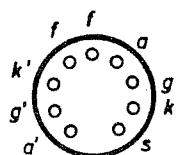


Anschlußschemas (Connection Details)

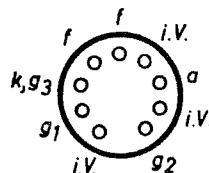
E 180 F



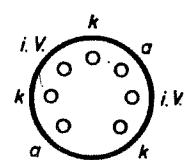
E 88 CC



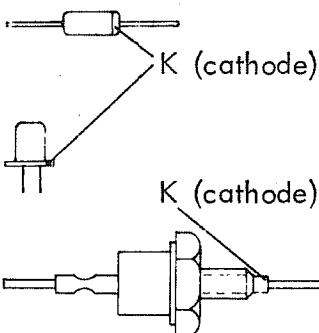
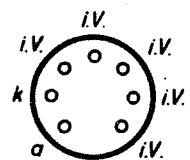
EL 86 u. E84 L



85 A 2

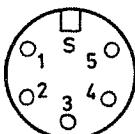


150 B 2



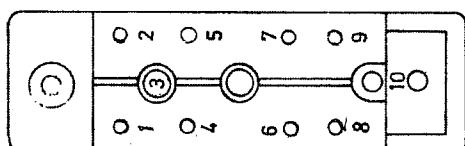
1 N 82, OA 126/14, OA 150, OA 159, OA 160

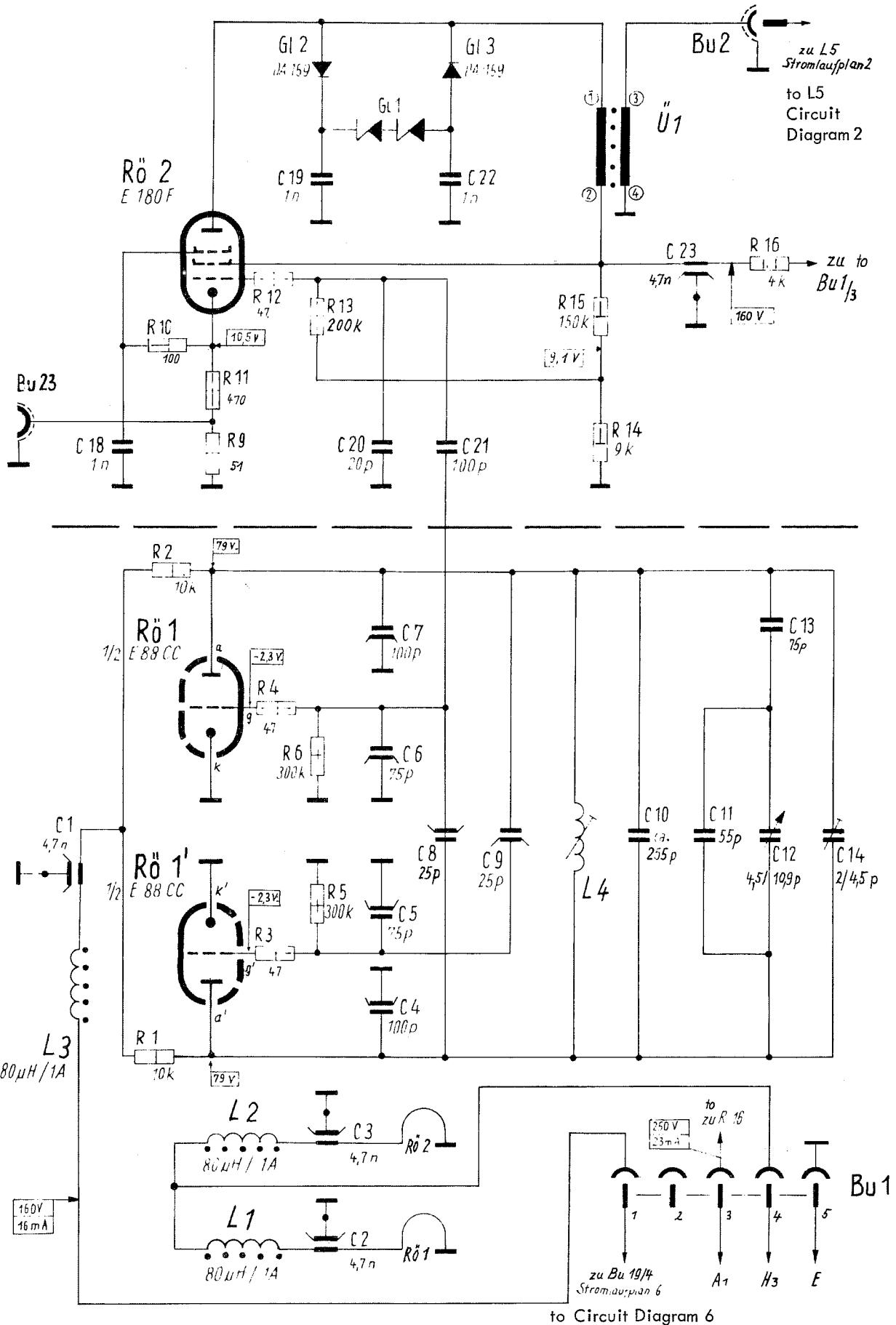
Z 8, Z 10, FD 7



Speisespannungen (Supply voltages)

Bu 14 (Buchsenleiste)
auf Lötseite gesehen

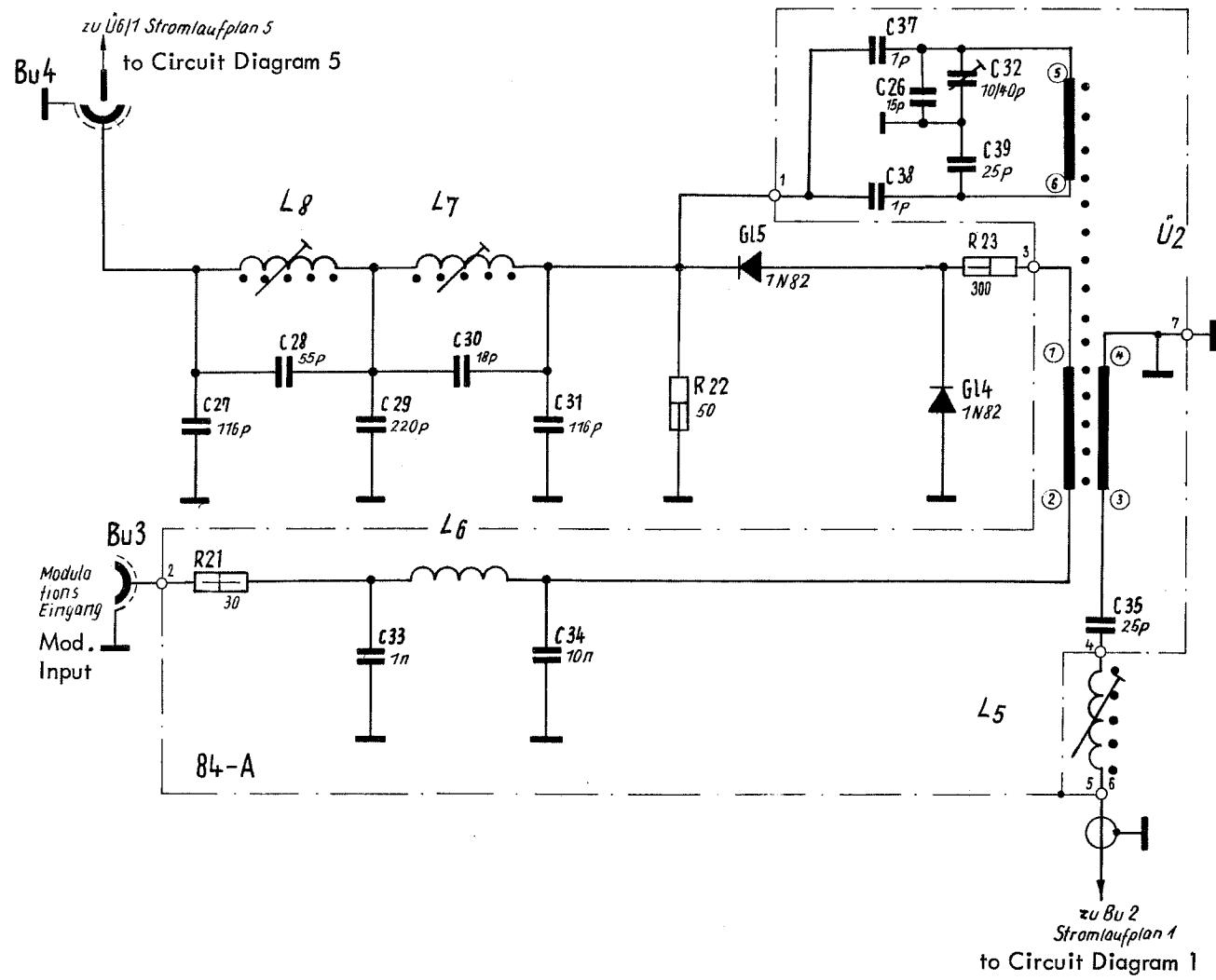




TFPS - 42 / BN 84

Oszillator II mit Trennstufe II

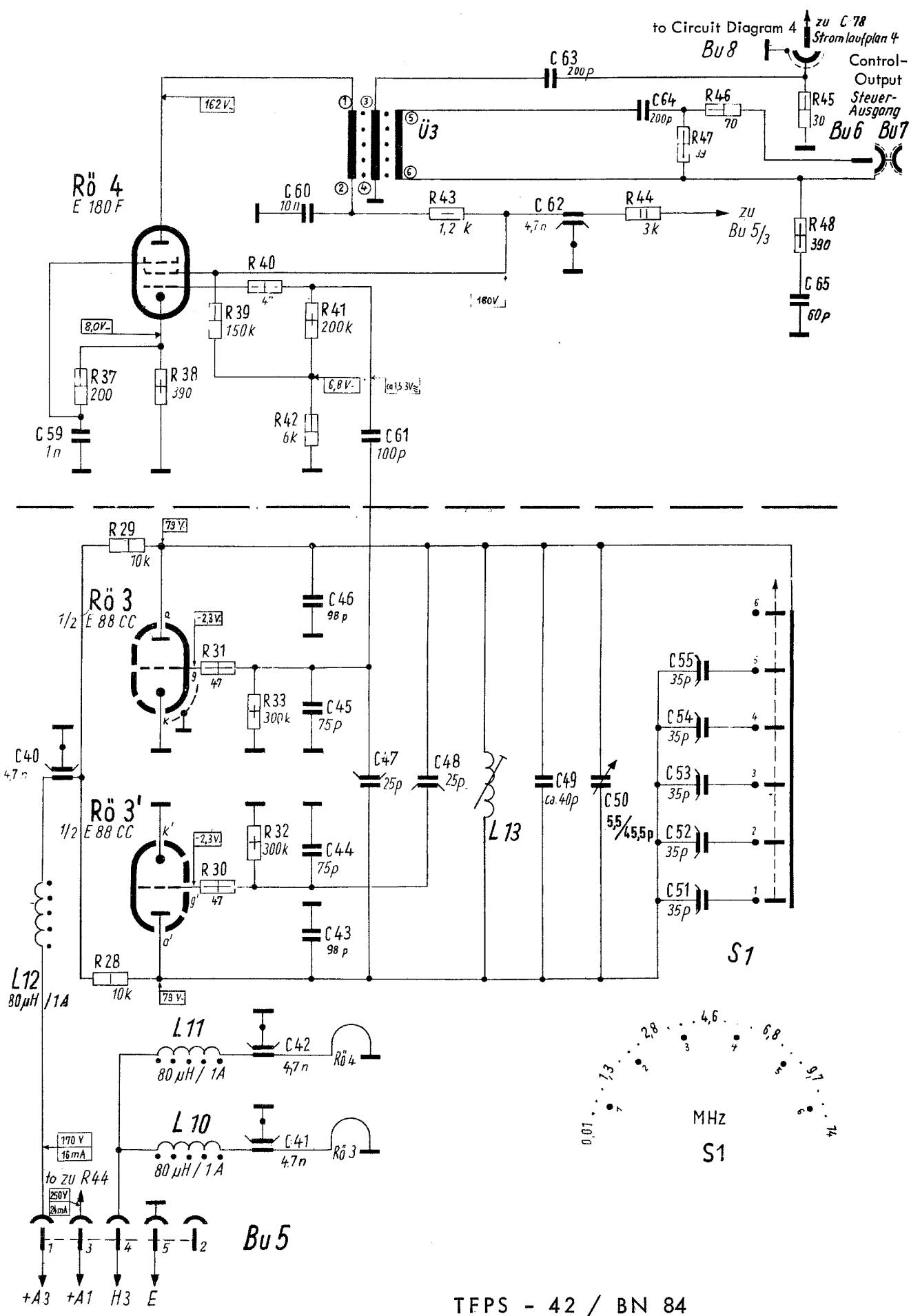
Oscillator II with Buffer-stage II



TFPS - 42 / BN 84

Amplitudens-Modulator (2)

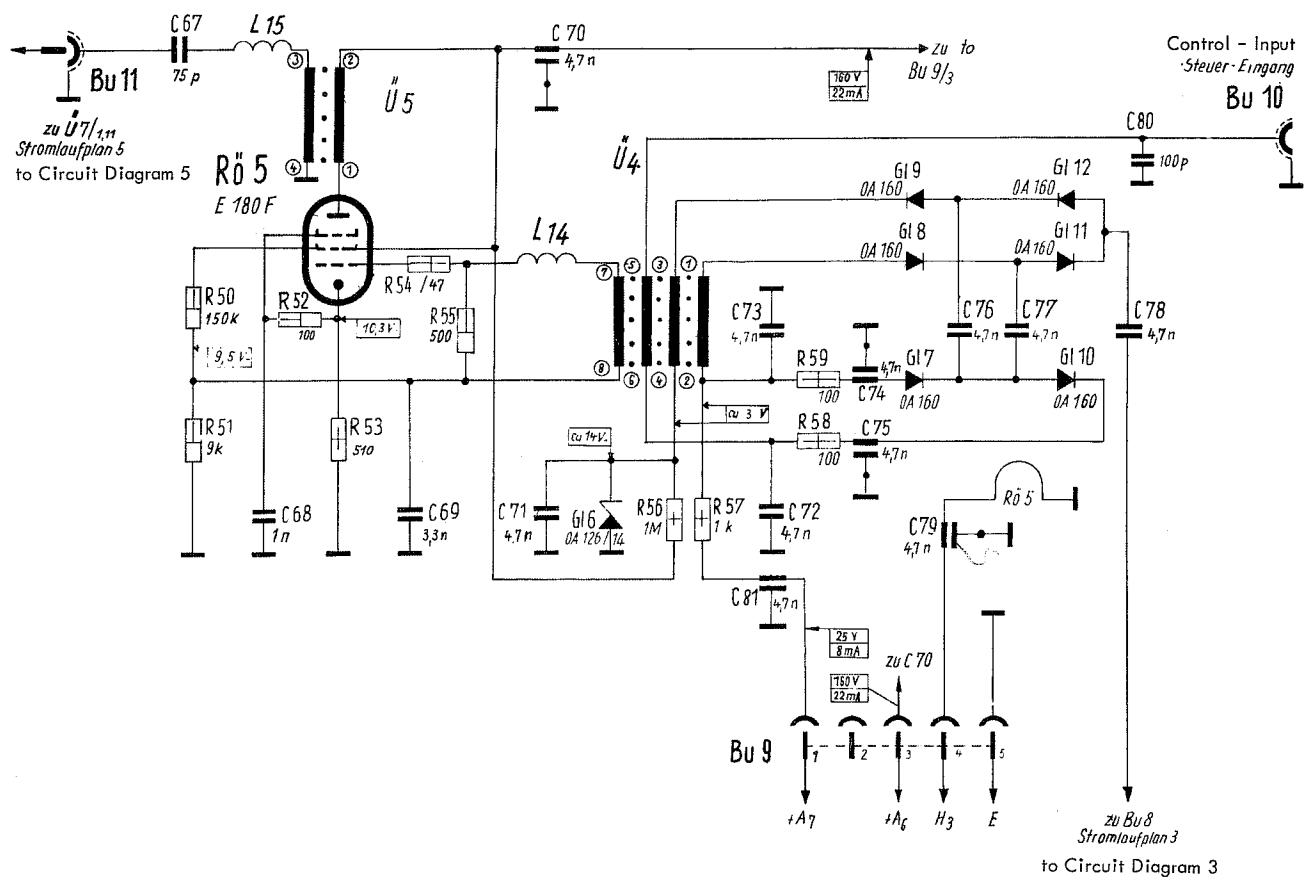
Amplitude - Modulator



TFPS - 42 / BN 84

Oszillator I mit Trennstufe I 3

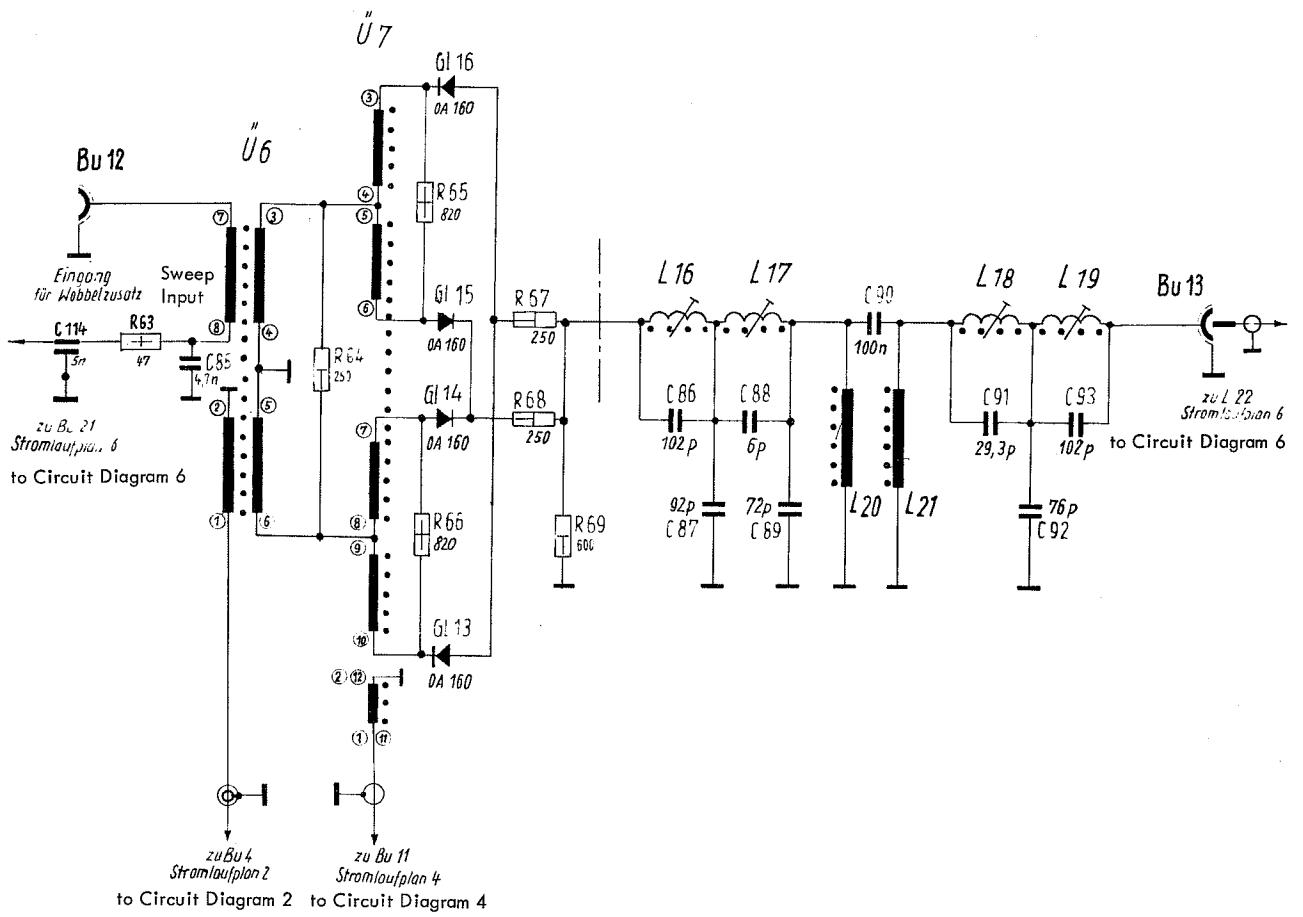
Oscillator I with Buffer-stage I



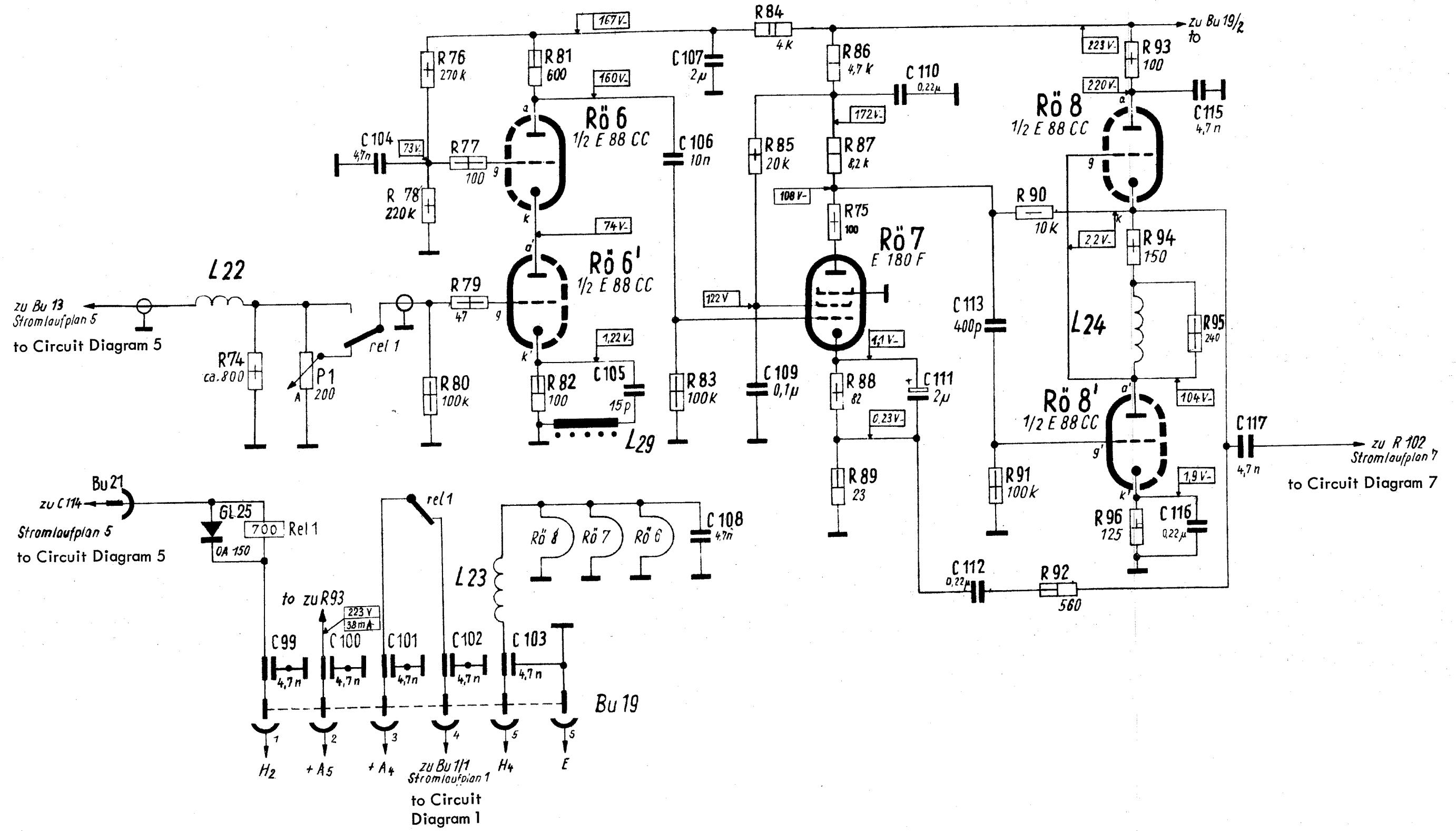
TFPS - 42 / BN 84

Schaltertrennstufe 20 MHz bis 34 MHz 4

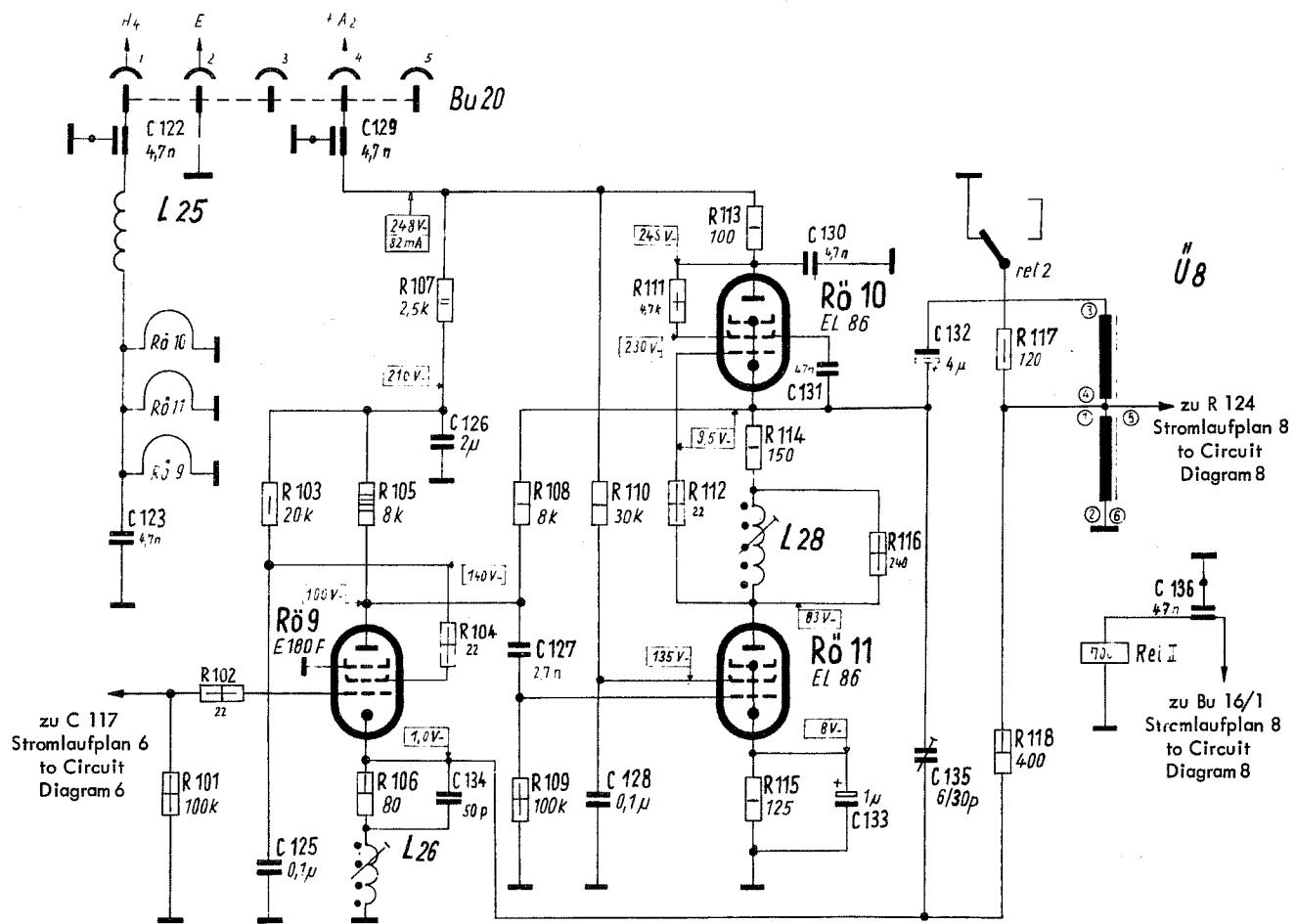
Buffer Stage with Switch 20 MHz to 34 MHz



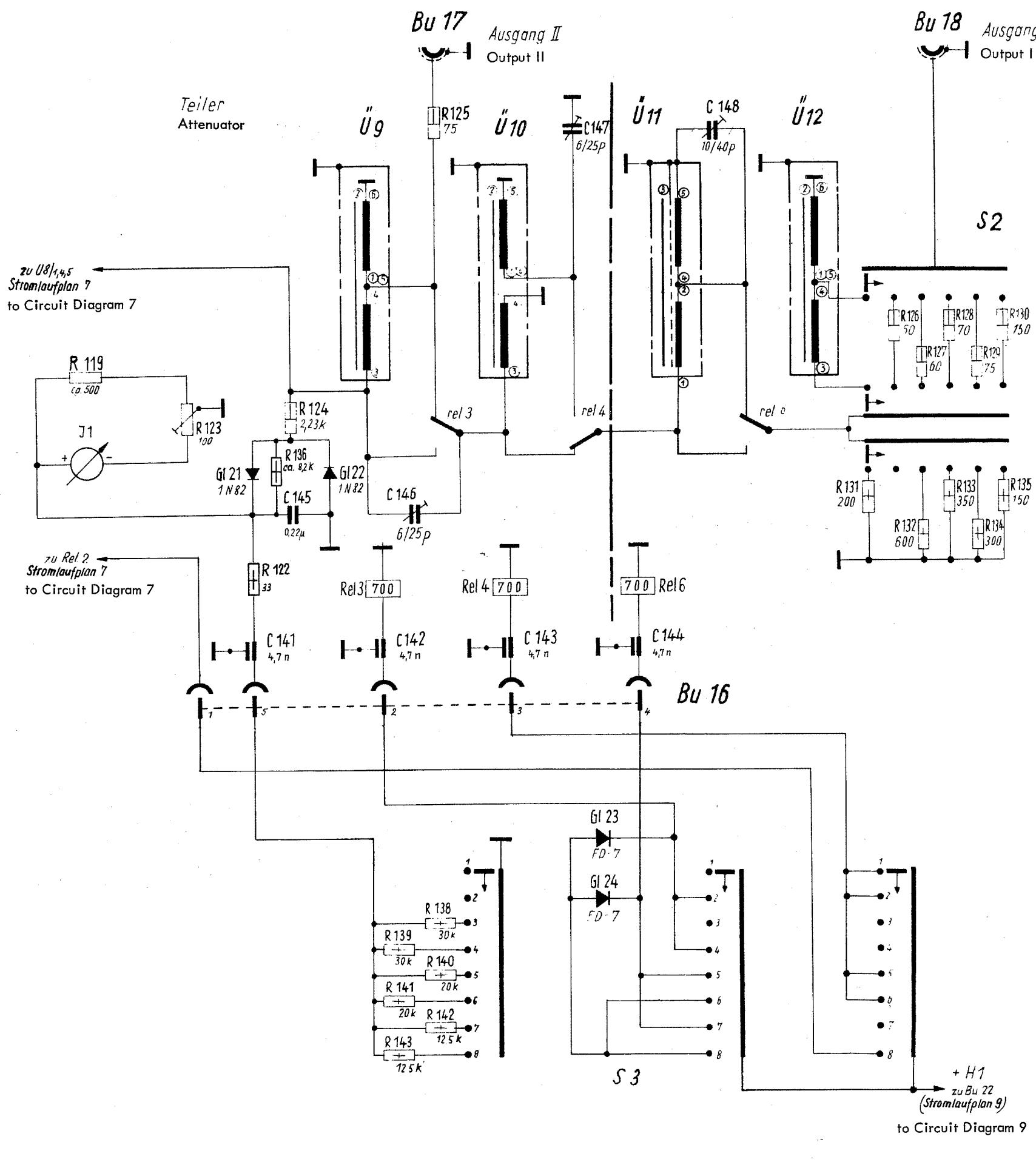
TFPS - 42 / BN 84
Hauptmodulator (5)
 Main Modulator



TFPS - 42 / BN 84
Verstärker I (6)
Amplifier I

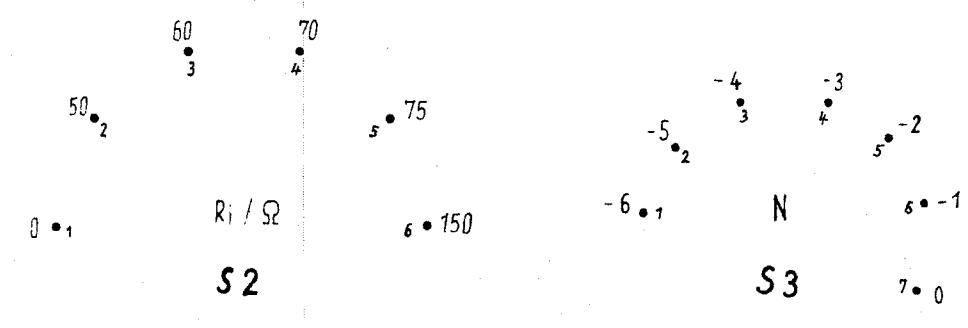
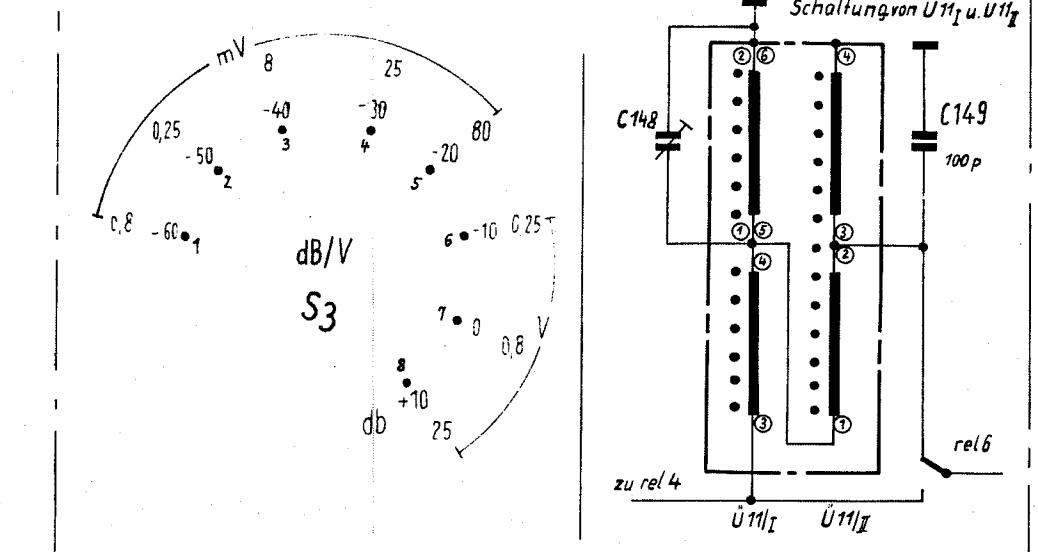


TFPS - 42 / BN 84
 Verstärker II (7)
 Amplifier II



Änderungen bei dB/V-Ausführung:
Modifications for dB/V version

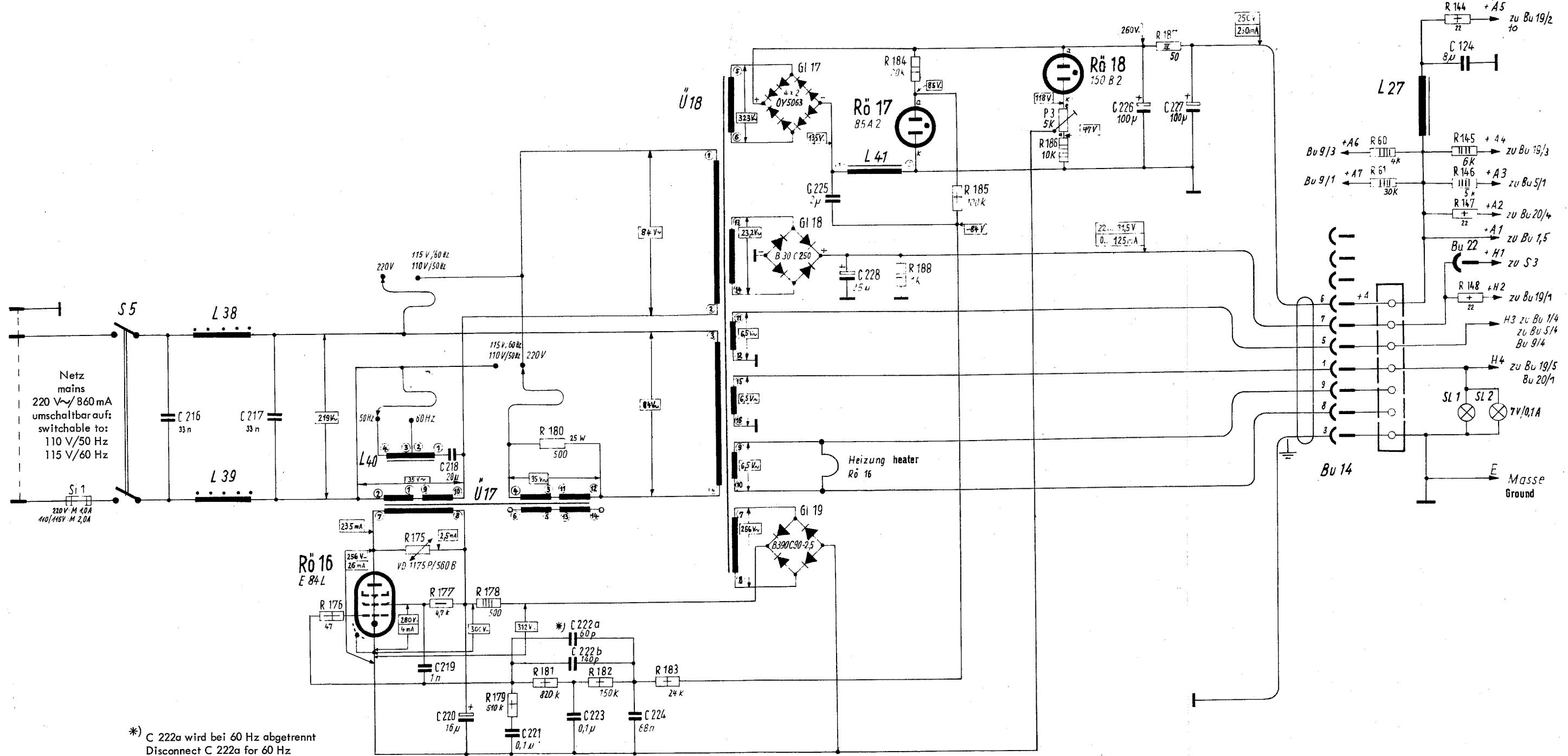
- 1) R 138, 139, ..., 143 entfallen (deleted)
- 2) R 124 : 2,4 kΩ / 0,33 W / 1 %
- 3) Trimmer C 146 : 3/12 pF
- 4) Trimmer C 147 : 10/40 pF
- 5) C 149 : 100 pF / 500 V / 2 %



TFPS - 42 / BN 84

Teiler (Np und dB Ausführung) (8)

Attenuator (Np and dB version)



SCHALTTEIL - LISTE (Parts-List)

TFPS 42

Widerstände (Resistors)

R 1, 2	10 kΩ	1 W	5 %
R 3, 4	47 Ω	0,25 W	5 %
R 5, 6	300 kΩ	0,25 W	5 %
R 9	51 Ω	0,1 W	5 %
R 10	100 Ω	0,33 W	1 %
R 11	450 Ω	0,25 W	5 %
R 12	47 Ω	0,25 W	5 %
R 13	200 kΩ	0,25 W	5 %
R 14	9 kΩ	0,33 W	1 %
R 15	150 kΩ	0,25 W	1 %
R 16	4 kΩ	4 W	10 % Draht (wire)
R 21	30 Ω	0,25 W	5 %
R 22	50 Ω	0,33 W	1 %
R 23	300 Ω	0,33 W	1 %
R 28, 29	10 kΩ	1 W	5 %
R 30, 31	47 Ω	0,25 W	5 %
R 32, 33	300 kΩ	0,25 W	5 %
R 37	200 Ω	0,33 W	1 %
R 38	390 Ω	0,25 W	5 %
R 39	150 kΩ	0,33 W	1 %
R 40	47 Ω	0,25 W	5 %
R 41	200 kΩ	0,25 W	5 %
R 42	6 kΩ	0,33 W	1 %
R 43	1,2 kΩ	0,5 W	5 %
R 44	3 kΩ	2 W	10 % Draht (wire)
R 45	30 Ω	0,33 W	1 %
R 46	70 Ω	0,33 W	1 %
R 47	39 Ω	0,25 W	5 %
R 48	390 Ω	0,25 W	5 %
R 50	150 kΩ	0,33 W	1 %
R 51	9 kΩ	0,33 W	1 %
R 52	100 Ω	0,33 W	1 %
R 53	510 Ω	0,25 W	5 %
R 54	47 Ω	0,25 W	5 %
R 55	500 Ω	0,33 W	1 %
R 56	1 MΩ	0,25 W	5 %
R 57	1 kΩ	0,25 W	5 %
R 58, 59	100 Ω	0,1 W	5 %
R 60	4 kΩ	4 W	10 % Draht (wire)
R 61	{ 56 Ω	2 W	5 %
	{ 68 kΩ	2 W	5 %
R 63	47 Ω	0,25 W	5 %
R 64	250 Ω	0,33 W	1 %
R 65, 66	820 Ω	0,25 W	5 %.

R 67, 68	250 Ω	0,33 W	1 %	
R 69	600 Ω	0,33 W	1 %	
R 74	800 Ω	0,5 W		Abgleichwert
R 75	100 Ω	0,25 W	5 %	
R 76	270 k Ω	0,25 W	5 %	
R 77	100 Ω	0,25 W	5 %	
R 78	220 k Ω	0,25 W	5 %	
R 79	47 Ω	0,1 W	5 %	
R 80	100 k Ω	0,25 W	5 %	
R 81	600 Ω	0,33 W	1 %	
R 82	100 Ω	0,33 W	1 %	
R 83	100 k Ω	0,25 W	5 %	
R 84	4 k Ω	2 W	10 %	Draht (wire)
R 85	20 k Ω	0,25 W	5 %	
R 86	4,7 k Ω	1 W	5 %	
R 87	8,2 k Ω	1 W	5 %	
R 88	82 Ω	0,25 W	5 %	
R 89	23 Ω	0,33 W	1 %	
R 90	10 k Ω	0,5 W	1 %	
R 91	100 k Ω	0,1 W	5 %	
R 92	560 Ω	0,33 W	1 %	
R 93	100 Ω	0,25 W	5 %	
R 94	150 Ω	0,25 W	5 %	
R 95	240 Ω	0,25 W	5 %	
R 96	125 Ω	0,33 W	1 %	
R 101	100 k Ω	0,25 W	5 %	
R 102	22 Ω	0,25 W	5 %	
R 103	20 k Ω	0,5 W	5 %	
R 104	22 Ω	0,25 W	5 %	
R 105	8 k Ω	4 W	10 %	Draht (wire)
R 106	80 Ω	0,33 W	1 %	
R 107	2,5 k Ω	2 W	10 %	Draht (wire)
R 108	8 k Ω	1 W	1 %	
R 109	100k Ω	0,25 W	5 %	
R 110	30 k Ω	1 W	5 %	
R 111	4,7 k Ω	0,25 W	5 %	
R 112	22 Ω	0,25 W	5 %	
R 113	100 Ω	1 W	5 %	
R 114	150 Ω	1 W	5 %	
R 115	125 Ω	1 W	1 %	
R 116	240 Ω	0,25 W	5 %	
R 117	120 Ω	0,5 W	5 %	
R 118	400 Ω	0,33 W	1 %	
R 119	ca. 500 Ω	in J 1 eingebaut		Cu-Widerstand
R 122	33 Ω	0,25 W	5 %	
R 123	100 Ω	2,5 W		Potentiometer
R 124	2,23 k Ω	0,33 W	1 %	
R 125	75 Ω	0,33 W	1 %	
R 126	50 Ω	0,33 W	1 %	

R 127	60 Ω	0,33 W	1 %	
R 128	70 Ω	0,33 W	1 %	
R 129	75 Ω	0,33 W	1 %	
R 130	150 Ω	0,33 W	1 %	
R 131	200 Ω	0,25 W	5 %	
R 132	600 Ω	0,33 W	1 %	
R 133	350 Ω	0,33 W	1 %	
R 134	300 Ω	0,25 W	5 %	
R 135	150 Ω	0,25 W	5 %	
R 136	8,2 k Ω	0,25 W	5 %	Abgleichwert (Nominal value)
R 138, 139	30 k Ω	0,25 W	5 %	
R 140, 141	20 k Ω	0,25 W	5 %	
R 142, 143	12,5 k Ω	0,33 W	1 %	
R 144	22 Ω	0,25 W	5 %	
R 145	6 k Ω	4 W	10 %	Draht (wire)
R 146	5 k Ω	4 W	10 %	Draht (wire)
R 147, 148	22 Ω	0,25 W	5 %	
R 175	E 299 AG/P 348			VDR-Widerst. Valvo
R 176	47 Ω	0,25 W	5 %	
R 177	4,7 k Ω	0,5 W	5 %	
R 178	500 Ω	4 W	10 %	Draht (wire)
R 179	510 k Ω	0,25 W	5 %	
R 180	500 Ω	25 W	5 %	Draht (wire)
R 181	820 k Ω	0,25 W	5 %	
R 182	150 k Ω	0,25 W	5 %	
R 183	24 k Ω	0,25 W	5 %	
R 184	10 k Ω	1 W	5 %	
R 185	100 k Ω	0,25 W	5 %	
R 186	10 k Ω	4 W	10 %	Draht (wire)
R 187	50 Ω	4 W	10 %	Draht (wire)
R 188	1 k Ω	2 W	10 %	Draht (wire)

Potentiometer

P 1	200 Ω , lin	0,25 W	
P 3	5 k Ω lin		10 %

Kondensatoren (Capacitors)

C 1, 2, 3	4,7 nF	500 V		
C 4	100 pF	500 V	$\pm 1 \%$	Keram.
C 5, 6	75 pF	500 V	$\pm 1 \%$	Keram.
C 7	100 pF	500 V	$\pm 1 \%$	Keram.
C 8	25 pF	500 V	$\pm 1 \%$	Keram.
C 9	25 pF	500 V	$\pm 1 \%$	Keram.
C 10	{ 3 x 70 pF 40 pF 0/20 pF	500 V	$\pm 2 \%$ $\pm 2,5 \%$	Keram. } ca. 255 pF

C 11	55 pF	500 V	$\pm 2 \%$	Keram.
C 12	4,5/10,9 pF			Trimmer
C 13	75 pF	500 V	$\pm 2 \%$	Keram.
C 14	2/4,5 pF			Trimmer
C 18, 19	1 nF	500 V	$\pm 20 \%$	Keram.
C 20	20 pF	500 V	$\pm 10 \%$	Keram.
C 21	100 pF	500 V	$\pm 10 \%$	Keram.
C 22	1 nF	500 V	$\pm 20 \%$	Keram.
C 23	4,7 nF	500 V		Keram.
C 26	15 pF	500 V	$\pm 5 \%$	Keram.
C 27	116 pF	500 V	$\pm 1 \%$	Keram.
C 28	55 pF	500 V	$\pm 1 \%$	Keram.
C 29	220 pF	500 V	$\pm 1 \%$	Keram.
C 30	18 pF	500 V	$\pm 2 \%$	Keram.
C 31	116 pF	500 V	$\pm 1 \%$	Keram.
C 32	10/40 pF			Trimmer
C 33	1 nF	500 V	$\pm 20 \%$	Keram.
C 34	10 nF	500 V	$+50/-20 \%$	Keram.
C 35	25 pF	500 V	$\pm 2 \%$	Keram.
C 37, 38	1 pF	500 V	$\pm 0,25$	Keram.
C 39	25 pF	500 V	$\pm 2 \%$	Keram.
C 40, 41, 42	4,7 nF	500 V		Keram.
C 43	2x49 pF	500 V	$\pm 2,5 \%$	Keram.
C 44, 45	75 pF	500 V	$\pm 1 \%$	Keram.
C 46	2x49 pF	500 V	$\pm 2,5 \%$	Keram.
C 47, 48	25 pF	500 V	$\pm 2,5 \%$	Keram.
C 49	{ 40 pF 0/10 pF	500 V	$\pm 5 \%$	Keram.
C 50	5,5/45,5 pF			Trimmer
C 51, 52	35 pF	500 V	$\pm 1 \%$	Keram.
C 53, 54, 55	35 pF	500 V	$\pm 2,5 \%$	Keram.
C 59	1nF	500 V	$\pm 20 \%$	Keram.
C 60	10 nF	500 V	$+50/-20 \%$	Keram.
C 61	100 pF	500 V	$\pm 10 \%$	Keram.
C 62	4,7 nF	500 V		Keram.
C 63, 64	200 pF	500 V	$\pm 2 \%$	Keram.
C 65	60 pF	500 V	$\pm 10 \%$	Keram.
C 67	75 pF	500 V	$\pm 5 \%$	Keram.
C 68	1 nF	500 V	$\pm 20 \%$	Keram.
C 69	3,3 nF	500 V	$\pm 20 \%$	Keram.
C 70, 71, ..., 79	4,7 nF	500 V	$+50/-20 \%$	Keram.
C 80	100 pF	500 V	$\pm 2 \%$	Keram.
C 81, 85	4,7 nF	500 V	$+50/-20 \%$	Keram.
C 86	102 pF	500 V	$\pm 1 \%$	Keram.
C 87	92 pF	500 V	$\pm 1 \%$	Keram.
C 88	6 pF	500 V	$\pm 0,5$	Keram.
C 89	72 pF	500 V	$\pm 1 \%$	Keram.
C 90	0,1 μ F	125 V	$\pm 2 \%$	Kunst.folie (plastic-foil)

C 91	29,3 pF	500 V	$\pm 2 \%$	Keram.
C 92	76 pF	500 V	$\pm 1 \%$	Keram.
C 93	102 pF	500 V	$\pm 1 \%$	Keram.
C 99, 100,... 104	4,7 nF	500 V	+50/-20 %	Keram.
C 105	15 pF	500 V	$\pm 20 \%$	Keram.
C 106	10 nF	500 V	+50/-20 %	Keram.
C 107	2 μ F	250 V		MP
C 108	4,7 nF	500 V	+50/-20 %	Keram.
C 109	0,1 μ F	400 V		Kunst.Folie (plastic-foil)
C 110	0,25 μ F	630 V		Kunst.Folie (plastic-foil)
C 111	2 μ F	15 V		Elko
C 112	0,25 μ F	250 V		Kunst.Folie (plastic-foil)
C 113	400 pF	500 V	$\pm 20 \%$	Keram.
C 114, 115	5 nF	500 V	+50/-20 %	Keram.
C 116	0,22 μ F	250 V		Kunst.Folie (plastic-foil)
C 117, 122, 123	4,7 nF	500 V	+50/-20 %	Keram.
C 124	8 μ F	400 V		MP
C 125	0,1 μ F	400 V		Kunst.Folie (plastic-foil)
C 126	2 μ F	250 V		MP
C 127	2,7 nF	500 V	$\pm 20 \%$	Keram.
C 128	0,1 μ F	400 V		Kunst.Folie (plastic-foil)
C 129, 130	4,7 nF	500 V	+50/-20 %	Keram.
C 131	0,047 μ F	400 V		Kunst.Folie (plastic-foil)
C 132	4 μ F	250 V		Elko
C 133	1 μ F	35 V		Elko
C 134	50 pF	500 V	$\pm 2 \%$	Keram.
C 135	6/30 pF			Trimmer
C 136, 141,... 144	4,7 nF	500 V	+50/-20 %	Keram.
C 145	0,22 μ F	250 V		Kunst.Folie (plastic-foil)
C 146, 147	6/25 pF			Trimmer
C 148	10/40 pF			Trimmer
C 216, 217	33 nF	1000 V		
C 218	20 μ F	250 V	$\pm 10 \%$	MP
C 219	1 nF	1000 V		
C 220	16 μ F	450 V		
C 221	0,1 μ F	250 V		Elko
C 222 a	{ 60 pF	500 V	$\pm 2 \%$	Nennwert: 200 pF (Nominal value)
C 222 b	{ 140 pF	500 V	$\pm 2 \%$	
C 223	0,1 μ F	250 V		
C 224	68 nF	400 V		
C 225	2 μ F	250 V		MP
C 226, 227	100 μ F	350 V		Elko
C 228	25 μ F	70 V		Elko

Röhren (Tubes)

Rö 1	E 88 CC	Telefunken
Rö 2	E 180 F	Telefunken
Rö 3	E 88 CC	Telefunken
Rö 4, 5	E 180 F	Telefunken
Rö 6	E 88 CC	Telefunken
Rö 7	E 180 F	Telefunken
Rö 8	E 88 CC	Telefunken
Rö 9	E 180 F	Telefunken
Rö 10, 11	EL 86	Telefunken
Rö 16	E 84 L	Siemens
Rö 17	85 A 2	Valvo
Rö 18	150 B 2	Valvo

Dioden

GI 1	Z 10 u. Z 8	18 V±0,5 V	Intermetall
GI 2, 3	OA 159		Telefunken
GI 4, 5	1 N 82		Sylvania
GI 6	OA 126/14		Telefunken
GI 7, 8, ..., 16	OA 160		Telefunken
GI 17	8x OY 5063		Intermetall
GI 18	B 30 C 250		Siemens
GI 19	B 390 C 90 - 2,5		Siemens
GI 21, 22	1 N 82		Sylvania
GI 23, 24	FD 7		Intermetall
GI 25	OA 150		Telefunken

Lampen (Lamps)

SL 1, 2 7 V/0,1 A im Instrument eingebaut

Sicherungen (Fuses)

Si 1 für 110/115 V: M 2,0 D
 für 220 V: M 1,0 C