

Amplifier TV-450
450 W output

Operating Manual

BN 0846/00.82

Wandel & Goltermann
Audio Communication



Amplifier TV 450

BN 0846, Series V...

Operating Manual

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Audio Communication



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1 Introduction

The TV-450 is a fully transistorized AF amplifier for sound reinforcement systems. It has 450 W output power and comprises the Pre-amplifier VV-450, BN 0846/10 or BN 0846/21, plus the separate Final Amplifier TE-450, BN 0846/03. The TV-450 is applicable overall where a mobile loudspeaker system satisfying high demands for power, reliability, low weight and small dimensions is needed.

For those reasons, the TV-450 is especially suitable for use in helicopters. This is also due to the pre-amplifier's design; it has the operating controls and can be mounted with an easy range of the pilot. A connection to the aircraft's intercommunication system permits issuing instructions via the helmet microphone to individual stations on board. The Pre-amplifier VV-450 is designed to match the input of most of the intercoms used in aircrafts.

Announcements made without using the aircraft's equipment are possible with the special extremely low feedback hand microphone MN 513 HS 5. The microphone has a short-circuit push-to-talk button, or is available with a switching cable for remote control.

The TE-450 Final Amplifier may be installed at any convenient location in a vehicle. It is easily placed in the helicopter's storage space where the center of gravity is taken into account.

The transistorized amplifier is protected against false polarity being applied, it is open-circuit proof and is electronically protected against short-circuits and excess temperature. If the temperature is too high, the protective circuit removes the drive signal to the Final Amplifier and after the temperature drops, the drive signal is restored.

A sound reinforcement loudspeaker system for example comprises:

- 1 ea Pre-amplifier VV-450, BN 0846/10 or 0846/21,
- 1 ea Final Amplifier TE-450, including linkage for battery cable, BN 0846/03,
- 2 ea Compression loudspeakers HLU-100 including connection cable,
- 1 ea Hand Microphone MN 513 HS 5,
- 1 ea Interconnecting cable ZK-450, BN K-2011 or BN K-2012.

2 Operation

2.1 Mounting in Helicopter

2.1.1 VV-450 Pre-amplifier

The pre-amplifier is intended to be mounted so that both the pilot and the co-pilot can reach it easily for controlling the volume by means of the slide actuated potentiometer. It is advantageous to mount the pre-amplifier on the cabin ceiling or between the two front seats. Any convenient mounting position is possible for operation. The mounting dimensions are shown in figures 2.1-1 and 2.1-2 for the different versions of the VV-450. Four screws should be used for fastening, and the volume control should be protected against damage when the amplifier is fastened to the aircraft cabin.

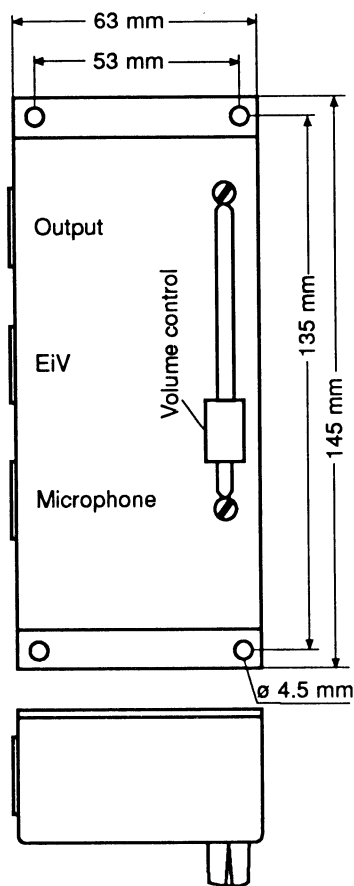


Fig. 2.1-1
Dimensions VV-450 (standard)
BN 0846/10
Volume control at top

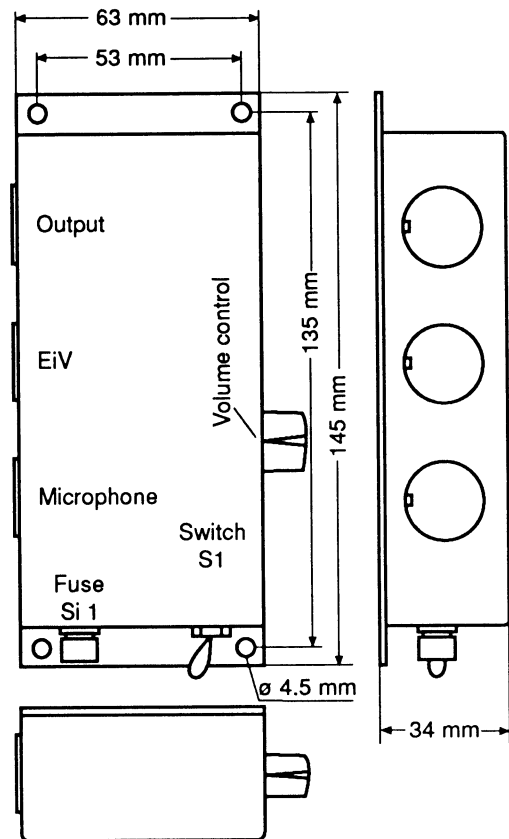


Fig. 2.1-2
Dimensions VV-450 (MBB version)
BN 0846/21
Volume control at side

2.1.2 Final Amplifier TE-450

In order to maintain a proper location for the center of gravity of the helicopter (weight and balance), it is worthwhile to mount the Final Amplifier, which in itself does not require any special location, in any convenient place of storage. However, access to the connectors and sufficient air for ventilating the amplifier should be taken into account, i.e. the heat dissipating vanes of the cabinet should have sufficient clearance from any surrounding surfaces, or other equipment. It is especially important that no other equipment emitting heat may be mounted below the Final Amplifier. Figure 2.1-3 shows the mounting dimensions of the Final Amplifier whose fastening straps are provided with elongated holes, 10 x 6 mm.

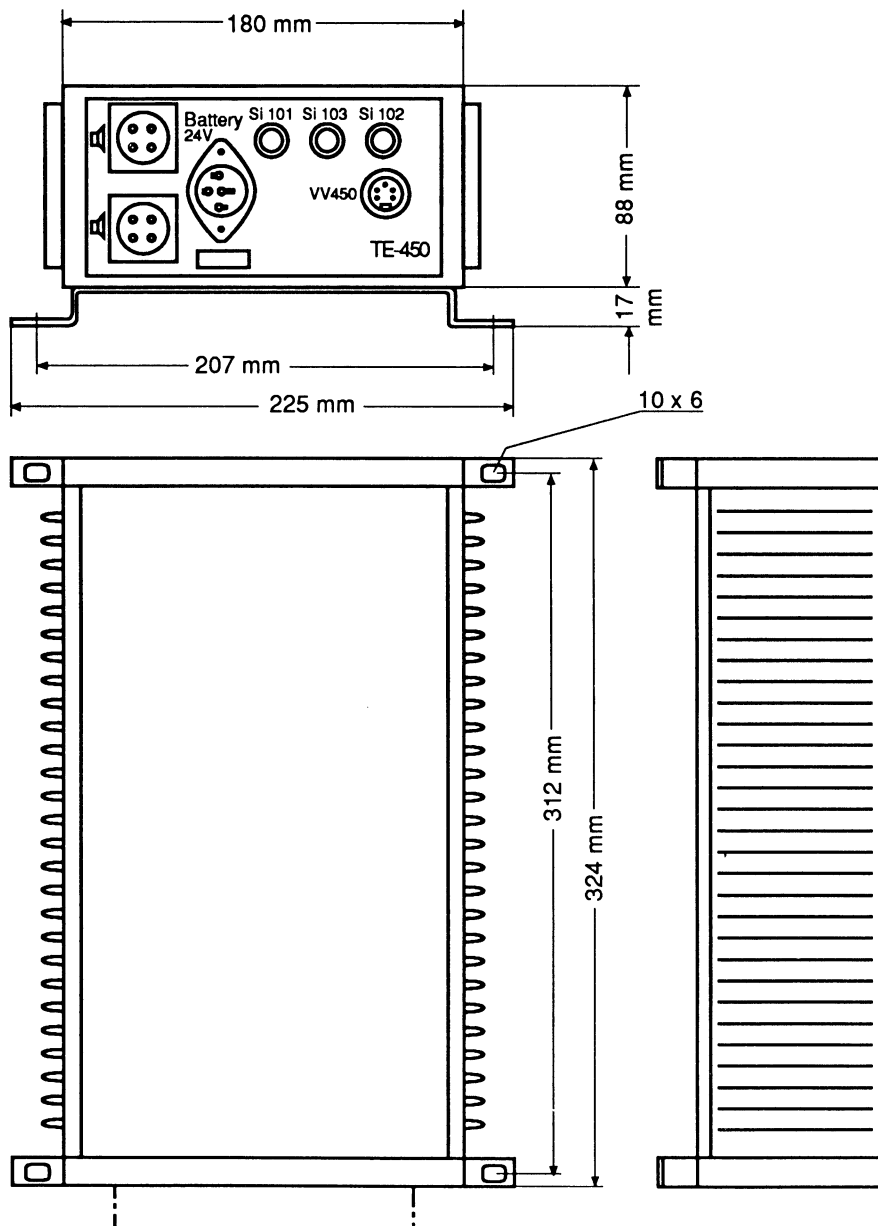


Fig. 2.1-3
Mounting dimensions of TE-450 Final Amplifier, BN 0846/03

2.1.3 Loudspeaker

When the loudspeaker(s) is/are mounted, the following locations could be considered:

- the skids or landing gear,
- the transverse strut,
- the eye bolts for the slings,
- or the cabin outer walls.

For helicopters of commercial standard types, Wandel & Goltermann supplies special mounting attachments. These mountings are constructed in a way that the two loudspeakers are attached as tilted about 30 ° to 40 ° (each according to the helicopter type) and projecting the sound in a forward direction. These settings must be observed even when the speakers are mounted for a temporary application. (Figures see appendix)

2.2 Power Supply

The transistorized amplifier, TV-450 operates with between 22 and 29 VDC battery voltage. The battery is connected to the TE-450 Final Amplifier; a 20 A fuse has to be used. The battery cable should be as short as possible and should have a large enough cross section in order to avoid voltage drop across the cable. The battery cable is not included with the delivered order, but a cable of requested length will be assembled at the factory.

The pre-amplifier obtains its power from the final amplifier via the interconnecting cable ZK 450.

2.3 Connectors and Cable connections

The wiring diagram (fig. 2.3-1) shows how the connections are arranged in the usual type of helicopter loudspeaker installation.

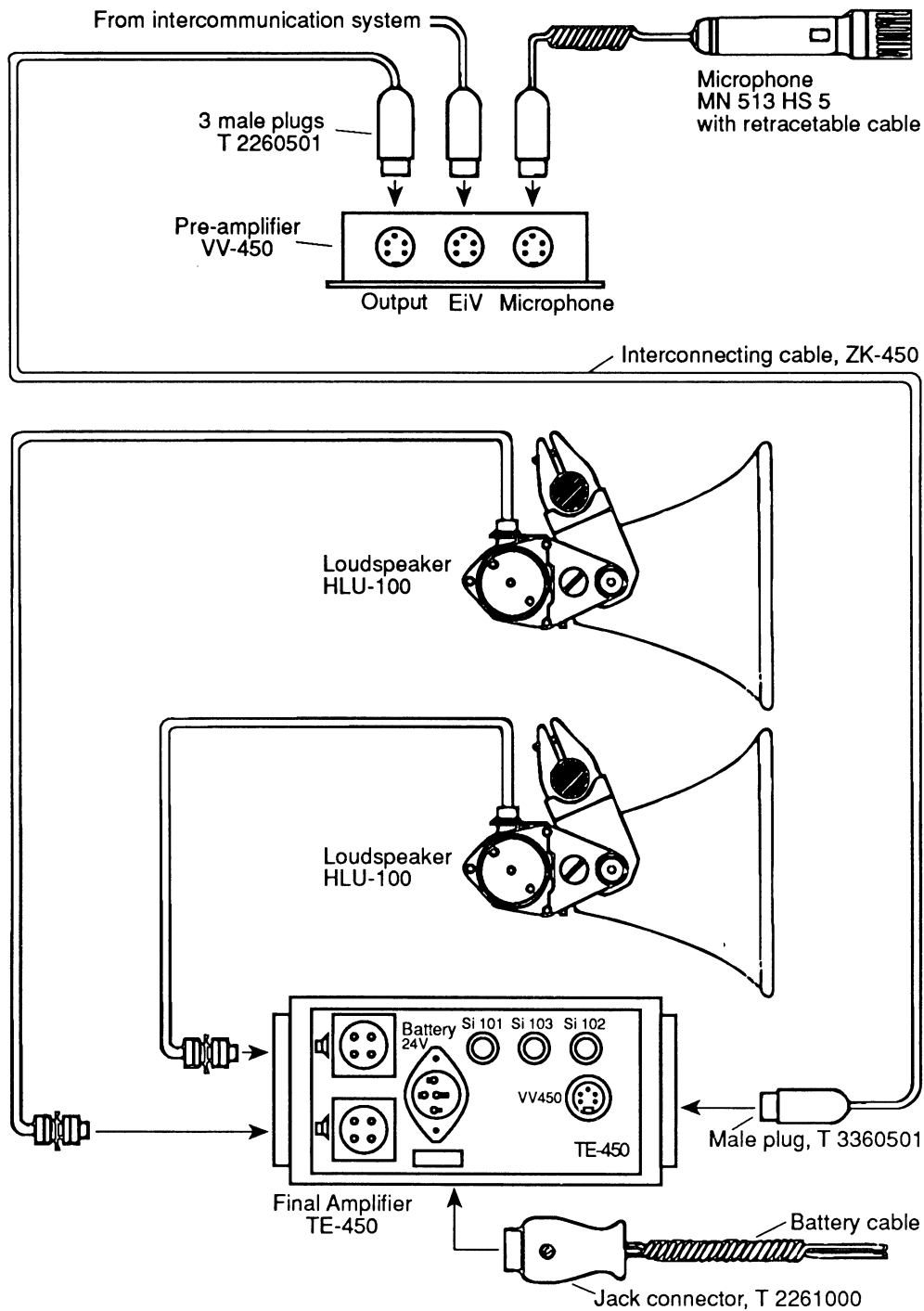


Fig. 2.3-1
Connectors and cable connections

2.3.1 Loudspeaker

The compression-driver trumpet loudspeaker HLU-100 comprises the trumpet SMH, the compression-driver unit DSS-100, with the connected cable terminal.

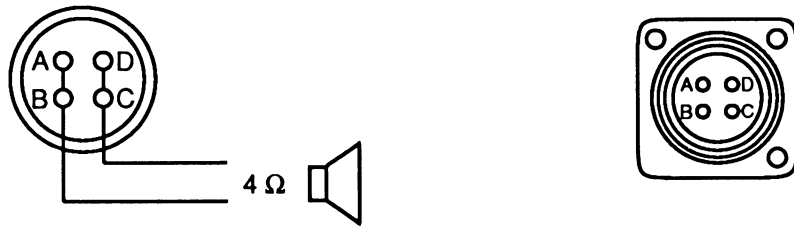


Fig. 2.3-2
Wiring of loudspeaker connectors, St 102 and St 103

**Loudspeakers delivered by Wandel & Goltermann are checked for phase equality.
If other loudspeakers are used, then attention must be paid to assure phase equality.**

2.3.2 Connection. Pre-amplifier - Final Amplifier

The interconnection cable ZK-450 conducts the AF signal from the pre-amplifier to the final amplifier and contains two additional conductors for supplying current to the VV-450. The cable is fitted with a 5-contact plug at each end. Figure 2.3-3 and 2.3-4 shows the wiring for the normal version and MBB version. Special versions of interconnecting cables for special intercommunication systems can be prepared by Wandel & Goltermann on request.

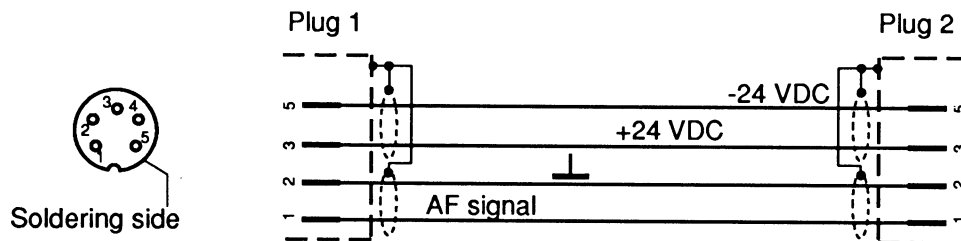


Fig. 2.3-3
Wiring of interconnecting cable ZK-450 (normal version)

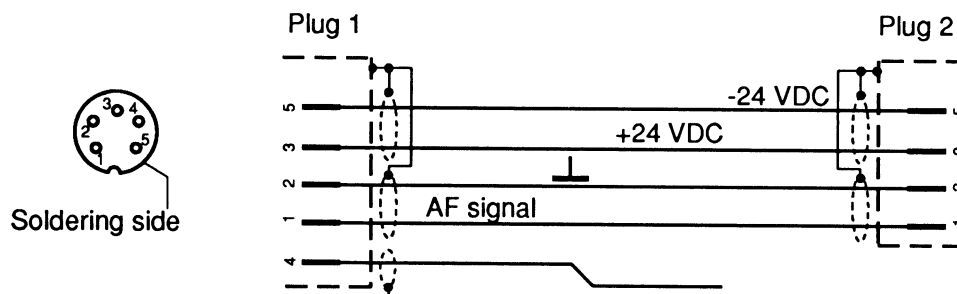


Fig. 2.3-4
Wiring of interconnecting cable ZK-450 (MBB version)

2.3.3 Aircraft intercommunication system

The aircraft intercommunication system is connected to connector 2 (EiV) of the VV-450 Pre-amplifier.

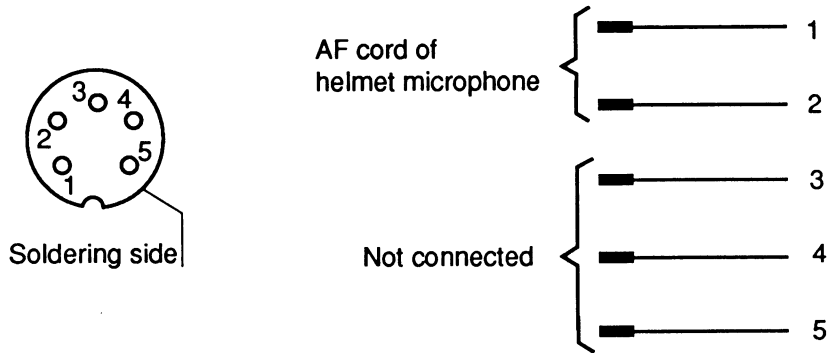


Fig. 2.3-5
Plug wiring to EiV (intercom.input) for pre-amplifier BN 0846/10, standard

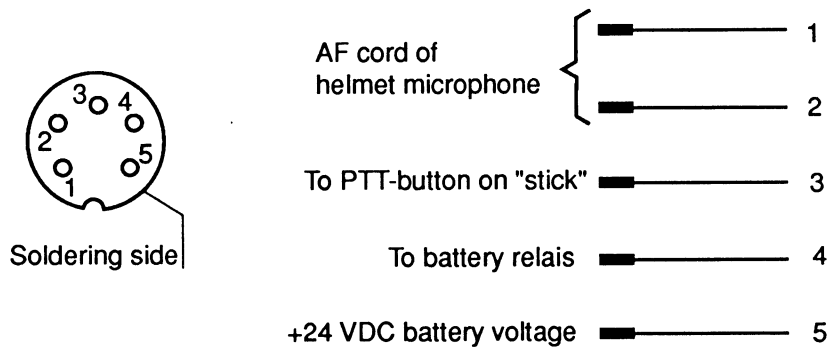


Fig. 2.3-6
Plug wiring to EiV (intercom.input) for pre-amplifier BN 0846/21, MBB version

2.3.4 Hand microphone

The push-to-talk button of microphone MN 513 HS 5 is connected as normally open, so a relay can be actuated. This permits the microphone to have priority over the helmet microphone. Another relays contact opens the microphone cable which otherwise is short-circuited when idling.

An input transformer, Ü1, provides balanced and floating input at the microphone connector of the Pre-amplifier.

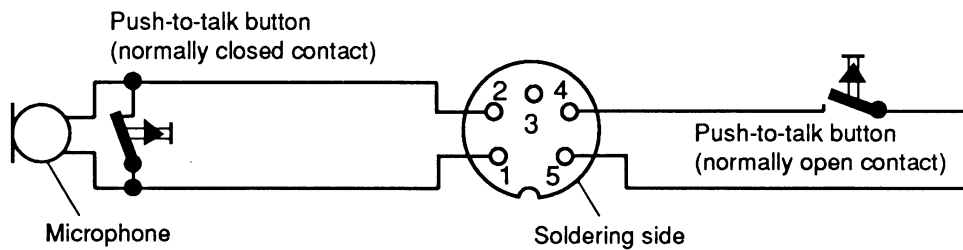


Fig. 2.3-7
Plug wiring for microphone input

2.3.5 Battery polarity and connections

In order to avoid short circuits, it is best to connect the battery as the last step. The minus pole of the battery input on the TE-450 (Fig. 2.3-8) is connected to the Final Amplifier case and via the interconnecting cable it is also connected to the Pre-amplifier case.

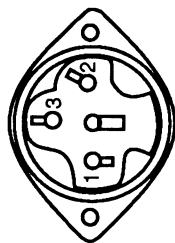


Fig. 2.3-8
Battery input St 101
flanged receptacle T 2262000 (Amphenol)
(seen from outside)

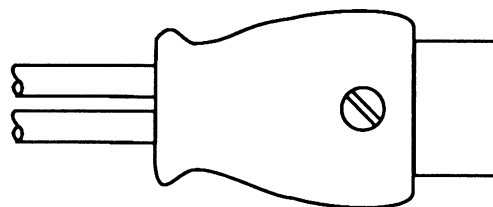


Fig. 2.3-9
Battery connector
female connector plug T 2261000 (Amphenol)

2.4 Placing into operation

After connecting all necessary cables according to chapter 2.3, the volume control should be first set at a low number on the slide potentiometer. Now the system functions can be checked by a speech test. If the speech signals are emitted on the ground or in the hanger, it is possible that acoustic feedback may occur. This can be avoided by lowering the volume at the slide potentiometer.

2.4.1 Operating with helmet microphone and intercommunication system

The pilot or co-pilot usually speak over their helmet microphones. These are internally connected in parallel with the hand microphone with Pre-amplifier BN 0846/10. The two microphones are decoupled from another by resistors, so they do not have mutual effects.

When Pre-amplifier BN 0846/21, MBB version, is used, connector 2 is coupled by a relay to the intercommunication system and to the joy stick PTT-button.

The intercommunication and loudspeaker system is operated as follows:

- Microphone switch S1 on Pre-amplifier placed to ON
- Selector switch on intercom. placed to "External Loudspeaker" position
- Press joy stick PTT-button, and speak
- Adjust volume with slide potentiometer.

2.4.2 Hand microphone operation

The hand microphone is mainly used for making announcements from the rear seats. The distance between speaker and microphone should be 1 or 2 cm during announcements.

When operated with Pre-amplifier BN 0846/10:

The loudspeaker system is operational after the push-to-talk button is actuated on microphone.

When operated with Pre-amplifier BN 0846/21, MBB version:

After the push-to-talk button is pressed, the microphone has priority over the helmet microphone switched by the relay.

- Microphone switch S1 on Pre-amplifier placed to ON
- Press push-to-talk button, and speak
- Adjust volume with slide potentiometer.

3 Technical instructions

3.1 Loudspeaker system for mobile and stationary service

For mobile and stationary service the loudspeaker type HLU-100 is useful as well as for helicopter service.

If the loudspeaker system is not used exclusively for issuing commands, but instead is used mainly for paging or announcements, then larger loudspeaker trumpets are recommended for use in the field. For that function a separate request is needed.

3.2 Electronic "Fuse"

The electronic fuse protects the amplifier final stage against overloading:

- when the loudspeaker impedance is too low or if a short-circuit occurs,
- when the heat sink temperature rises above about +73 °C.

In both cases, the drive signal to the final stage is short-circuited. As the switching is carried out quickly, the final stage cannot be destroyed.

After the heat sink drops below approx. +73 °C, or after the short circuited output is relieved, the final stage self-actuates and permits drive signal input again.

Because of the TE-450 Final Amplifier having been assembled from two single final stages each of 225 W, the loudspeaker system remains in operation with half-power if a single final stage or single loudspeaker becomes defective.

4.2 Final Amplifier

The Final Amplifier is assembled from two similar modules, EM 101 and EM 101, and the transformers Ü 101 and Ü 102. The inputs for the AF signal (Bu101) and the power supply (St101) are common to both modules, the loudspeaker outputs, however, each at 4 Ω , are fed-out separately.

4.2.1 Driver

The output signals from the Pre-amplifier are fed via resistor R2 to the +input of IC 1 and are amplified by 20 times. Potentiometer P1 is adjusted to the optimum working point so as to supply transformer Ü1 with the maximum undistorted voltage. The transformer acts as a phase-splitter and provides a push-pull voltage for the push-pull pre-driver T2/T3. This supplies drive-signal to the push-pull driver stage T14/T18 which then drives the Class B push-pull output stage. This final stage comprises 3 pairs of transistors connected in push-pull parallel. T15, T16 and T17 are in parallel and are connected in push-pull with T19, T20 and T21 (also in parallel).

The collector current of T1 is adjusted with P2 "Quiescent Current". The voltage drop across R13 sets the final stage working point. Transistor T1 is mounted on the heat sink along with the output stage transistors so that the quiescent current of the final stage is also relatively independent of the temperature.

4.2.2 Electronic Fuse

If the permissible power dissipation of the transistor is exceeded, the "electronic fuse" interrupts the drive signal to the final stage. This takes place as follows:

As long as T8 is conducting, the drive signal for T2 and T3 is short circuited via G1 2 and G1 3. T8 can be switched on by T7 provided that T9 conducts. The case occurs when the output current rises too high due to too low an output impedance - in the worst case, a short circuit. Because Ü2 is arranged with half of its windings on one side in series with the load impedance, the other side of the transformer delivers across R30 a voltage proportional to the output current. When an overload occurs and the positive voltage peaks from Ü2 outweigh by 0.6 V (or more) the rectified negative voltage from the final stage output, then T9 conducts and switches on T7 and also T8, which causes the drive signal to the final stage to be blocked.

This blocking is also brought about by the heat sink reaching too high a temperature. With that, the negative temperature coefficient resistor R21 mounted on the heat sink becomes low resistance and switches the Schmitt trigger (T5/T6) when the heat sink becomes about +73 °C.

In quiescent status, T6 conducts and T5 is cut-off. If the heat sink temperature reaches +73 °C, then T5 base potential drops (it is about +4 V at +25 °C) to + 2.6 V, and T5 conducts with T6 cut-off. With that T8 conducts and cuts off the drive signal to the final stage. After cooling down, the drive signal is restored by self-actuated switching back to the normal state.

In case of short-circuit, a time constant network comprising C11 and R27 in parallel with the input resistance of T7 prevents the signal restoration for a short time after the short circuit is removed.

4.2.3 Zout circuit

For better division of the current flowing through the final stage transistors, 0.1 Ω resistors are placed in the emitter current paths.

4.2.4 Output transformer and amplifier output

Output transformers Ü101 and Ü102 are connected between the emitter connection points 2 and 27 of the push-pull output stage and combine the half-waves of the final stage halves. Each transformer has two windings connected in parallel. Windings 9 - 10 deliver a feed-back voltage coupled back to the input of the final amplifier (R1).

The amplifier output is symmetrical about zero potential. This means, that the loudspeaker or the termination must be earth-free (ungrounded) or the power supply must be floating.

4.2.5 HF-Interference suppression

The amplifier TV-450 (BN 0846/03) which is very often used in conjunction with AM-modulated VHF- and UHF-transmitters, meets the demands of a very HF-proof audio-amplifier.

The excellent HF-interference suppression of the amplifier can be obtained by the dedicated design of the input stages of the pre- and final-amplifier as well as through consequent decoupling of all link circuits.

4 Functions and characteristics

The TV-450 Transistor Amplifier (see circuit diagrams in appendix) is a combination of the following individual equipments:

Pre-amplifier VV-450, BN 0846/10	Printed circuit board 846-C1
or	
Pre-amplifier VV-450, BN 0846/21, MBB version	
with relay switch	Printed circuit board 846-C1
Final Amplifier TE-450, BN 0846/03	
with two similar modules	EM 101 and EM 102
with two similar transformers	Ü 101 and Ü 102
with printed circuit board	Driver and electronic fuse 846-B1
with printed circuit board	Z _{OUT} circuit (bias resistors) 846-A

4.1 Pre-amplifier VV-450

4.1.1 Pre-amplifier BN 0846/10

The volume control is on the top of this pre-amplifier (see fig. 2.1-1)

Connector Bu1 is for the connection of a microphone, Bu2 is for an inclusion of an intercommunication system. The two connectors are internally connected in parallel. The AF signals are decoupled by resistors and fed in via Ü1. The decoupling network prevents any mutual AF interference between the hand-microphone and the intercommunication system. In order to suppress RF interference via the connected microphone cable, the microphone input at Bu1 is short-circuited by the normally closed contacts of the push-to-talk button, and only after the button is pressed, does the microphone feed into the Pre-amplifier (see fig. 2.3-7).

For the rated power of 2 x 225 W at the outputs of the final stage, an r.m.s. voltage of approx. 500 mV is needed at the Pre-amplifier output. The rated power is achieved if ≤ 5 mV r.m.s. are applied to the Pre-amplifier input, and if the sliding potentiometer P1 is set at 10.

The input voltage is transformed down by Ü1 with the ratio 10:1, and then amplified by IC 1 at a gain of 37 times. Capacitors C6 and C7 cut the frequency range of the amplifier so that it operates only in the voice range. Zener diode G1 1 stabilizes the operating voltage to about 10 V. This operating voltage is supplied via the interconnecting cable from the Final Amplifier supply voltage.

4.1.2 Pre-amplifier BN 0846/21 (MBB version)

The volume control is on the narrow side of this pre-amplifier (see fig. 2.1-2)

In addition to the type described in chapter 4.1.1, the switch S1 and the fuse Si1 are located on its front side. The circuitry matches the latest intercommunication system installed in the MBB Helicopter type BO 105.

4.1.2.1 Helmet microphone operation

When the miniature toggle switch S1 is switched to ON, a relay is energized in the intercom. via connector 2, pin 4, and it then switches in the battery voltage for the final stage. When the PTT-button on the "stick" is pressed, pin 3 is grounded.

Relay 2 energizes, and the contact, rel. 2, opens the AF output line of the Pre-amplifier. This line is short-circuited in the normally open position in order to reject RF interference at the input to the final amplifier.

The AF signal from the helmet microphone is fed via pins 1 and 2 of the intercommunication input connector Bu 2, and via relay contacts rel. 1/1 and rel. 1/2 to the input transformer Ü1.

4.1.2.2 Operation with hand microphone

When the miniature toggle switch S1 is switched to ON, a relay in the intercommunication system is energized and switches the battery voltage on for the final stage. When the microphone push-to-talk button is pressed, pin 4 of Bu1 is grounded. Doing so, relay 1 and relay 2 (connected in series) are energized. Contacts rel. 1/1 and rel. 1/2 switch-over from the intercommunication input to the microphone input. Thus, the hand microphone has priority. Relay 2 enables the AF output to the final stage.

5 Function Checking, Maintenance, General Information

5.1 Mechanical assembly

5.1.1 Pre-amplifier

After the bottom cover has been removed, printed circuit board C1 may be pulled out from the mounting.

5.1.2 Final Amplifier TE-450

In order to obtain access to the TE-450 printed circuit boards, the four fastening screws must be removed from the cover. Then, the cover can be slid forwards or backwards along the guides to the opposite edge where the cover can be removed.

The TE-450 is equipped with two electrically identical 225 W modules EM 101 and EM 101 and transformers Ü 101 and Ü 102 mechanically assembled as symmetrical.

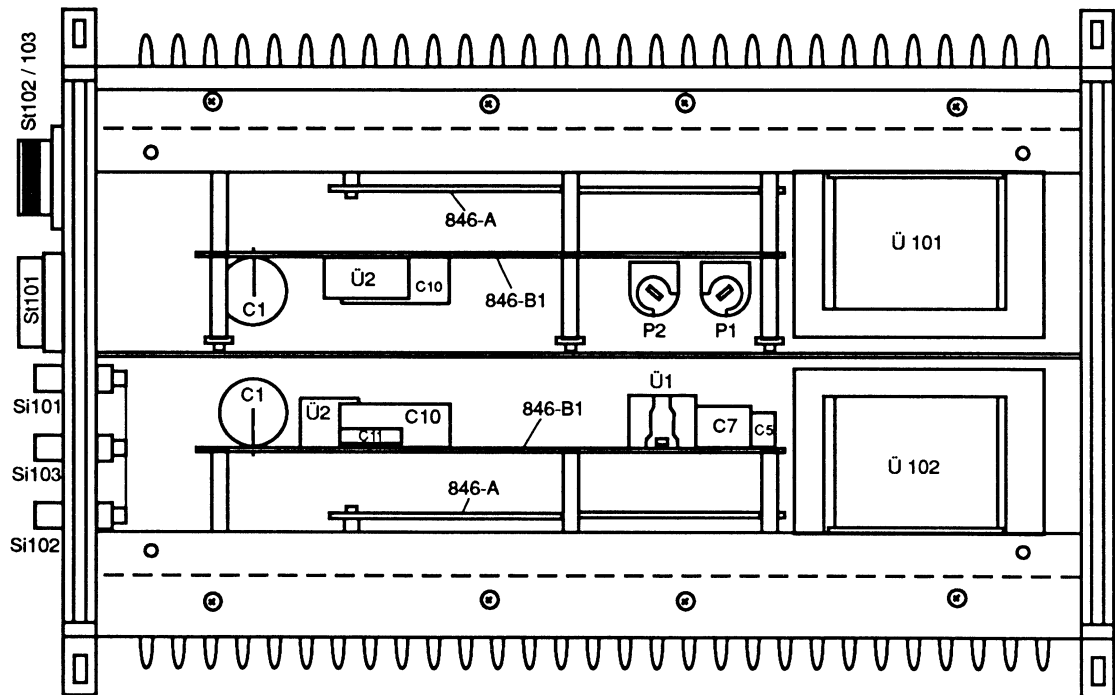


Figure 5.1-1
Mechanical Construction of the TV-450

Figure 5.1-1 shows the positions of the most important sub-assemblies of the TV-450, access to them or disassembly is explained as follows:

5.1.2.1 Heat sink with driver and protective resistors (Zout circuit)

- Remove the 8 Philips head screws which fasten the circuits to the frame
- because the wiring harness is assembled as a "gooseneck", the complete heat sink with transformer Ü101 or Ü102 and the printed circuit boards, 846-B1 "driver and electronic fuse" as well as 846-A "Z_{OUT}" circuit can be unfolded out of the case.
- At printed circuit board 846-B1, unscrew 3 Philips head screws and 3 flat head screws and remove from stand-off studs.
- With that, the printed circuit board 846-A is accessible.

5.1.2.2 Output transistors and NTC resistor

- Unsolder connections from printed circuit board 846-A to output transistors and to NTC R21.
- Remove printed circuit board after unscrewing flat head screws.
With that, the transistors T14 to T21 as well as NTC R21 are accessible.

5.1.2.3 Transformers

In case Transformer Ü101 or Ü102 becomes defective, it must be exchanged for another.

5.2 Fuses

The fuses are accessible at the front panel of the TE-450. The fuses are rated as follows:

Si 101	10 A	slow-blow
Si 102	0.5 A	medium speed
Si 103	10 A	slow-blow

The fuse holder cap is easily removed with a screw driver.

5.3 Function Checking and Adjustments

After the cables and connections have been established, according to chapter 2.3, the simplest function test is a microphone talker test as described in chapter 2.4.

For verifying the most important technical data, the following measurement arrangement is recommended, whereby a level generator or audio frequency generator (50 Hz to 15 kHz) and a corresponding level meter or audio meter are required.

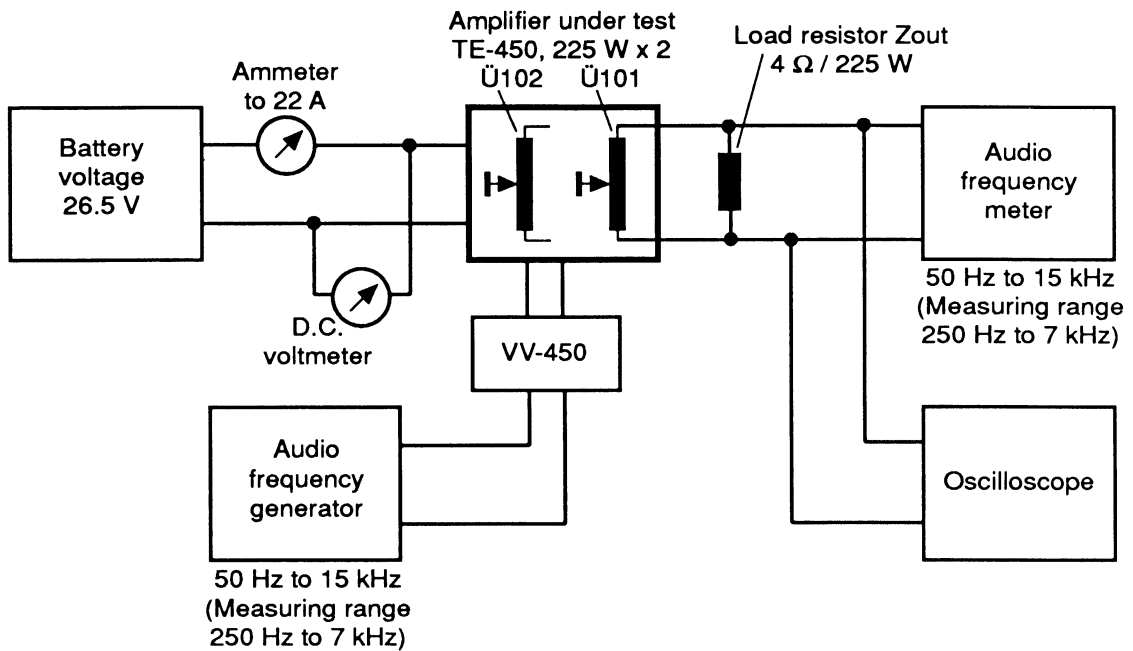


Fig. 5.3-1
Measuring configuration

All function checks can be made according to Figure 5.3-1. Owing to the center tap ground (battery-pole) on transformers Ü101 or Ü102, the output of the TE-450 Final Amplifier is not floating above ground. Therefore, there must not be any short-circuit placed on the output of the TE-450 because it could cause destruction of the output stage. For that reason, using an oscilloscope with differential amplifier input and an audio frequency meter with balanced input is recommended.

All measurements are made with a 26.5 VDC battery voltage (load up to 22 A).

5.3.1 Testing the TE-450 Final Amplifier without Pre-amplifier

5.3.1.1 Placing into operation

- Before placing into operation, set potentiometer P1 ("symm.") (p.c.b.846-B1) to the middle position and P2 (quiescent current) to full clockwise position.

5.3.1.2 Setting the quiescent current

- remove the fuse from one of the 225 W final stages, leave the fuse in the final stage under test
- adjust current flow to about 80 mA without input signal
- do the same with the other stage

5.3.1.3 Setting the balance (symmetry)

- have fuse only in 225 W final stage under test
- connect oscilloscope in parallel to load resistor
- switch ammeter to 30 A scale
- feed 1 kHz audio signal into R2 (point 41 on p.c.b.846-B1 against ground, point 30)
- slowly raise level to fully load (about 12 A)
{effective voltage of 30 V at load resistor is equal to 225 W output power}
- slowly raise level further until overload is visible on oscilloscope.
Adjust P1 to limit of balance
- Caution! Operate TV-450 only for a short time in over-driven condition.**
- repeat above steps with the other final stage.

5.3.2 Testing the Final Amplifier with Pre-amplifier

Use Interconnection Cable ZK-450 to connect the Pre-amplifier to the Final Amplifier.

The Pre-amplifier used can be the normal version BN 0846/10 or the MBB version BN 0846/21.

Have fuse only in the 225 W Amplifier under test.

5.3.2.1 Checking the frequency range

- connect AF generator to microphone input of VV-450, pins 1 and 2
- slowly raise level until a voltage drop of $20V_{r.m.s.}$ can be measured across load resistor
- holding level constant, vary frequency from 150 Hz to 10 kHz
- rated values for lower and upper roll-off frequency at -3 dB:
 $f_L = 250 \text{ Hz} \pm 50 \text{ Hz}$
 $f_u = 6 \text{ kHz} \pm 1 \text{ kHz}$
- repeat above steps with the other final stage.

5.3.2.2 Input voltage for 225 W output power

- set potentiometer slide at 10 on Pre-amplifier
- slowly raise level of AF generator until $V_{r.m.s.} = 30 \text{ V}$ appear across load resistor (this voltage corresponds to 225 W)
- measure input voltage on Pre-amplifier rated value: $V_{r.m.s.} \leq 5 \text{ mV}$
- repeat above steps with the other final stage

5.4 Maintenance

The TE-450 Final Amplifier has no parts that wear-out, therefore maintenance and service are not needed.

However, the loudspeakers must be verified regularly for correct functioning. If scratchy noises or distorted sounds appear, then the membrane must be changed and the magnetic gap should be cleaned.

Furthermore, an annual inspection of the complete Sound Projection System is needed which may be performed at the time the vehicle or helicopter is inspected for safety, operating, efficiency etc.

6 Specifications

The specified values are valid unless otherwise noted for battery voltage $V_B = 26.5$ VDC
ambient temperature = +20 °C

6.1 Pre-amplifier VV-450

Operating voltage	from TE-450 Final Amplifier
Microphone input	≤ 5 mV across 200 Ω bal.
Input for intercommunication system	≤ 5 mV across 200 Ω bal.
Output Voltage	continuously adjustable
Dimensions, W x H x D	BN 0846/10 145 x 63 x 44 mm
.....	BN 0846/21 145 x 74 x 34 mm
Weight	approx. 0.3 kg
Order number: normal version, volume control at top	BN 0846/10
.....	MBB version, volume control at side BN 0846/21

6.2 Final Amplifier TE 450

Permissible voltage range	22...29 VDC
Current consumption without drive	200 mA
.....	with full drive 20 A
Rated power at 1 kHz	2 x 225 W = 450 W
Harmonic distortion at rated power (1 kHz)	≤ 10 %
Frequency range (with VV-450)	lower limit 250 Hz ± 50 Hz
.....	upper limit 6 kHz ± 1 kHz
.....	referred to 1 kHz at 100 W output power
R.M.S. input voltage (with VV-450) for 450 W output power	≤ 5 mV
Loudspeaker outputs	2 x 4 Ω
Ambient temperature, rated range of use	-20 °C...+40 °C
Dimensions W x H x D	225 x 105 x 324 mm
Weight	approx. 6.2 kg
Order number	BN 0846/03

6.3 Accessories

6.3.1 Microphone, compensated, with switching line to remote control circuit

Output impedance	200 Ω , bal.
Sensitivity	0.1 mV / μ bar
Length	156 mm
Weight	approx. 0.13 kg
Order number	MN 513 HS 5

6.3.2 Special loudspeaker HLU-100

Load on TV-450 Amplifier	225 W
Impedance, Z, at f = 1 kHz	approx. 5 Ω
Projection angle	approx. 95 °
Weight	approx. 10.2 kg
Dimensions	see appendix
Order numbers	see appendix

6.3.3 Interconnecting cable

for connecting the VV-450 Pre-amplifier with the TE-450 Final Amplifier

Length of normal cable	approx. 3 m
Weight	approx. 0.2 kg
Order number for normal version of Pre-amplifier	ZK-450
Order number for MBB version of Pre-amplifier	ZK-450, according to drawing No. 846-8523.008/4
Order number for normal version of Pre-amplifier and 2 parallel connected TE-450 Final Amplifier	ZK-900

Additional special versions of interconnecting cables are available for the various intercommunication systems. Please request further information.

Important Safety Instructions

1 Opening the equipment

After the covers have been removed or when components are removed with tools, certain components that operate with applied voltage could be exposed. And also connection points might be carrying a voltage. Therefore, before the equipment is opened for inspection, all voltage sources should be disconnected.

But sometimes calibration, maintenance or repairs require that the equipment be open with applied voltage. **So only experienced craftspersons who understand the dangers associated with working on instruments that have exposed voltage points should undertake the job.**

Capacitors can retain a voltage charge even after the equipment has been disconnected from voltage sources. Thus, the circuit diagrams should be observed.

2 Fuses

Only specified fuses are permitted for use.

3 Defects and Exceptional Conditions

When it can be assumed that safe operations is no longer possible, the equipment should be taken out of service and inadvertent operation should be prevented.

This occurs when

- the equipment shows external signs of damage
- the equipment no longer operates
- after being overstressed in any way (e.g. storage, transport)
so that the tolerable limits are exceeded.

4 Repairs, Replacement of Components

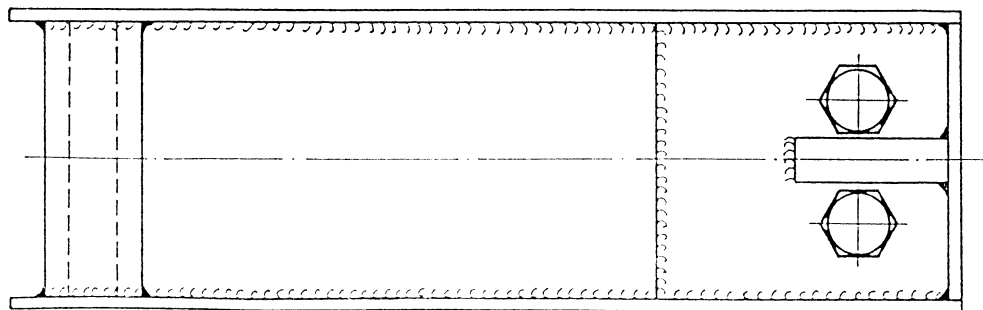
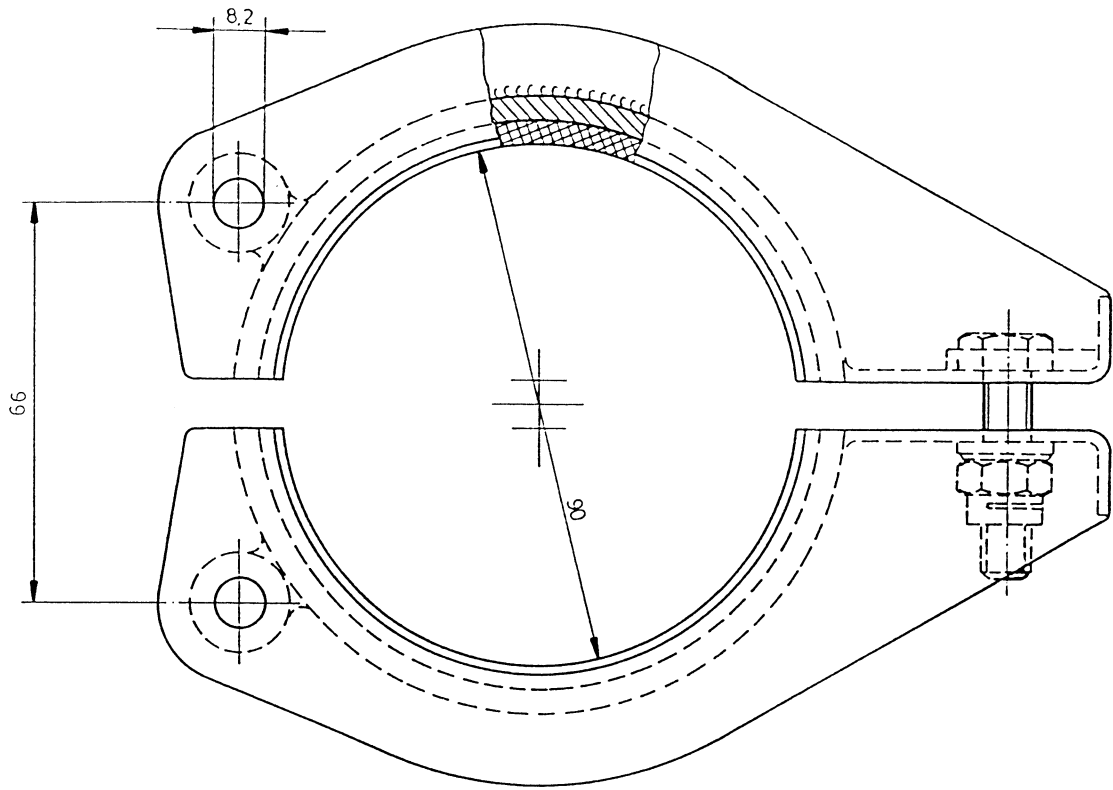
Repairs must be done according to correct technical practice.

With that, particular attention must be paid to the characteristics of construction. None of the safety precautions should be changed, especially for leakage paths and air gaps, and separation by insulation must not be reduced.

Only original replacement parts ought to be used. Other replacement parts are only permitted if the safety and protection against human injury are not degraded through the use of non-original components.

Mounting Claw, diameter 90 mm

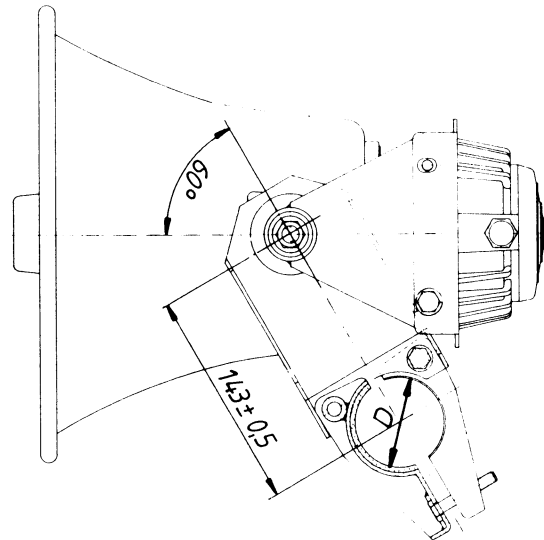
Order number: BN 5613/00.07



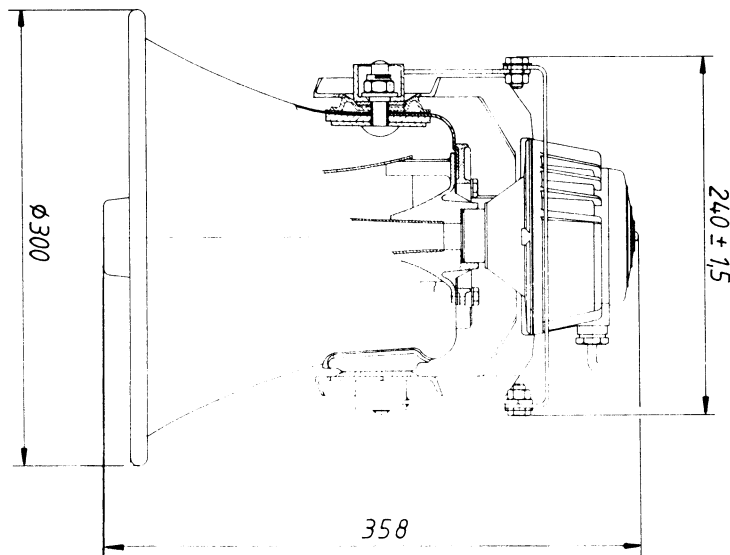
Dimension Diagram
5613-6045.019/4

HLU 100 K

Order number: BN 5613/01



$D = 56\text{mm}$



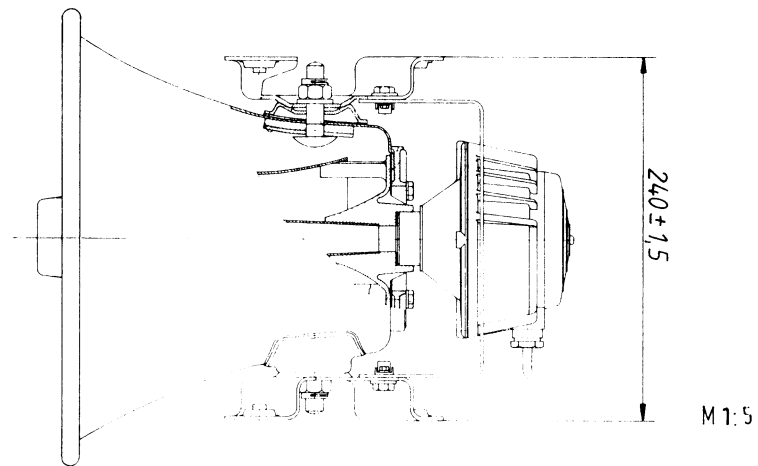
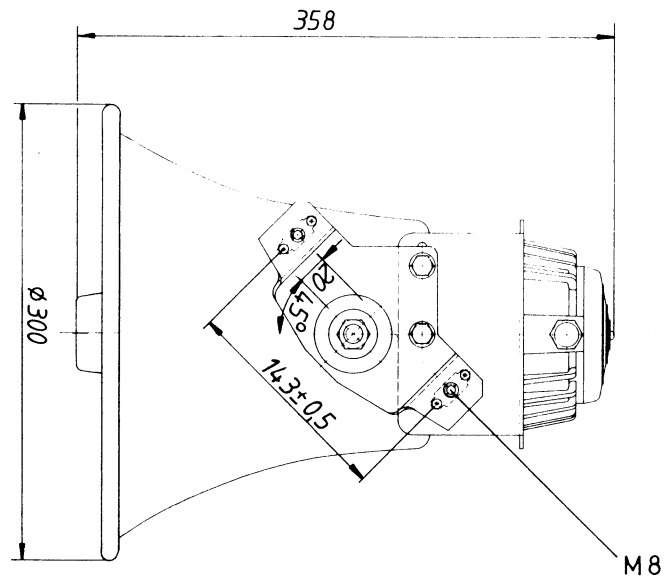
M1:5

Power: max 100 W $f=200\text{ Hz} \dots 1000\text{ Hz}$
Angle of Radiation: 95° Adaption: 8 Ω
Weight: approx. 6.3 kg
Acoustic values (800 Hz): approx. 131 dB(A) with 100 W,
distance 100 cm

Dimension Diagram
5613-6045.006/4

HLU 100 V

Order number: BN 5613/02

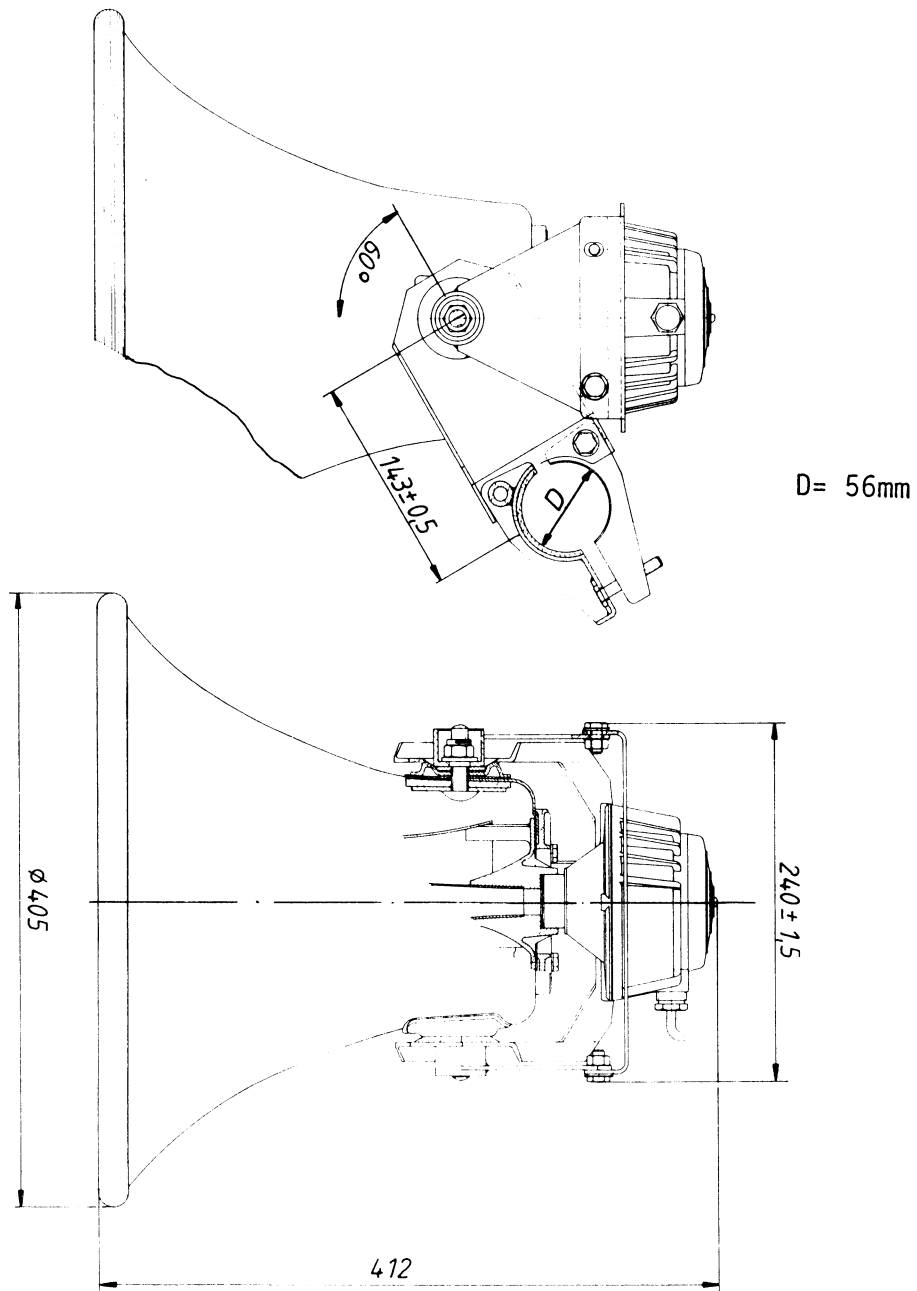


Power: max 100 W $f=200$ Hz...1000 Hz
Angle of Radiation: 95° Adaption: 8 Ω
Weight: approx. 4.8 kg
Acoustic values (800 Hz): approx. 131 dB(A) with 100 W,
distance 100 cm

Dimension Diagram
5613-6047.004/4

HLU 100

Order number: BN 5613/03

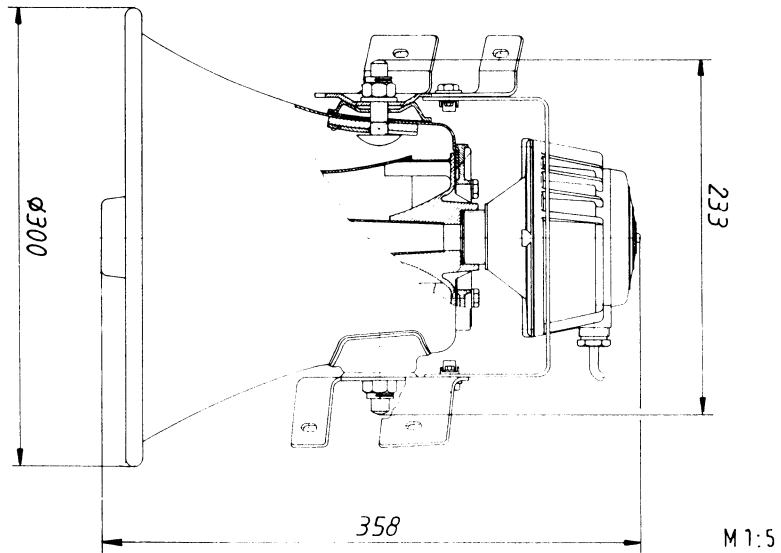
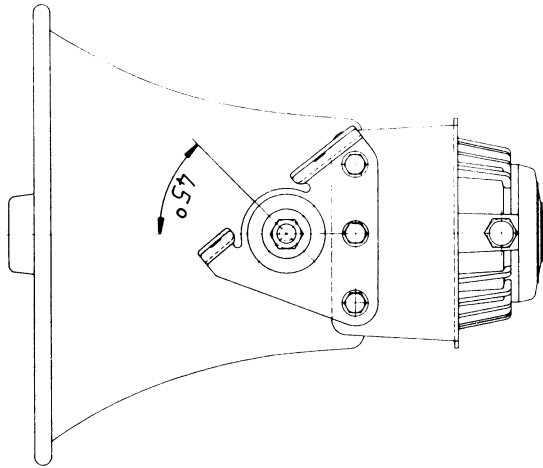


Power: max 100 W f=200 Hz...1000 Hz
Angle of Radiation: 95° Adaption: 8 Ω
Weight: approx. 6.3 kg
Acoustic values (800 Hz): approx. 131 dB(A) with 100 W,
distance 100 cm

Dimension Diagram
5613-6044.007/4

HLU 100-117 L

Order number: BN 5613/04

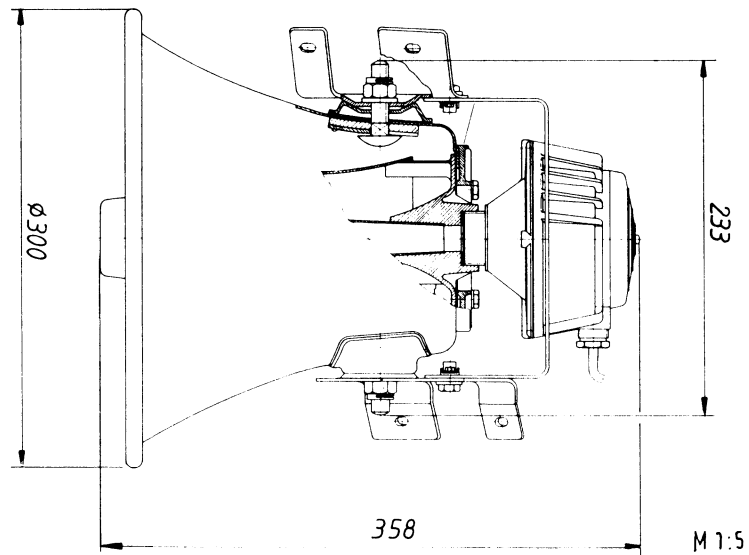
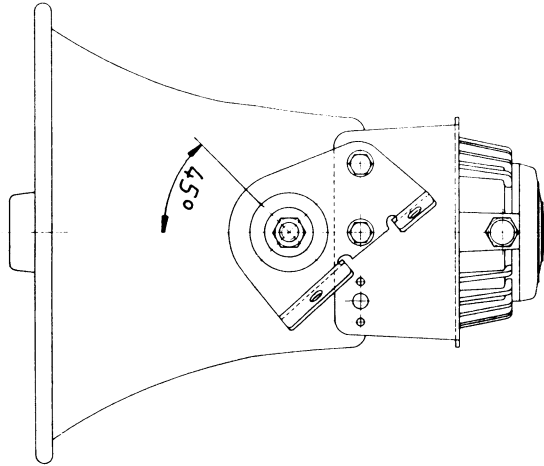


Power: max 100 W $f=200$ Hz...1000 Hz
Angle of Radiation: 95° Adaption: 8 Ω
Weight: approx. 4.8 kg
Acoustic values (800 Hz): approx. 131 dB(A) with 100 W,
distance 100 cm

Dimension Diagram
5613-6042.009/4

HLU 100-117 R

Order number: BN 5613/05

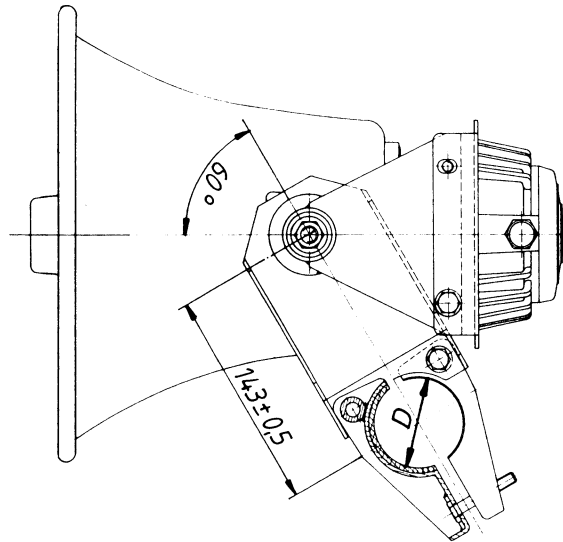


Power: max 100 W $f=200$ Hz...1000 Hz
Angle of Radiation: 95° Adaption: 8 Ω
Weight: approx. 4.8 kg
Acoustic values (800 Hz): approx. 131 dB(A) with 100 W,
distance 100 cm

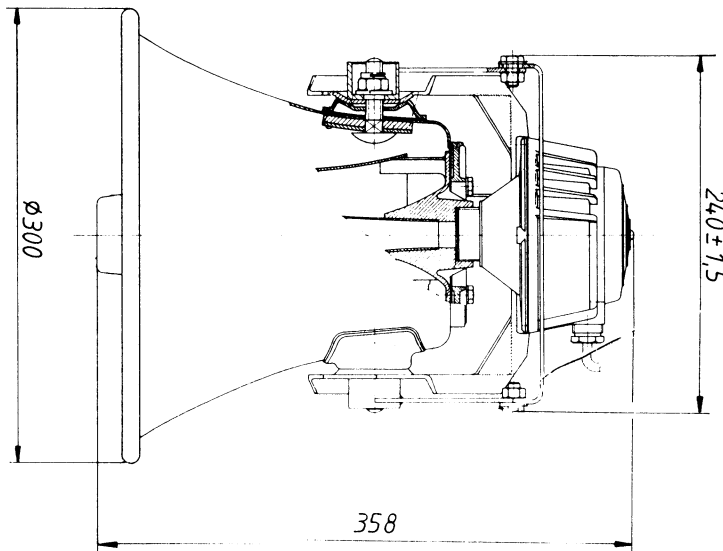
Dimension Diagram
5613-6043.008/4

HLU 100-350

Order number: BN 5613/06



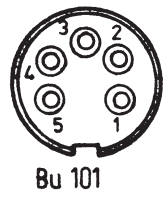
D= 52mm



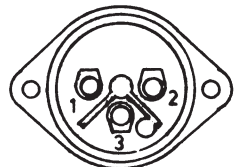
M1:5

Power: max 100 W f=200 Hz...1000 Hz
Angle of Radiation: 95° Adaption: 8 Ω
Weight: approx. 6.3 kg
Acoustic values (800 Hz): approx. 131 dB(A) with 100 W,
distance 100 cm

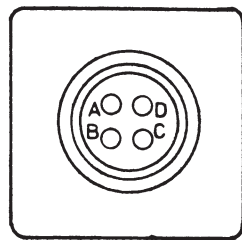
Dimension Diagram
5613-6046.005/4



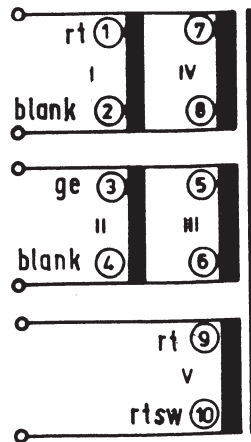
Bu 101



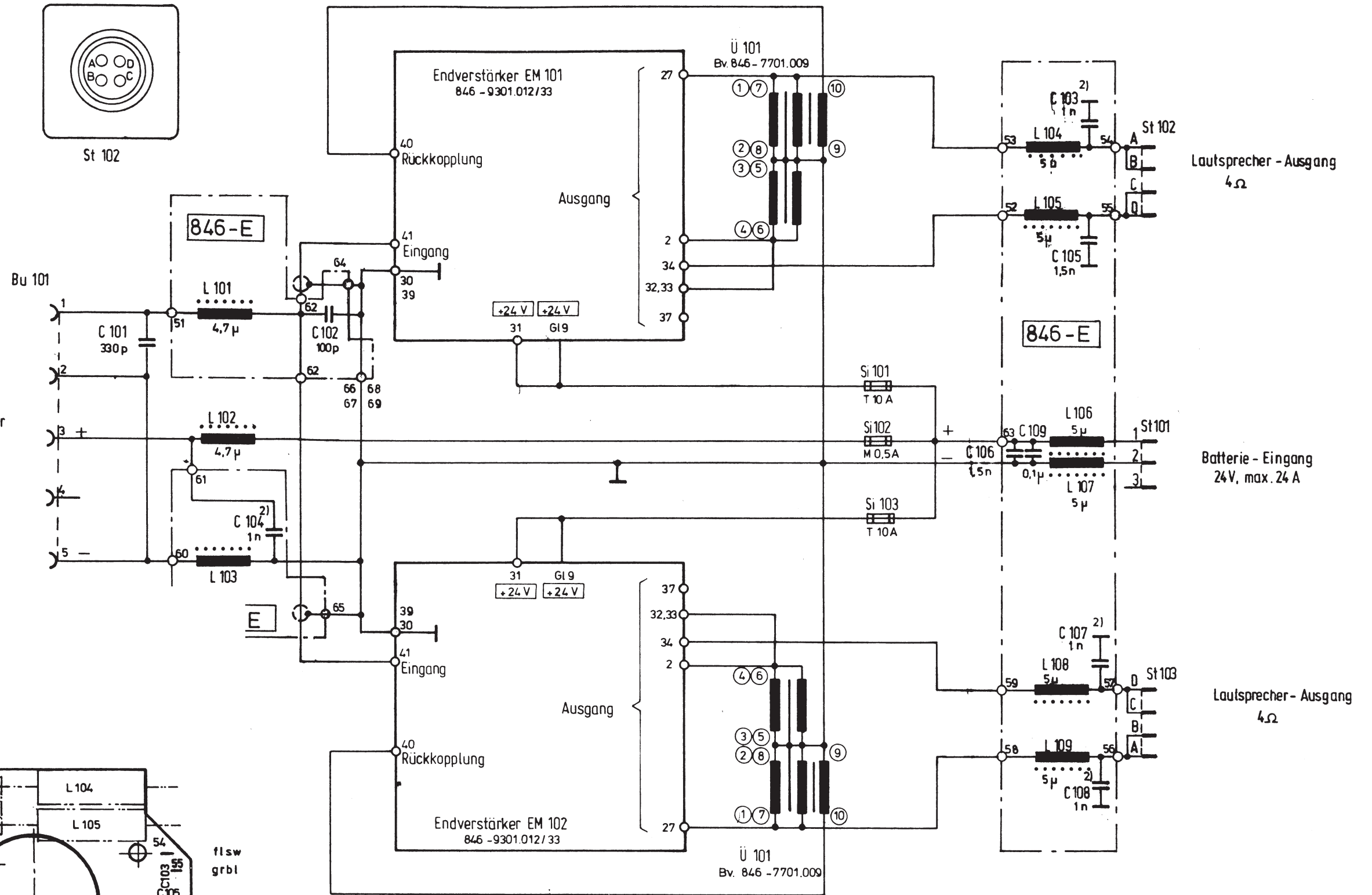
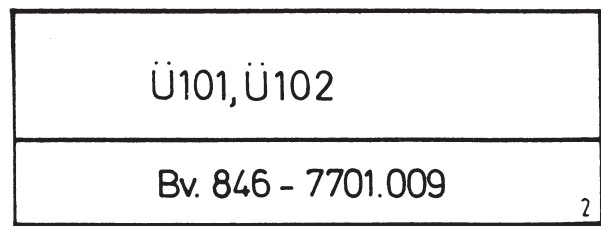
St 101



St 102



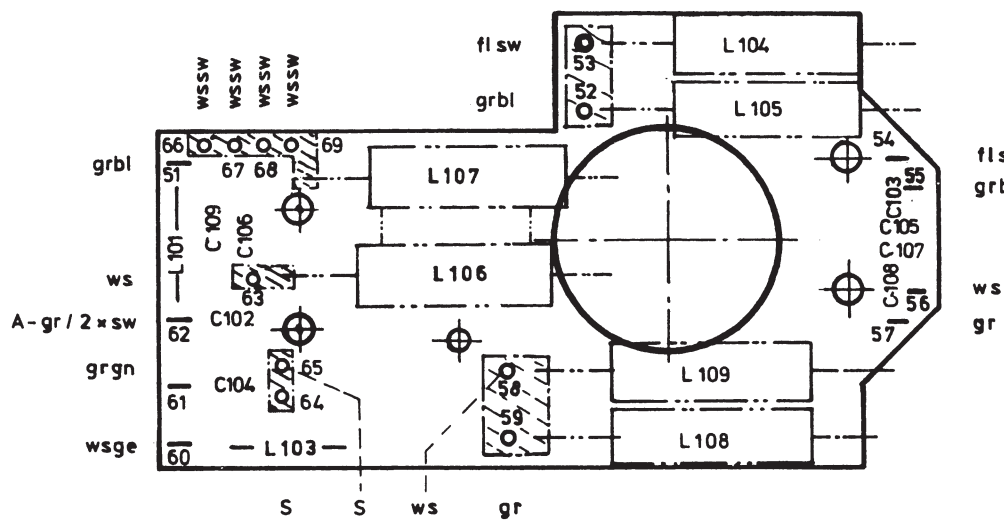
Eingang vom Vorverstärker



Lautsprecher - Ausgang
4Ω

Batterie - Eingang
24V, max. 24 A

Lautsprecher - Ausgang
4Ω



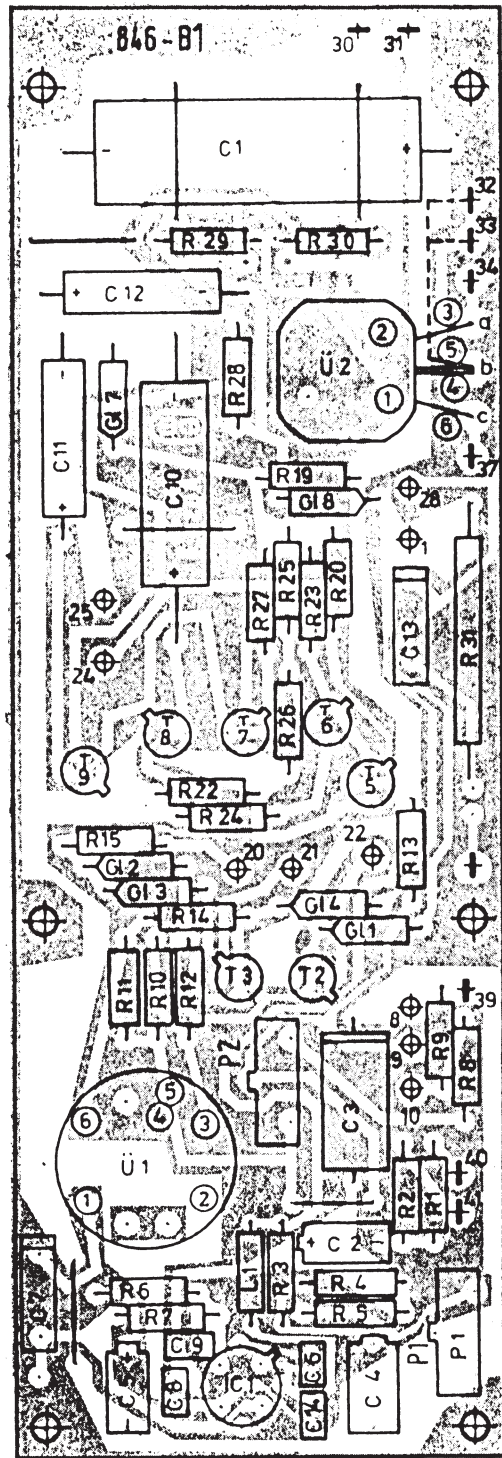
Benennung: 846 - E
Funkentstörkarte, best.
846 - 7004.00714

- Serienänderungen:
 1) Serie Gu.H: C109 / entfällt
 2) Serie G... teilw. K: C103, C104, C107 u. C108 / 1,5n

Final amplifier with RFI suppression card
 Amplificateur final avec carte suppression interférences radio

*1) Serie G...K: Bv.846 - 8402, Serie L...: JPS

	Stromlaufplan ① für Gerät: TE-450/BN 846 /03	Serie G...	Schaltteilliste	*)
	Endverstärker mit Funkentstörkarte	846 - 7501.212 / 3	1 Blatt	Blatt Nr. -

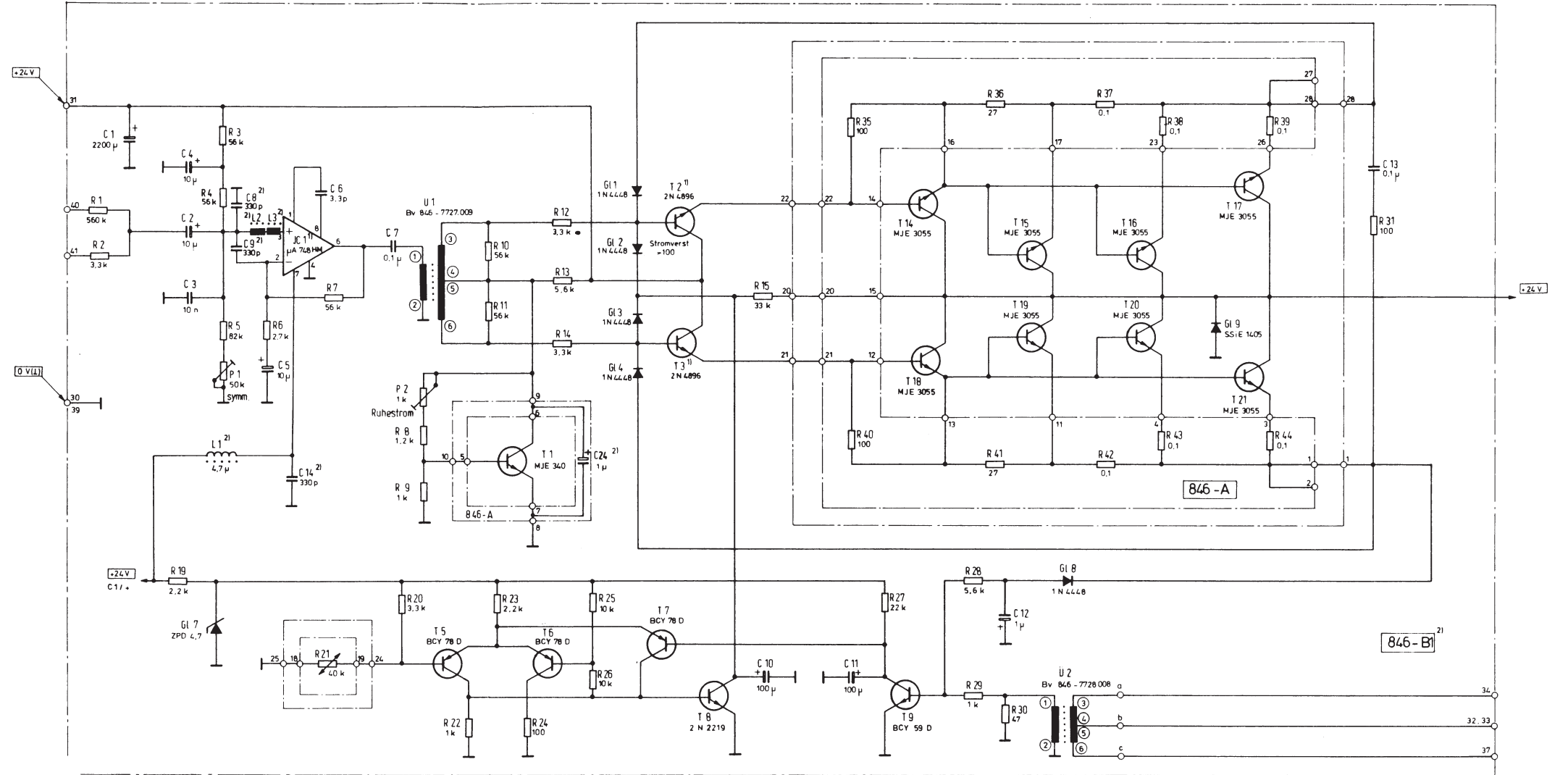


Benennung:
 Treiber u. elektron. Sicherung
 bestückt 846-B1
 846-7001.000 / 4

Driver and electronic fuse
 Etage attaque et protection
 électronique

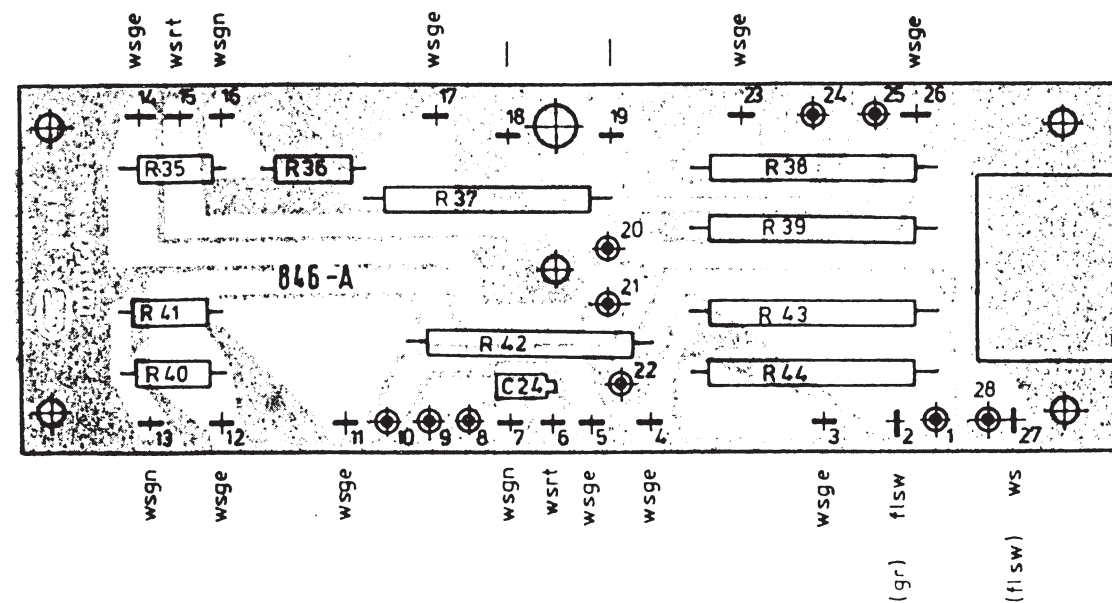
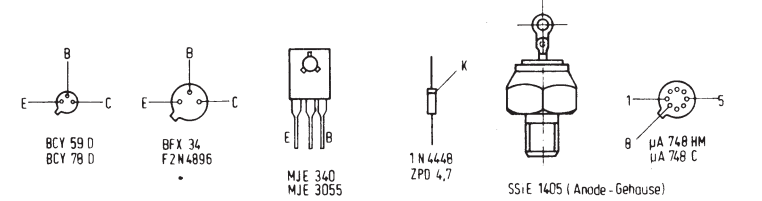
flsw (gr)
 flsw (gr)
 gr (grbl)

S
 gr (wsgn)
 sw



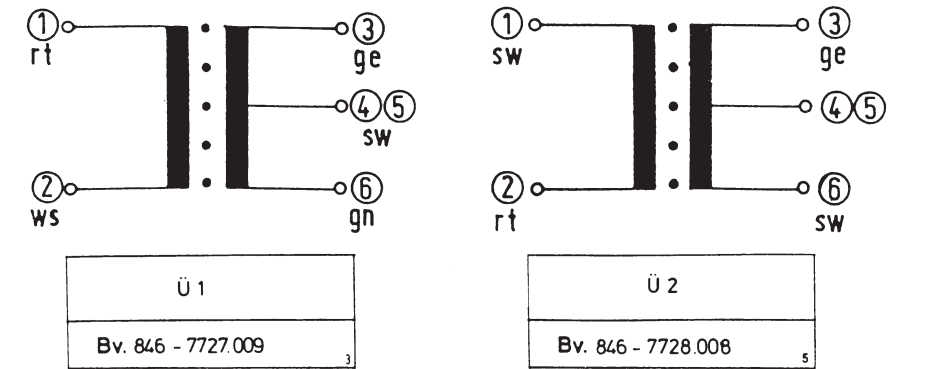
Serienänderungen:

- 1) Serie A: C: T2 u T3 / BFX 34 Stromverstärkung >100
- 2) Serie A: F: JC1 / μ A 748 C, C8, C9, C14, L1: L3 / entfällt, gedr. Schaltg. 846-B: C24 / entfällt



Z_{out} circuitry
 Circuit R_i

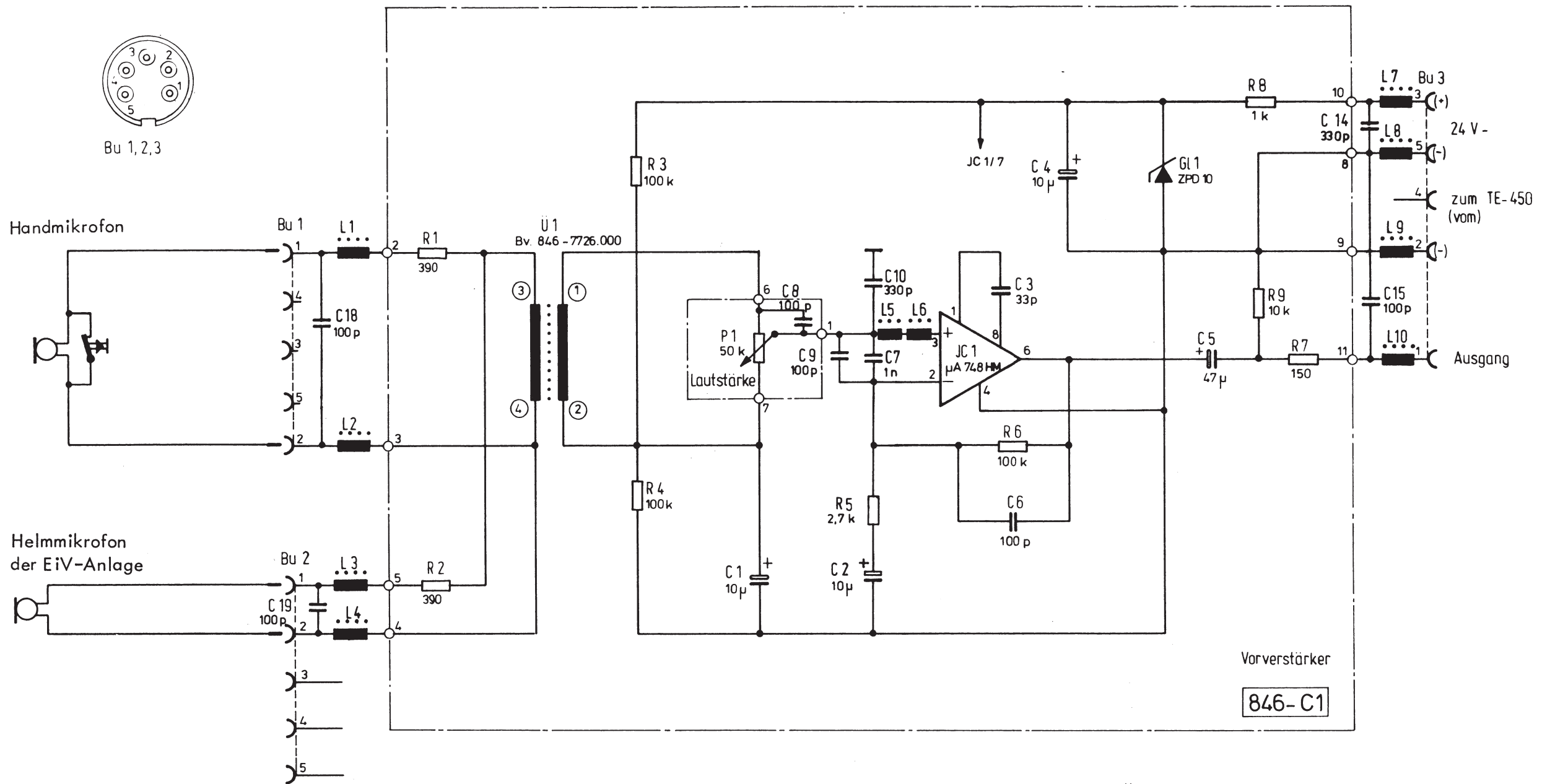
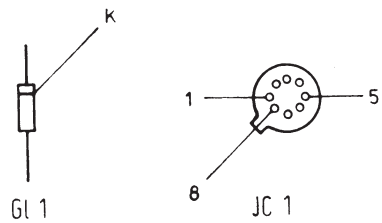
Benennung:
 Ri-Schaltung
 bestückt 846-A
 846-7000.001 / 4



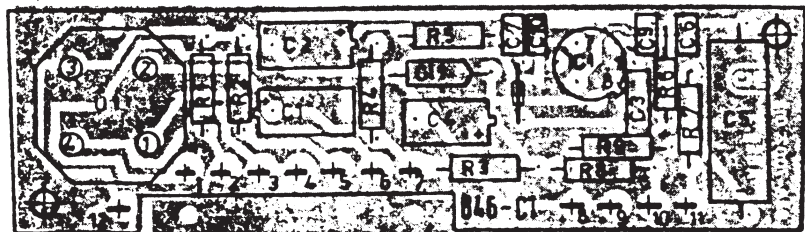
Final amplifier module
 Amplificateur final module

*) Serie A: K: Bv 846-9301 01/4 Bl 2 6.Serie L JPS

Stromlaufplan Endverstärker-Modul EM 101, 102	für Gerät: TE-450/BN 846	Serie A	Schalteliste	5 Blatt Blatt-Nr. 1
		846-9301 012 / 33		

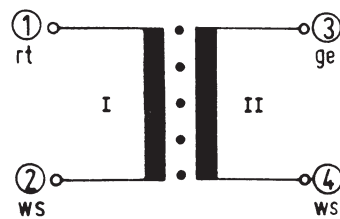


Vorverstärker
846-C1



846110
846121:

846110-121



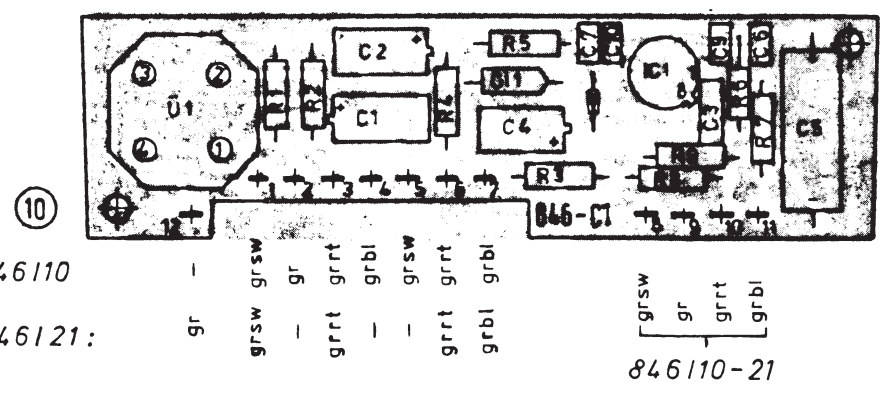
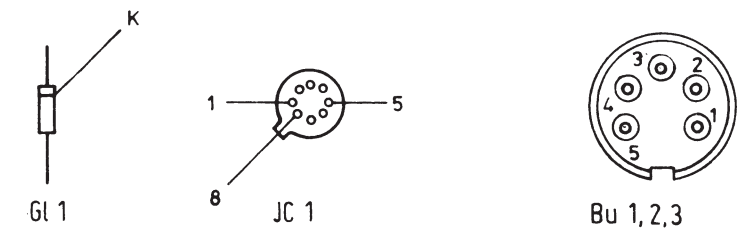
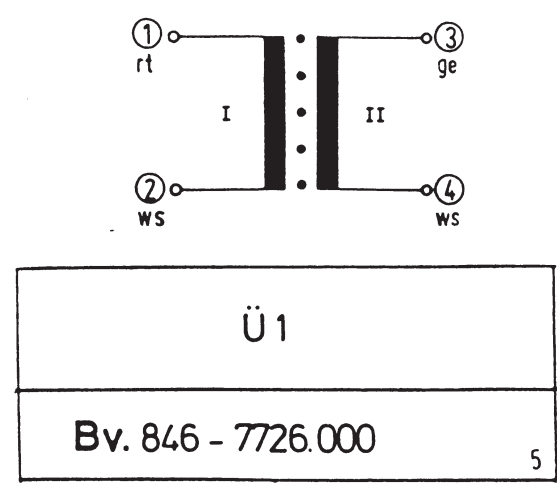
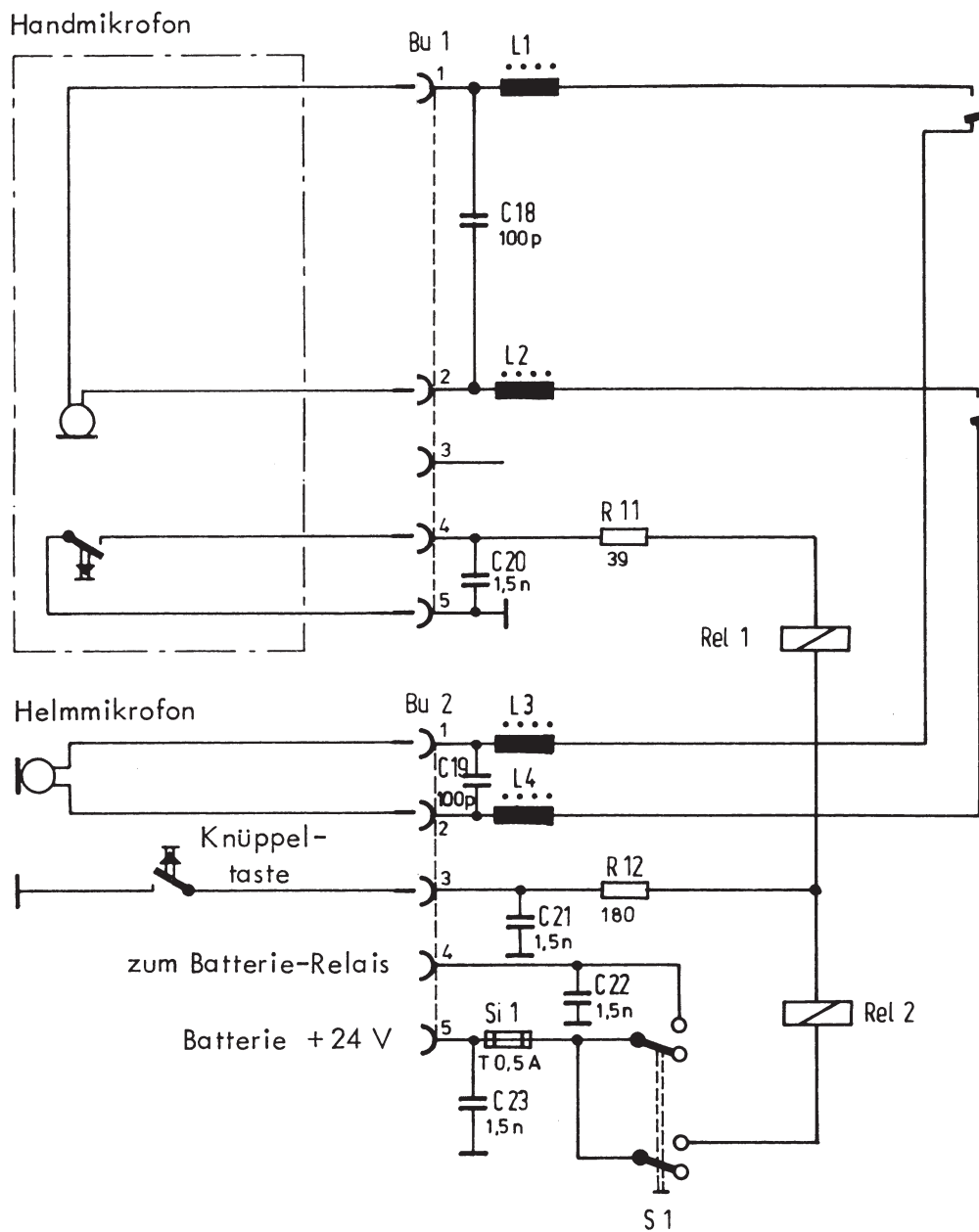
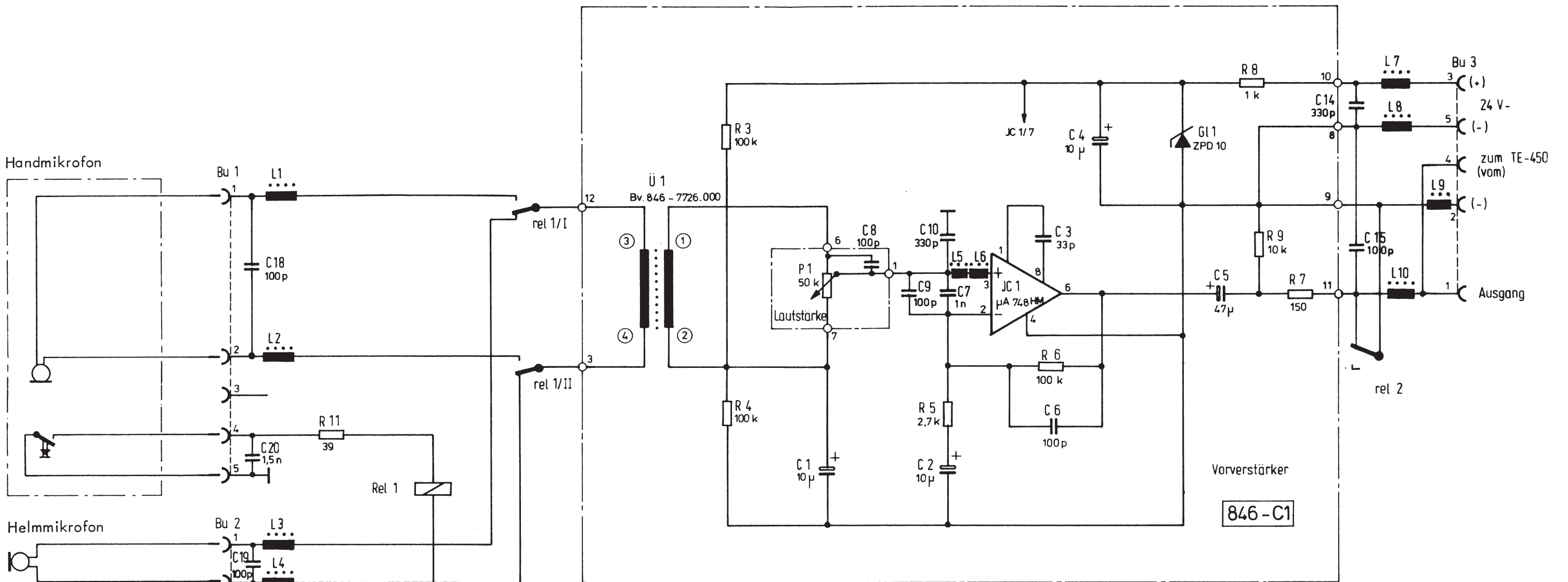
Ü 1

Bv. 846 - 7726.000

Preamplifier for TE-450
Préamplificateur pour TE-450

WG	Stromlaufplan für Gerät: BN 846/10	BN 846/10: Serie G...	Schaltteilliste: IPS
	Vorverstärker zum TE-450	846 - 7510.025/3	
			1 Blatt Blatt-Nr. 5

Benennung:	
Vorverstärker	
bestückt	846-C1
846 - 7002.009 / 4	



Benennung:
Vorverstärker
 bestückt 846-C1
846-7002.009 / 4

Preamplifier for TE-450
 Préamplificateur pour TE-450

	Stromlaufplan für Gerät: BN 846/21	Serie G...	Schaltteilliste: IPS
	Vorverstärker zum TE-450	846-7510.229/3	
			1 Blatt Blatt-Nr. 4

Anmerkungen zu den Stromlaufplänen und den Schalteillisten

Notes for Circuit Diagram and the Parts Lists

Notes sur les schémas de principe et les listes de composants

Abkürzungsbeispiele

④ = Stromlaufplan 4
 [820-B] = Leiterplatte B
 Pkt. 6 = Anschlußpunkt 6
 TP 203 = Testpunkt 203

Farbkennzeichnung

bl = blau
 blank = blank
 br = braun
 fl = farblos
 ge = gelb
 gn = grün
 gr = grau
 rs = rosa
 rt = rot
 Schirm = Schirm
 sw = schwarz
 vio = violett
 ws = weiß
 grt = grau/rot
 geschirmte Leitung
 blanker Draht
 BS = Bestückungsseite
 NBS = nicht bestückte Seite

Alle angegebenen Spannungen sind mit einem Instrument 100 k Ω /V gegen 0 V gemessen.

Relais in Ruhestellung dargestellt

Sollten die Werte bestimmter Bauelemente in den Stromlaufplänen und Schalteillisten differieren, so sind stets die Angaben in den Schalteillisten als verbindlich anzusehen.

Bestellangaben

Bei Ersatzteilbestellungen unbedingt beachten:

Die genaue Bezeichnung ist der Schalteilliste zu entnehmen.

Bauelemente mit BV bzw. WN sind im Werk anzufordern.

Neben der Bestellnummer (BN) ist die Gerätenummer mit Serienindex, die Positionsnummer des Bauelements und die Sachnummer anzugeben.

Beispiel: PM-20 BN 881/01
 Nr. 0001 A

2 T 2

Schaltbild-Nr. Positions-Nr.
 Sach-Nr. 0001-0015.836

Baugruppenverbindungen

Da die Stromlaufpläne für jede Baugruppe getrennt gezeichnet sind, müssen alle Zuleitungen zu anderen Baugruppen deutlich erkennbar sein. Die nachstehende Skizze erläutert die hier angewandten Verfahren zur Kennzeichnung.

Verfahren 1

Beim Anschlußpunkt einer Baugruppe steht die Adresse der anderen Anschlußpunkte, mit denen er verbunden ist.

Verfahren 2

Beim Anschlußpunkt steht nur eine Signalbezeichnung ohne Adresse. Dann sind alle Anschlußpunkte anderer Baugruppen mit der gleichen Signalbezeichnung untereinander verbunden.

Abbreviations examples

Circuit diagram 4
 Circuit board B
 Connection point 6
 Test point 203

Colour coding

blue
 bare wire
 brown
 transparent
 yellow
 green
 grey
 pink
 red
 screening
 black
 violet
 white
 grey/red
 Screened lead
 Bare wire
 Components side
 Soldering side

All voltage ratings measured with respect to 0 V with 100 k Ω /V meter.

Relays shown in rest position

If the values of individual components listed in the circuit diagrams and component lists should differ from another, those values given in the component lists are valid.

Ordering Information

When ordering spare parts, the following instructions must be followed without fail:

The exact designation of the component shall be taken from the "Parts Lists".

Components prefixed with BV or WN should be ordered from the manufacturer, W&G.

Next to the order number (BN) the serial number of that particular instrument along with the position number of the component and the item number shall be given.

Example: PM-20 BN 881/01
 No. 0001 A

2 T 2

Circuit diagram Position No.
 Item number 0001-0015.836

Connections between subassemblies

Because of each subassembly having been drawn separately, all the interconnections with the other subassemblies must be clearly identifiable. The following sketch explains the method used here for identifying the connections.

Method 1

At a connection point of a subassembly, there are located the addresses of the other connection points with which it is connected.

Method 2

At the connection point, there is only located a signal designation without address. Then, all similarly designated connection points of other subassemblies are interconnected.

Exemples d'abréviations

Schéma 4
 Platine B
 Point de raccordement 6
 Point test 203

Code des couleurs

bleu
 nu
 brun
 transparent
 jaune
 vert
 gris
 rose
 rouge
 blindage
 noir
 violet
 blanc
 gris/rouge
 Conducteur blindé
 Fil nu
 Côté composants
 Côté soudure

Toutes les tensions données sont mesurées par rapport à 0 V avec un instrument de 100 k Ω /V.

Les relais sont représentés en position repos

Lorsque les valeurs de certains composants diffèrent entre les schémas de principes et les listes de composants, les valeurs des listes de composants sont seules valables.

Données pour la commande

Pour la commande de composants de rechange il faut absolument observer:

La désignation exacte du composant qui est à prendre dans la liste des composants.

Les composants BV ou WN sont à réclamer à l'usine.

Outre le numéro de commande (BN) le numéro de l'appareil avec son index de série et le numéro de position du composant et numéro d'objet sont à donner.

Exemple: PM-20 BN 881/01
 N° 0001 A

2 T 2

N° de schéma N° de position
 N° d'objet 0001-0015.836

Raccordement des modules

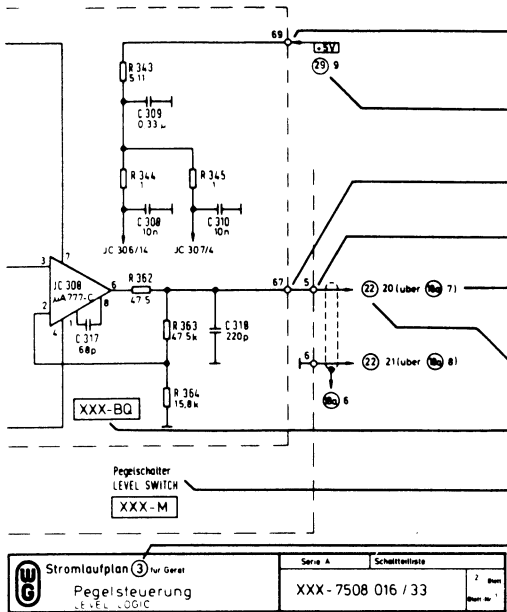
Les schémas de principe des modules étant représentés séparément les liaisons entre les différents modules doivent être facilement reconnues. Le schéma suivant indique le système d'identification utilisé.

Système 1

Le point de raccordement du module comporte l'adresse de l'autre point de raccordement auquel il est relié.

Système 2

Le point de raccordement ne comporte qu'une indication de signal sans adresse. Tous les points de raccordement des autres modules comportant la même indication de signal sont alors reliés ensemble.



Anschlußpunkt 69 der Leiterplatte 697-BQ
 + 5 V kommt von Stromlaufplan (29) Anschlußpunkt 9
 Anschlußpunkt 67 der Leiterplatte XXX-BQ geht auf Anschlußpunkt 5 der Trägerkarte XXX-M, von hier aus zu Stromlaufplan (18a) Anschlußpunkt 7 und schließlich zu Punkt 20 des Stromlaufplanes (22)
 Bezeichnung der Leiterplatte (Sandwichkarte)
 Bezeichnung der Trägerkarte
 Stromlaufplan Nr.

Connection point 69 of printed circuit board (p.c.b.) 697-BQ
 +5 V coming from circuit diagram (29) connection point 9
 Connection point 67 of the p.c.b. XXX-BQ going to connection point 5 of mother board XXX-M, and from this point, to circuit diagram (18a), connection point 7, finally going to point 20 of circuit diagram (22)
 Designation of p.c.b. (sandwich card)
 Designation of mother board
 Circuit diagram No.

Point 69 du circuit imprimé 697-BQ
 le +5 V arrive du schéma (29), point 9
 le point 67 du circuit imprimé XXX-BQ va au point 5 de la carte support XXX-M, de là au schéma (18a), point 7 et pour terminer au point 20 du schéma (22)
 Désignation du circuit imprimé (carte sandwich)
 Désignation de carte support
 N° du schéma de principe

Bezeichnung der Anschlußpunkte

(30) 21: Anschlußpunkt 21 von Schaltbild (30)

(30) S 3010/a/5: Kontakt a/5 von Schalter 10 in Schaltbild (30)

Beispiel: Der Anschlußpunkt M des Schaltbildes (29) mit der Signalbezeichnung "Null-Verschiebung (0,4)" ist mit 2 weiteren Anschlußpunkten der gleichen Signalbezeichnung verbunden.

- 1) Kontakt a/5 von Schalter 10 in Schaltbild (30) (Verbindung läuft ganz oder teilweise außerhalb des Steckkartenträgers)
- 2) bBW/7 von Schaltbild (31) (Verbindung läuft innerhalb des Steckkartenträgers)

Bei Steckkartentechnik mit einem Steckkartenträger gibt eine Liste Auskunft über die Anschlußpunkte mit gleicher Signalbezeichnung.

Designation of connection points

(30) 21: connection point 21 from circuit diagram (30)

(30) S 3010/a/5: contact a/5 from switch 10 in circuit diagram (30)

Example: Connection point M of circuit diagram (29) having the signal designation "zero offset (0,4)" is connected to two other connection points of the same signal designation.

- 1) Contact a/5 from switch 10 in circuit diagram (30) (connection passes completely, or partially, outside of the mother board)
- 2) bBW/7 from circuit diagram (31) (connection stays within the mother board)

With plug-in p.c.b. technology using plug-in mother boards, a list provides information concerning the connection points having the same signal designation.

Désignation des points de raccordement

(30) 21: point de raccordement 21 du schéma (30)

(30) S 3010/a/5: contact a/5 du commutateur 10 du schéma (30)

Exemple: Le point de raccordement M du schéma (29) avec l'indication de signal "décalage du zéro (0,4)" est relié à deux autres points de raccordement avec la même indication de signal.

- 1) Contact a/5 du commutateur 10 du schéma (30) (la liaison passe entièrement ou en partie hors de la carte support)
- 2) bBW/7 du schéma (31) (la liaison passe dans la carte support)

Système de cartes enfichables sur une carte support. Une liste informe des points de raccordement avec la même indication de signal.

Buchsenleisten - Kontaktbezeichnung
 ≙ Anschlußpunkt-Bezeichnung
 Edge connectors - contact designation
 ≙ connection point designation
 Prise - désignation du contact
 ≙ désignation du point de raccordement

von Schaltbild (29)
 from Circuit diagram (29)
 du schéma (29)

Signalbezeichnung	außerhalb Prüfbereich	Anschlußpunkte	innerhalb Prüfbereich	1	11	11	1	innerhalb Prüfbereich	Anschlußpunkte	außerhalb Prüfbereich	Signalbezeichnung	Leiste	
- 12 V			Stromversorgung siehe Bl.16	16	V	16	18	Stromversorgung siehe Bl.16			- 12 V	(29)	
			frei	35	U	17	17		(31) Bw 3101 / 4		8 x 10 ⁻²	376 CG	
4 x 10 ⁻²			(31) Bw 3001 / 3	2	34	T	16	16	2	(31) BQ / 8	xxx (30) 19	2 ² x 0,01 B	Bl.33
2 ² x 0,01 B		(30) 18	xxx (31) bW / K	2	33	S	15	15	2	(31) bW / J	xxx (30) 17	2 ¹ x 0,01 B	
2 ⁰ x 0,01 B		(30) 16	xxx (31) bW / H	2	32	R	14	14	5	(18) R / B, (19) E / B, (20) A / B, (22) B / B		Bereich Digital	
1 x 10 ⁻²			(31) Bw 3101 / 1	2	31	P	13	13	2	(31) Bw 3101 / 2		2 x 10 ⁻²	
Null - Verschiebung (0,2)		(30) S 3010 / a / 3	xxx (31) bW / 6	2	30	N	12	12	2	(31) bW / 5	xxx (30) S 3010 / a / 2	Null - Verschiebung (0,1)	
Null - Verschiebung (0,4)		(30) S 3010 / a / 5	xxx (31) bW / 7	2	29	M	11	11	2	(31) bW / 4	xxx (30) S 3010 / a / 4	Null - Verschiebung (0,2)	
Null - Verschiebung (0,6)		(30) S 3010 / a / 7	xxx (31) bW / 8	2	28	L	10	10	2	(31) bW / 3	xxx (30) S 3010 / a / 6	Null - Verschiebung (0,4)	
Null - Verschiebung (0,8)		(30) S 3010 / a / 9	xxx (31) bW / 9	2	27	K	9	9	2	(31) bW / 2	xxx (30) S 3010 / a / 8	Null - Verschiebung (0,2)	
Masse (hoch)			Stromversorgung siehe Bl.16	26	J	8	8					Masse (hoch)	
Verschiebung 2 ⁰		(19) E / 6, (22) B / 2, (23) U / 7		4	25	H	7	7	2	(31) bW / 1	xxx (30) S 3010 / a / 10	Null - Verschiebung (0,3)	
Verschiebung 2 ¹		(19) E / 5		2	24	F	6	6	2	(19) E / H		Verschiebung 2 ¹	
Verschiebung 2 ²		(22) B / A		2	23	E	5	5	2	(19) E / 10		Verschiebung 2 ²	
Vorzeichen -		(30) 21	xxx (31) bW / 17, (19) E / 4	3	22	D	4	4	2	(22) B / 4		Verschiebung 2 ³	
Verschiebung 2 ¹		(22) B / C		2	21	C	3	3	3	(20) A / F, (21) G / F		2 ³ x 0,01 A	
2 ² x 0,01 A		(20) A / 5, (21) G / K		3	20	B	2	2	3	(20) A / L, (21) G / L		2 ² x 0,01 A	
+ 5 V			Stromversorgung siehe Bl.16	19	A	1	1	1	3	(20) A / M, (21) G / M		2 ⁰ x 0,01 A	

Anschlußpunkte mit gleicher Signalbezeichnung für diese Buchsenreihe
 Connection points with the same signal designation for this connector row of contacts
 Points de raccordement avec même indication de signal pour cette rangée de prises

außerhalb Prüfbereich xxx innerhalb Prüfbereich
 außerhalb Prüfbereich ≙ diese Anschlußpunkte sind durch Leitungen verbunden, die teilweise oder ganz außerhalb des Steckkartenträgers verlaufen.

outside of test region xxx within test region
 outside of test region ≙ these connection points are connected by lines which partially, or completely, pass outside of the mother board.

hors gamme de contrôle xxx dans la gamme de contrôle
 hors gamme de contrôle ≙ ces points de raccordement sont reliés par des conducteurs qui passent en partie ou entièrement hors de la carte support.

Erklärung der wichtigsten Abkürzungen und der Darstellung der Daten

Benennung	Bezeichnung 1	Bezeichnung 2	
R-KOHLE	100 5% 0309		Kohleschicht-Widerstand 100 Ω 5% D x L = 3 x 9 mm Carbon Film Resistor Résistance d couche de carbone
R-METALL	2,77 K 0,1% 0207	TK 50	Metall-Schichtwiderstand 2,77 k Ω 0,1% TK 50 D x L = 2 x 7 mm Metal Film Resistor Résistance d couche métal
R-DRAHT	47 10% 2 W	WM 50 SKA 2	Drahtwiderstand 47 Ω 10% 2 Watt Mat.: WM 50, Typ SKA-2 Wirewound Resistor Résistance bobinée
R-TRIMM-CERMET	470 20% 0,5 W 1	150	Trimm-Widerstand Cermet 470 Ω 20% 0,5 W 1 Umdrehg. TK 150 PPM Adjustment Potentiometer Cermet 1-Turn Potentiomètre d'ajustment Cermet 1 tour
R-TRIM DRAHT SPINDEL	5 K 5% 0,7 W 22	70	Spindel-Trimmer Draht 5 k Ω 5% 0,7 Watt 22 Umdrehungen TK 70 Rectangular Wirewound adjustment Potentiometer 22 Turns Potentiomètre d'ajustment bobiné 22 tours
R-TRIM DRAHT SQUARE	20 K 5% 0,7 W 25	70	Square-Trimmer Draht 20 k Ω 5% 0,7 Watt 25 Umdrehungen TK 70 PPM Square Wirewound adjustment Potentiometer 25 Turns Potentiomètre d'ajustment bobiné Square 25 tours
R-VAR KOHLE	100 10/20 0,2 W LIN	260	Kohleschicht-Pot. 100 Ω - 10/+20 % 0,2 W linear, Drehwinkel 260° Carbonfilm Potentiometer Potentiomètre d couche de carbone
R-VAR DRAHT	5 K 3% 2 W LIN	3600 0,25%	Drahtpotentiometer 5 k Ω 3% 2 W Linear 3600° = 10-Gang Lineartoleranz 0,25% Wirewound Potentiometer 10-Turns Potentiomètre bobiné 10 tours
ELKO-AL	470 U 10/50 70 V		Aluminium-Elko 470 μ F - 10/+50% 70 V, gepolt Aluminium Electrolytic Capacitor, polarized Condensateur électrolytique d'aluminium polarisé
ELKO-AL UNGEPOLT	100 U 40 V	EU 100/40	Aluminium-Elko ungepolt (bipolar) 100 μ F 40 V Typ EU 100/40 Aluminium Electrolytic Capacitor, unpolarized Condensateur électrolytique d'aluminium non polarisé
ELKO-TA SINT FEST	6,8 U 20% 6,3 V		Tantal-Elko Sinteranode, fester Elektrolyt 6,8 μ F 20% 6,3 V Tantalum Electrolytic Capacitor, Sintered Anode dry Condensateur au tantale d'électrolyte solide
C-KERAMIK EDPU	120 P 2% 63 V	N 150 I B	Keramik-Kondensator 120 pF 2% 63 V Keramik: N 150 Typ I B EDPU = Kennzeichnung nach DIN 41930 Ceramic Capacitor Condensateur céramique
C-KERAMIK RDLL	88,7 P 1% 25 VEF	N 075 I B KZK4	Keramik-Kondensator kurzzeitkonstant (10-4) 88,7 pF 1% 25 V _{eff} Material N 075 Typ I B Ceramic Capacitor Short-Term-Stability Condensateur céramique de stabilité de lourte durée
C-GLIMMER	487 P 0,5% 500 V	BF 48.10	Glimmer-Kondensator 487 pF 0,5% 500 V Bauform 48.10 Mica Capacitor Type 48.10 Condensateur au mica argenté
C-GLIMMER KNOPF	3900 P 5% 100 V	BF 49.25-3	Glimmer-Knopf-Kondensator 3,9 nF 5% 100 V 49.25-3 Mica Button Capacitor Condensateur bouton au mica argenté
C-KF KS	316 P 0,5% 63 V	KSM	Kunststoff-Folienkondensator Styroflex 316 pF 0,5 % 3 V Polystyrene Capacitor Condensateur polystyrène
C-KF MKT	0,068 U 10% 100 V		Metallisierter Polyester Kondensator 68 nF 10% 100 V Metallized Polyester Capacitor Condensateur polyester métallisé
C-DREH	9,0-25,0 P 1-Fach-LIN 2222 805 90123		Drehkondensator 9-25 pF 1-fach C-Linear Typ. ... Variable Capacitor, Single-Section, SLC, Type ... Condensateur variable, Variation linéaire en capacité
C-DREH SCHMETTERLING			Schmetterling-Kondensator Butterfly variable Capacitor Condensateur papillon

C-TRIM KER SCHEIBE	10,0-60, OP N 1500	xxx...				Keramik Scheibentrimmer 10-60 pF Material N 1500 0,5 Umdrehungen Typ xxx ... Variable Ceramic Disc Capacitor Condensateur ajustable disque céramique
C-TRIM GLAS ROHR	0,6- 3, OP 100PPM 12	xxx...				Glasrohrtrimmer 0,6 - 3 pF TK 100 PPM 12 Umdrehungen Typ xxx... Glass Piston Trimmer Capacitor ... 12 Turns Condensateur ajustable
C-TRIM LUFT	1,75-15, SP 45 PPM 0,5	xxx...				Lufttrimmer (Platten) 1,275 - 15,5 pF RK 45 PPM 0,5 Umdrehg. Typ xxx... Air variable Capacitor Condensateur ajustable
C-PAPIER ENTSTOER						Funkentstörkondensator R.F.-Interference-Suppression Capacitor Condensateur d' antiparasitage
L-FUNKENTSTOER						Funkentstördosel Microwaves Interference Suppression Choke Self d' antiparasitage pour ondes ultra-courtes
L-FEST	15 u 10%					Festinduktivität 15 µH 10% R.F. Molded Choke Inductance
C-KF KC	13300 P 1% 63 V		KC 1853			Polycarbonat-Kondensator 13300 pF 1% 63 V Typ KC 1853 Polycarbonate-Capacitor Condensateur à film polycarbonate à armatures
C-KF MKC	220000 P 20% 250 V		MKC 1858			Metallisierter Polycarbonat-Kondensator 220000 pF 20% 250 V Typ MKC 1858 Metallized Polycarbonate Capacitor Condensateur à film polycarbonate métallisé
C-KF KT	0,015U % 100 V		KT 1801			Polyester-Kondensator 0,015 µF 5% 100 V Typ KT 1801 Polyester Capacitor Condensateur à film polyester à armatures
C-KF MKU	10 U 10% 63 V		B 32110			Cellulose-Acetat Kondensator 10 µF 10% 63 V Typ B 32110
C-KF KP	183000 P 2% 160 V					Polypropylen-Kondensator 183000 PF 2% 160 V Polypropylene Capacitor Condensateur à film polypropylène à armatures
S-DREH	Werksinterne Daten Ersatz per Sach-Nr. bestellen					Drehschalter Rotary switch Commutateur rotatif
S-KIPP	"					Kippschalter Toggle switch Interrupteur à touche basculante
S-SCHIEBE	"					Schiebeschalter Slide switch Interrupteur à glissière
S-TASTE	"					Tastenschalter Push-button switch Commutateur à touches
S-SCHNAPP	"					Schnappschalter Micro switch Interrupteur à déclic
S-KODIER	"					Kodierschalter Thumb-Wheel switch Roue codeuse
RELAIS						
IC-... TRANS...	"			Mos		mit "Mos" sind alle Halbleiterbauelemente gekennzeichnet, die durch elektrostatische Aufladung gefährdet sind. Die hierfür gültigen Verarbeitungsvorschriften sind unbedingt einzuhalten. All semiconductors subject to damage caused by electrostatic discharge are identified with the letters "Mos". The existing regulations applied to handling these devices are to be uncon- ditionally complied with. Tous les semi-conducteurs pouvant être détériorés par une charge électrostatique sont identifiés avec "MOS". Les consignes con- cernant la manipulation de ces éléments sont absolument à respecter.

PLATINE PC-BOARD	SACHNUMMER PART-NUMBER	BENENNUNG DESCRIPTION	BEZEICHNUNG MARKING	Seite Page
	0846-7000.001 01	RI-SCHALTUNG	0846-A	1
	0846-7001.000	TREIB U EL.SICH	0846-B	2
	0846-7004.007	FUNKENTSTOERKA	0846-E	4

Anhang: Hier finden Sie Bauteile, die keiner speziellen Platine zugeordnet sind

Here you will find the components which are not assigned to specific PC board 5

DATUM 18.05.91

PLATINE

PC-BOARD 0846-7000.001 01 RI-SCHALTUNG

0846-A

TEIL-NR ITEM-NO	SACHNUMMER PART-NUMBER	BENENNUNG DESCRIPTION	BEZEICHNUNG MARKING			
	1 0846-7000.027	RJ-SCHALTUNG	02ANO			
	13 0000-2901.026	LOETOESE STECK-		MS	VERZ	
	15 0000-3002.254	STIFT	1 V L	LT		
C	24 0001-0040.704	ELKO-TA SINT FEST	1U	20%	35V	
R	35 0000-7519.471	R-METALL	100R	1%	0204	
R	36 0000-7608.858	R-METALL	27R4	1%	0204	
R	37 0000-7516.212	R-DRAHT	OR1	10%	2W	
R	38 0000-7516.212	R-DRAHT	OR1	10%	2W	
R	39 0000-7516.212	R-DRAHT	OR1	10%	2W	
R	40 0000-7519.471	R-METALL	100R	1%	0204	
R	41 0000-7608.858	R-METALL	27R4	1%	0204	
R	42 0000-7516.212	R-DRAHT	OR1	10%	2W	
R	43 0000-7516.212	R-DRAHT	OR1	10%	2W	
R	44 0000-7516.212	R-DRAHT	OR1	10%	2W	

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PLATINE

PC-BOARD 0846-7001.000

TREIB U EL.SICH

0846-B

TEIL-NR ITEM-NO	SACHNUMMER PART-NUMBER	BENENNUNG DESCRIPTION	BEZEICHNUNG MARKING			
	1 0846-7001.806	TREIB U EL.SICH BEDRU				
	3 0000-7639.623	0-OHM WIDERSTAND	OR			0204
	5 0000-7639.623	0-OHM WIDERSTAND	OR			0204
	9 0846-8526.018	BRUECKE				
	13 0001-0031.056	BUCHSE	1 M L	LT		
	15 0000-2901.026	LOETOESE STECK-		MS	VERZ	
C	1 0000-7500.082	ELKO-AL	2200U	10/ 50	40V	
C	2 0001-0040.898	ELKO-TA SINT FEST	10U	20%	35V	
C	3 0000-7610.778	C-KF MKT	10N	10%	400V	
C	4 0001-0040.898	ELKO-TA SINT FEST	10U	20%	35V	
C	5 0001-0040.898	ELKO-TA SINT FEST	10U	20%	35V	
C	6 0001-0004.054	C-KERAMIK EDPT	3P3	OP25	63V	
C	7 0001-0010.378	C-KF MKT	100N	20%	100V	
C	8 0001-0004.630	C-KERAMIK EDPT	330P	2%	63V	
C	9 0001-0004.630	C-KERAMIK EDPT	330P	2%	63V	
C	10 0001-0041.813	ELKO-AL	100U	10/ 50	40V	
C	11 0001-0041.790	ELKO-AL	100U	10/ 50	16V	
C	12 0001-0042.142	ELKO-AL	1U	20/ 50	350V	
C	13 0001-0010.378	C-KF MKT	100N	20%	100V	
C	14 0001-0004.630	C-KERAMIK EDPT	330P	2%	63V	
GL	1 0001-0018.493	DIODE SI	1N4448		DO 35	
GL	2 0001-0018.493	DIODE SI	1N4448		DO 35	
GL	3 0001-0018.493	DIODE SI	1N4448		DO 35	
GL	4 0001-0018.493	DIODE SI	1N4448		DO 35	
GL	7 0001-0018.804	DIODE SI Z-	ZPD4,7		DO 35	
GL	8 0001-0018.493	DIODE SI	1N4448		DO 35	
IC	1 0001-0068.168	IC-OP.-VERST.	748G		TO 99	
L	1 0000-7556.133	L-FEST	4U7 10%	1025-36		
L	2 0874-7005.810	DAEMPFUNGSERLE KPL				
L	3 0874-7005.810	DAEMPFUNGSERLE KPL				
P	1 0001-0008.212	R-TRIM CERMET	47K 20%	1W	1	
P	2 0001-0008.173	R-TRIM CERMET	1K 20%	1W	1	
R	1 0000-7645.659	R-METALL	562K	1%	0204	
R	2 0000-7604.357	R-METALL	3K32	1%	0204	
R	3 0000-7607.244	R-METALL	56K2	1%	0204	
R	4 0000-7607.244	R-METALL	56K2	1%	0204	
R	5 0000-7585.599	R-METALL	82K5	1%	0204	
R	6 0000-7608.955	R-METALL	2K74	1%	0204	
R	7 0000-7607.244	R-METALL	56K2	1%	0204	
R	8 0000-7605.042	R-METALL	1K21	1%	0204	
R	9 0000-7585.544	R-METALL	1K	1%	0204	
R	10 0000-7607.244	R-METALL	56K2	1%	0204	
R	11 0000-7607.244	R-METALL	56K2	1%	0204	
R	12 0000-7604.357	R-METALL	3K32	1%	0204	
R	13 0000-7588.509	R-METALL	5K62	1%	0204	
R	14 0000-7604.357	R-METALL	3K32	1%	0204	
R	15 0000-7585.586	R-METALL	33K2	1%	0204	
R	19 0000-7585.528	R-METALL	2K21	1%	0204	
R	20 0000-7604.357	R-METALL	3K32	1%	0204	
R	22 0000-7585.544	R-METALL	1K	1%	0204	
R	23 0000-7585.528	R-METALL	2K21	1%	0204	

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PLATINE

PC-BOARD 0846-7001.000

TREIB U EL.SICH

0846-B

TEIL-NR ITEM-NO	SACHNUMMER PART-NUMBER	BENENNUNG DESCRIPTION	BEZEICHNUNG MARKING		
R 24	0000-7519.471	R-METALL	100R	1%	0204
R 25	0000-7585.560	R-METALL	10K	1%	0204
R 26	0000-7585.560	R-METALL	10K	1%	0204
R 27	0000-7607.228	R-METALL	22K1	1%	0204
R 28	0000-7588.509	R-METALL	5K62	1%	0204
R 29	0000-7585.544	R-METALL	1K	1%	0204
R 30	0000-7608.874	R-METALL	47R5	1%	0204
R 31	0000-7516.225	R-DRAHT	100R	10%	5W
T 2	0000-7593.552	TRANS SI NPN	2N4896		B TO 39
T 3	0000-7593.552	TRANS SI NPN	2N4896		B TO 39
T 5	0001-0016.550	TRANS SI PNP	BCY78X (D)		A TO 18
T 6	0001-0016.550	TRANS SI PNP	BCY78X (D)		A TO 18
T 7	0001-0016.550	TRANS SI PNP	BCY78X (D)		A TO 18
T 8	0001-0016.770	TRANS SI NPN	2N2219 (BFX97)		A TO 39
T 9	0001-0016.518	TRANS SI NPN	BCY59X (D)		A TO 18
UE 1	0846-7727.009	UEBERTRAGER			
UE 2	0846-7728.008	UEBERTRAGER			

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PLATINE

PC-BOARD 0846-7004.007

FUNKENTSTOERKA

0846-E

TEIL-NR	SACHNUMMER	BENENNUNG	BEZEICHNUNG			
ITEM-NO	PART-NUMBER	DESCRIPTION	MARKING			
	1 0846-7004.023	FUNKENTSTOERKARTE	02ANO			
	3 0000-2901.026	LOETOESE STECK-		MS	VERZ	
1C	2 0001-0004.517	C-KERAMIK EDPT	100P	2%	63V	
1C	3 0001-0004.698	C-KERAMIK EDPT	1N	10%	63V	
1C	4 0001-0004.698	C-KERAMIK EDPT	1N	10%	63V	
1C	5 0001-0004.711	C-KERAMIK EDPT	1N5	10%	63V	
1C	6 0001-0004.711	C-KERAMIK EDPT	1N5	10%	63V	
1C	7 0001-0004.698	C-KERAMIK EDPT	1N	10%	63V	
1C	8 0001-0004.698	C-KERAMIK EDPT	1N	10%	63V	
1C	9 0001-0010.378	C-KF MKT	100N	20%	100V	
1L	1 0001-0042.935	L-FEST	4U7 10%	1537-28		
1L	3 0001-0042.935	L-FEST	4U7 10%	1537-28		

ENDE DER PLATINE
END OF PC-BOARD

DATUM 18.05.91

ANHANG ** TE-450 ** BN 0846/03 **

TEIL-NR ITEM-NO	SACHNUMMER PART-NUMBER	BENENNUNG DESCRIPTION	BEZEICHNUNG MARKING
GL	9 0000-7509.915	GLEICHR SI	SSIE1410 S 290
GL	9 0000-7509.915	GLEICHR SI	SSIE1410 S 290
R	21 0000-7593.549	R-NTC	40K 10% 4250 OW1
R	21 0000-7593.549	R-NTC	40K 10% 4250 OW1
T	1 0000-7593.565	TRANS SI NPN	MJE340 A TO 126
T	1 0000-7593.565	TRANS SI NPN	MJE340 A TO 126
T	14 0001-0017.148	TRANS SI NPN	MJE3055 A X 58D
T	14 0001-0017.148	TRANS SI NPN	MJE3055 A X 58D
T	15 0001-0017.148	TRANS SI NPN	MJE3055 A X 58D
T	15 0001-0017.148	TRANS SI NPN	MJE3055 A X 58D
T	16 0001-0017.148	TRANS SI NPN	MJE3055 A X 58D
T	16 0001-0017.148	TRANS SI NPN	MJE3055 A X 58D
T	17 0001-0017.148	TRANS SI NPN	MJE3055 A X 58D
T	17 0001-0017.148	TRANS SI NPN	MJE3055 A X 58D
T	18 0001-0017.148	TRANS SI NPN	MJE3055 A X 58D
T	18 0001-0017.148	TRANS SI NPN	MJE3055 A X 58D
T	19 0001-0017.148	TRANS SI NPN	MJE3055 A X 58D
T	19 0001-0017.148	TRANS SI NPN	MJE3055 A X 58D
T	20 0001-0017.148	TRANS SI NPN	MJE3055 A X 58D
T	20 0001-0017.148	TRANS SI NPN	MJE3055 A X 58D
T	21 0001-0017.148	TRANS SI NPN	MJE3055 A X 58D
T	21 0001-0017.148	TRANS SI NPN	MJE3055 A X 58D
1BU	1 0001-0032.534	BUCHSE	5 A4 M EL LT 3
1C	1 0001-0004.630	C-KERAMIK EDPT	330P 2% 63V
1L	2 0001-0042.935	L-FEST	4U7 10% 1537-28
1L	4 0001-0042.689	L-FUNKENTSTOER	5U 20% B32-B1
1L	5 0001-0042.689	L-FUNKENTSTOER	5U 20% B32-B1
1L	6 0001-0042.689	L-FUNKENTSTOER	5U 20% B32-B1
1L	7 0001-0042.689	L-FUNKENTSTOER	5U 20% B32-B1
1L	8 0001-0042.689	L-FUNKENTSTOER	5U 20% B32-B1
1L	9 0001-0042.689	L-FUNKENTSTOER	5U 20% B32-B1
1SI	1 0001-0020.960	SICHERUNG SCHMELZ-	T 10,0 /250
1SI	2 0001-0020.630	SICHERUNG SCHMELZ-	M 0,5 /250 C OR4
1SI	3 0001-0020.960	SICHERUNG SCHMELZ-	T 10,0 /250
1ST	1 0000-7593.358	GERAETESTECKER	2P+E V SR 10A/250V
1ST	2 0000-7593.361	STECKER	4 A4 V EB LT
1ST	3 0000-7593.361	STECKER	4 A4 V EB LT
1UE	1 0846-7701.009	NETZTRAFO	
1UE	1 0846-7701.009	NETZTRAFO	

ENDE
END OF LIST

C61206A

W & G

TEILELISTE/PARTSLIST

BLATT 1

** VV-450 ** BN 0846/10 **

DATUM 21.05.91

PLATINE PC-BOARD	SACHNUMMER PART-NUMBER	BENENNUNG DESCRIPTION	BEZEICHNUNG MARKING	Seite Page
	0846-7002.009	VORVERSTAERKER	0846-C	1

Anhang: Hier finden Sie Bauteile, die keiner speziellen Platine zugeordnet sind

Here you will find the components which are not assigned to specific PC board 2

ENDE
END OF LIST

DATUM 21.05.91

PLATINE

PC-BOARD 0846-7002.009

VORVERSTAERKER

0846-C

TEIL-NR ITEM-NO	SACHNUMMER PART-NUMBER	BENENNUNG DESCRIPTION	BEZEICHNUNG MARKING		
	1 0846-7002.025	VORVERSTAERKER	02AN3		
	2 0000-2901.026	LOETOESE STECK-		MS	VERZ
	3 0000-7639.623	0-OHM WIDERSTAND	OR		0204
10C	1 0001-0040.898	ELKO-TA SINT FEST	10U	20%	35V
10C	2 0001-0040.898	ELKO-TA SINT FEST	10U	20%	35V
10C	3 0001-0004.342	C-KERAMIK EDPT	33P	2%	63V
10C	4 0001-0040.898	ELKO-TA SINT FEST	10U	20%	35V
10C	5 0001-0041.745	ELKO-AL	47U	10/ 50	16V
10C	6 0001-0004.520	C-KERAMIK EDPT	100P	2%	63V
10C	7 0001-0004.698	C-KERAMIK EDPT	1N	10%	63V
10C	9 0001-0004.520	C-KERAMIK EDPT	100P	2%	63V
10C	10 0001-0004.630	C-KERAMIK EDPT	330P	2%	63V
10GL	1 0001-0019.094	DIODE SI Z-	ZPD10		DO 35
10IC	1 0001-0068.168	IC-OP.-VERST.	748G		TO 99
10L	5 0001-0045.479	DAEMPfungSPERLE	DA= 3,5	DI= 1,3	L= 3,0
10L	6 0001-0045.479	DAEMPfungSPERLE	DA= 3,5	DI= 1,3	L= 3,0
10R	1 0000-7608.913	R-METALL	392R	1%	0204
10R	2 0000-7608.913	R-METALL	392R	1%	0204
10R	3 0000-7519.536	R-METALL	100K	1%	0204
10R	4 0000-7519.536	R-METALL	100K	1%	0204
10R	5 0000-7608.955	R-METALL	2K74	1%	0204
10R	6 0000-7519.536	R-METALL	100K	1%	0204
10R	7 0000-7585.007	R-METALL	150R	1%	0204
10R	8 0000-7585.544	R-METALL	1K	1%	0204
10R	9 0000-7585.560	R-METALL	10K	1%	0204
10UE	1 0846-7726.000	UEBERTRAGER			

ENDE DER PLATINE
END OF PC-BOARD

DATUM 21.05.91

ANHANG ** VV-450 ** BN 0846/10 **

TEIL-NR ITEM-NO	SACHNUMMER PART-NUMBER	BENENNUNG DESCRIPTION	BEZEICHNUNG MARKING
10BU 1	0001-0032.534	BUCHSE	5 A4 M EL LT 3
10BU 2	0001-0032.534	BUCHSE	5 A4 M EL LT 3
10BU 3	0001-0032.534	BUCHSE	5 A4 M EL LT 3
10C 8	0001-0004.520	C-KERAMIK EDPT	100P 2% 63V
10C 14	0001-0004.630	C-KERAMIK EDPT	330P 2% 63V
10C 15	0001-0004.520	C-KERAMIK EDPT	100P 2% 63V
10C 18	0001-0004.520	C-KERAMIK EDPT	100P 2% 63V
10C 19	0001-0004.520	C-KERAMIK EDPT	100P 2% 63V
10L 1	0001-0045.479	DAEMPFUNGSPERLE	DA= 3,5 DI= 1,3 L= 3,0
10L 2	0001-0045.479	DAEMPFUNGSPERLE	DA= 3,5 DI= 1,3 L= 3,0
10L 3	0001-0045.479	DAEMPFUNGSPERLE	DA= 3,5 DI= 1,3 L= 3,0
10L 4	0001-0045.479	DAEMPFUNGSPERLE	DA= 3,5 DI= 1,3 L= 3,0
10L 7	0001-0042.760	L-FUNKENTSTOER	Z=900 BR B82114-R-C4
10L 8	0001-0042.760	L-FUNKENTSTOER	Z=900 BR B82114-R-C4
10L 9	0001-0045.479	DAEMPFUNGSPERLE	DA= 3,5 DI= 1,3 L= 3,0
10L 10	0001-0042.760	L-FUNKENTSTOER	Z=900 BR B82114-R-C4
10P 1	0000-7593.280	R-VAR KOHLE SCHIEBE	50K OW6 LIN

ENDE
END OF LIST

C61206A

W & G

TEILELISTE/PARTSLIST

BLATT 1

** VV-450 ** BN 0846/21 **

DATUM 22.05.91

PLATINE PC-BOARD	SACHNUMMER PART-NUMBER	BENENNUNG DESCRIPTION	BEZEICHNUNG MARKING	Seite Page
	0846-7002.009	VORVERSTAERKER	0846-C	1

Anhang: Hier finden Sie Bauteile, die keiner speziellen Platine zugeordnet sind

Here you will find the components which are not assigned to specific PC board 2

ENDE
END OF LIST

DATUM 22.05.91

PLATINE

PC-BOARD 0846-7002.009

VORVERSTAERKER

0846-C

TEIL-NR ITEM-NO	SACHNUMMER PART-NUMBER	BENENNUNG DESCRIPTION	BEZEICHNUNG MARKING			
	1 0846-7002.025	VORVERSTAERKER	02AN3			
	2 0000-2901.026	LOETOESE STECK-		MS	VERZ	
	3 0000-7639.623	0-OHM WIDERSTAND	OR		0204	
10C	1 0001-0040.898	ELKO-TA SINT FEST	10U	20%	35V	
10C	2 0001-0040.898	ELKO-TA SINT FEST	10U	20%	35V	
10C	3 0001-0004.342	C-KERAMIK EDPT	33P	2%	63V	
10C	4 0001-0040.898	ELKO-TA SINT FEST	10U	20%	35V	
10C	5 0001-0041.745	ELKO-AL	47U	10/ 50	16V	
10C	6 0001-0004.520	C-KERAMIK EDPT	100P	2%	63V	
10C	7 0001-0004.698	C-KERAMIK EDPT	1N	10%	63V	
10C	9 0001-0004.520	C-KERAMIK EDPT	100P	2%	63V	
10C	10 0001-0004.630	C-KERAMIK EDPT	330P	2%	63V	
10GL	1 0001-0019.094	DIODE SI Z-	ZPD10		DO	35
10IC	1 0001-0068.168	IC-OP.-VERST.	748G		TO	99
10L	5 0001-0045.479	DAEMPfungSPERLE	DA= 3,5	DI= 1,3	L= 3,0	
10L	6 0001-0045.479	DAEMPfungSPERLE	DA= 3,5	DI= 1,3	L= 3,0	
10R	1 0000-7608.913	R-METALL	392R	1%	0204	
10R	2 0000-7608.913	R-METALL	392R	1%	0204	
10R	3 0000-7519.536	R-METALL	100K	1%	0204	
10R	4 0000-7519.536	R-METALL	100K	1%	0204	
10R	5 0000-7608.955	R-METALL	2K74	1%	0204	
10R	6 0000-7519.536	R-METALL	100K	1%	0204	
10R	7 0000-7585.007	R-METALL	150R	1%	0204	
10R	8 0000-7585.544	R-METALL	1K	1%	0204	
10R	9 0000-7585.560	R-METALL	10K	1%	0204	
10UE	1 0846-7726.000	UEBERTRAGER				

ENDE DER PLATINE
END OF PC-BOARD

DATUM 22.05.91

ANHANG

** VV-450 ** BN 0846/21 **

TEIL-NR ITEM-NO	SACHNUMMER PART-NUMBER	BENENNUNG DESCRIPTION	BEZEICHNUNG MARKING
10BU 1	0001-0032.534	BUCHSE	5 A4 M EL LT 3
10BU 2	0001-0032.534	BUCHSE	5 A4 M EL LT 3
10BU 3	0001-0032.534	BUCHSE	5 A4 M EL LT 3
10C 8	0001-0004.520	C-KERAMIK EDPT	100P 2% 63V
10C 14	0001-0004.630	C-KERAMIK EDPT	330P 2% 63V
10C 15	0001-0004.520	C-KERAMIK EDPT	100P 2% 63V
10C 18	0001-0004.520	C-KERAMIK EDPT	100P 2% 63V
10C 19	0001-0004.520	C-KERAMIK EDPT	100P 2% 63V
10C 20	0001-0004.711	C-KERAMIK EDPT	1N5 10% 63V
10C 21	0001-0004.711	C-KERAMIK EDPT	1N5 10% 63V
10C 22	0001-0004.711	C-KERAMIK EDPT	1N5 10% 63V
10C 23	0001-0004.711	C-KERAMIK EDPT	1N5 10% 63V
10L 1	0001-0045.479	DAEMPFUNGSERLE	DA= 3,5 DI= 1,3 L= 3,0
10L 2	0001-0045.479	DAEMPFUNGSERLE	DA= 3,5 DI= 1,3 L= 3,0
10L 3	0001-0045.479	DAEMPFUNGSERLE	DA= 3,5 DI= 1,3 L= 3,0
10L 4	0001-0045.479	DAEMPFUNGSERLE	DA= 3,5 DI= 1,3 L= 3,0
10L 7	0001-0042.760	L-FUNKENTSTOER	Z=900 BR B82114-R-C4
10L 8	0001-0042.760	L-FUNKENTSTOER	Z=900 BR B82114-R-C4
10L 9	0001-0045.479	DAEMPFUNGSERLE	DA= 3,5 DI= 1,3 L= 3,0
10L 10	0001-0042.760	L-FUNKENTSTOER	Z=900 BR B82114-R-C4
10P 1	0000-7593.280	R-VAR KOHLE SCHIEBE	50K OW6 LIN
10R 11	0000-7593.264	R-DRAHT	39R 10% 5W
10R 12	0000-7593.277	R-DRAHT	180R 10% 3W
10REL 1	0000-7593.390	RELAIS	002 AU 12V 150R HD
10REL 2	0000-7593.390	RELAIS	002 AU 12V 150R HD
10S 1	0000-7513.671	S-KIPP	R-R AU 2-POL 14X14X15
10SI 1	0001-0020.643	SICHERUNG SCHMELZ-	T 0,5 /250 35A

ENDE
END OF LIST