

1. General remarks

For carrying out repair work on receivers of series EKD 500, the following unit-specific documentation is required:

- Equipment documentation series EKD 500 1340.042-91700 Eu 02 (specification, operation, maintenance) forming part of every unit supply.
- Service documentation series EKD 500 1340.042-91700 Su 02
 - Volume 1: Repair instructions
 - Volume 2: Outline of subassemblies
 - Functional diagram
 - Circuit diagrams
 - Complementation drawings

Attention!

When performing service work adhere to the safety instructions especially to those concerning

- * earthing of the unit to be repaired
- * work on open units

Repair work is only to be carried out by authorized and particularly instructed specialists being well acquainted with the analogue and digital integrated circuit engineering as well as with the work of electronic units.

Any person meeting these demands will be able to repair every subassembly.

Reestablishment of troublefree functioning of the receiver can be performed through

- * detecting and replacing the faulty subassembly (Section 5)
- * repairing the faulty subassembly (Section 6)

In case of fault indication (F1 to F4) during ROM test (A5), the complete printed circuit "Control computer" (contained in spare part list E9) is to be replaced.

The spare part assortment offered by the manufacturer is to be taken from the spare part lists which are supplied on special request.

Spare part list E1: mechanical and electrical wear parts.

Spare part list E7: complete spare subassemblies (cassettes, control unit, power supply section)

Spare part list E9: stock spares for unit-specific spare parts

Capacitors, resistors, diodes, transistors, and integrated circuits required for repair work can also be procured from other manufacturers. It is to be observed that the electrical and mechanical values are equivalent. Component replacement on the double-clad pc boards requires utmost care when soldering on the plated-through holes.

If the requirements for subassembly repair are not met, it is recommended to exchange the entire subassemblies and have them repaired in a service workshop.

Performing repair work on the basis of this service documentation requires the test equipment and auxiliary testing means listed below. In the following, the abridged designation of the instruments is used; e.g. RF generator: P4.

- P1 Counting frequency meter
 $f_e \approx 120 \text{ MHz}$
 $\Delta f/f \approx 1 \cdot 10^{-7}$
 $U_e \approx 50 \text{ mV}$
- P2 RF-mV meter with RF measuring head and 50 ohm load
 $f = 10 \text{ kHz to } 200 \text{ MHz}$
 $U_e = 3 \text{ mV to } 10 \text{ V}$
- P3 AF-mV meter
(2x) $f = 5 \text{ Hz to } 200 \text{ kHz}$
 $U_e = 15 \text{ mV to } 5 \text{ V}$
 $R_e \approx 100 \text{ kohm/V}$
- P4 RF generator
 $f = 10 \text{ kHz to } 30 \text{ MHz}$
 $R_i = 75 \text{ ohm}$
 $\text{emf} = 1 \mu\text{V to } 3 \text{ V}$
unmodulated/modulated
 $1000 \text{ Hz } m = 0.3$
- P5 Double-beam oscilloscope
 $f_e \approx 50 \text{ MHz}$
- P6 Single-beam oscilloscope
 $f_B \approx 10 \text{ MHz}$
- P7 Wobble oscillator with display unit and probe
 $f = 100 \text{ kHz to } 200 \text{ MHz}$
- P8 Multimeter
 $R_i \approx 100 \text{ kohm/V}$
- P9 Digital voltmeter
 $U_e \approx 30 \text{ V dc}$

- P 10 Tone oscillator
 - f = 300 Hz to 6000 Hz
 - R_i = 20 ohm
 - U_a = 2 mV to 1 V
 - P 11 Mains control transformer 0 to 250 V/6 A
 - P 12 Line tester
 - P 13 Test plug 'substitution - control unit'
1340.042-01602
 - P 14 Adapter cable 'input-output logic'
1340.042-01603
 - P 15 Connection adapter 'control unit'
1340.042-01604
-
- RF cable (BNC-50 ohm) 2 pcs. 1340.037-01124
 - RF adapter 33 TGL 200-380
-
- 'Test cable set
1340.042-01601
(cf. equipment
documentation
1340.042-01700 Eu 02
Section I 6)
 - } contained in the
accessories
1340.037-10001
Z1 02 (4)

3. Dismounting and mounting

Pull the mains plug before starting dismounting. Loosen the red-ring marked screws provided below the handle of the plug-in. Withdraw the plug-in out of the rack by pressing the laterally arranged latches inwards.

Attention! Place the plug-in directly next to the casing and separate the BNC plug of the aerial cable from the plug-in.

After pulling the mains plug, the electric connection between the plug-in and the casing can be reestablished by means of the 30-core or 8-core adapter cable contained in the accessories.

Upon loosening the 8 screws marked with a red ring located on the right plug-in wall, the power supply section can be withdrawn upwards and connected again with the plug-in via the 16-core adapter cable contained in the accessories. An extractor, forming part of the accessories, (drwg.-No. 1340.037-02823) can be used for this purpose.

For cassette exchange, slacken per cassette 2 wing nuts provided on the rear wall of the plug-in and 2 hexagon screws (SW 8) on the front.

The front plate can be swung down by 90° thus providing access to the connections of all control elements as well as to the cassette terminals by only loosening the two screws located next to the plug-in handles.

For exchanging the "control unit" (with the front plate swung down by 90°), slacken both controls " " (13) and "changeover switch for LED row" (2) as well as the 4 fastening screws. After removing the two plug-and-socket connections X1022 and X1023 the subassembly can be lifted out.

The defective control elements

- * regulator "volume" (4)
- * regulator "RF/AF amplification" (6)
- * regulator "A1/pitch" (5)
- * changeover switch/monitoring channel (3)
- * unit switch ON/OFF (1)

can only be replaced with the "control unit" taken out of the receiver.

Access to all components of the cassettes is provided after loosening the 4 wing screws, swivelling out the two outer cassettes and unscrewing the 4 inner lids (with the pressed-in fastening points).

When a pc board is to be exchanged, take the respective cassette out of the casing and unscrew both lids. On the soldering side, slacken the 4 hexagon nuts by means of a socket wrench (7 mm). On the complementation side, remove the probably existing connections to the adjacent circuit.

The pc board can be withdrawn to the rear.

For carrying out repair work on the inner side of the rear wall of the casing, loosen the 4 hexagon nuts of the rear wall and the earth connections provided on the right inner side of the casing. Then, the rear wall of the casing can be removed.

Mounting is carried out in the reverse order.

4. Hints on troubleshooting

In case of faulty operation, fault localization is necessary for aimed repair work.

The sequence is the following:

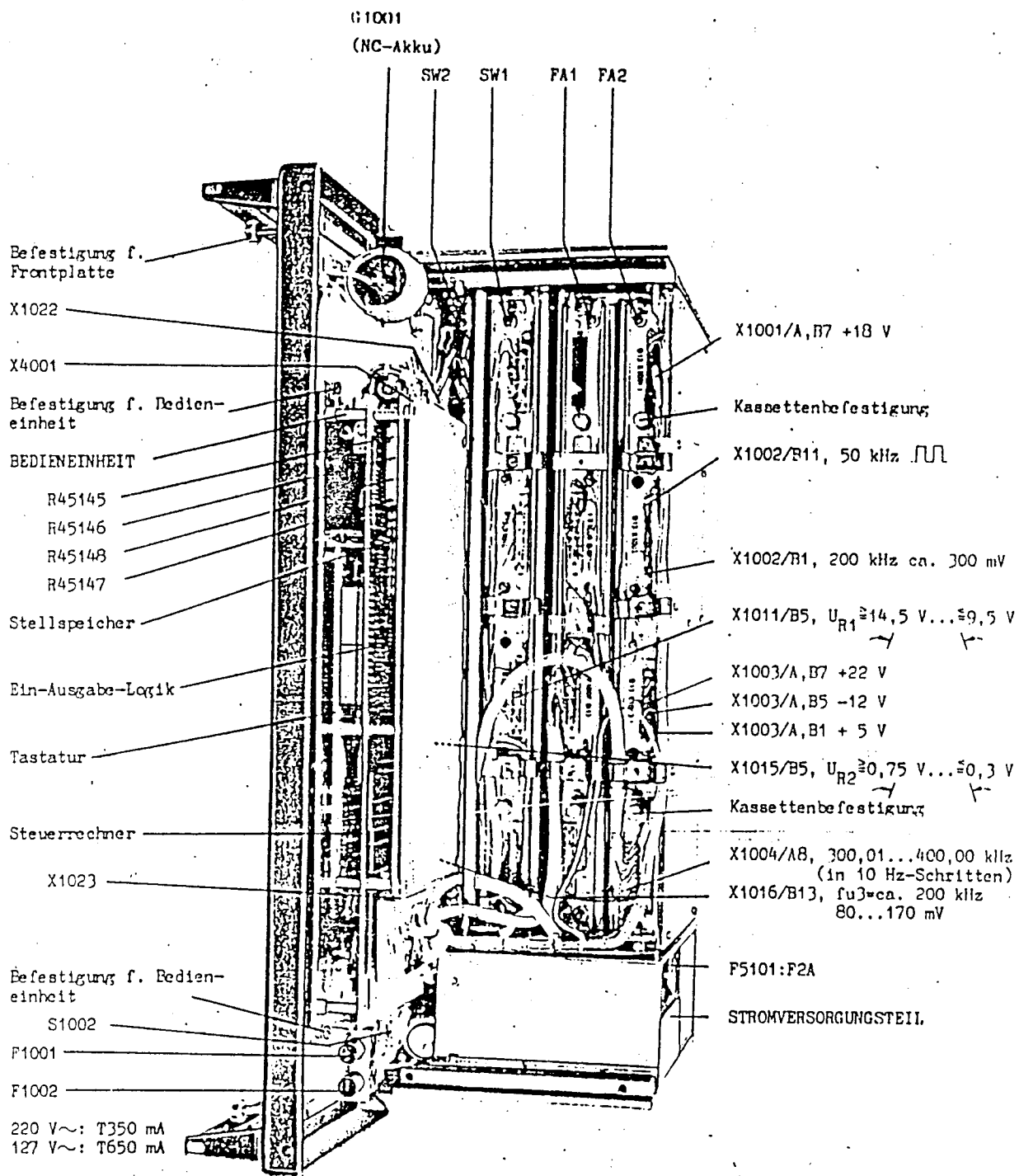
- External fault sources in the incoming and outgoing cables are to be excluded by checking.
- Exclude wrong operation of the receiver.
- If a total breakdown is present, check the fuse link in the receiver plug-in (equipment documentation EKD 500, section III.6.1.)
- Check the functionability of the receiver (equipment documentation EKD 500, Section III.5.).
- Reestablish the functionability of the receiver by:
 - . detecting and replacing the faulty subassembly (Section 5 of this service documentation)
- Recondition: Spare subassembly according to the
spare part list 1340.042-00001 E7
- . replacing the faulty component
(fault detection acc. to Section 6 of this service documentation)
- Marking of subassemblies:
All subassemblies are marked - in addition to the drwg.-No. - (referred to the electric components) with two-digit numbers. (viz. subassembly survey 1340.042-00001 U 02 (3))
- Marking of components:
All components are marked with four- (five)- digit numbers. The two first digits correspond with the code number of the sub-assembly.
Example: V04 in the circuit diagram 'mixer 1' ≙ V3304
 L01 in the circuit diagram 'oscillator 2' ≙ L2501

When ordering spare parts, these four-(five)- digit numbers are to be indicated.

- Marking of subassemblies in printed circuits:

Code No.	Subassembly/printed circuit	Drwg.-No.	
00	Casing	1340.042-01001	
	DC filter	1340.042-01022	
10	<u>Plug-in</u>	1340.041-00001	
20	<u>Frequency processing</u>)	1340.041-01211	
21	Oscillator 1	1340.037-01251	
22	Frequency divider 1	1340.037-01252	
23	Oscillator 3	1340.039-01253	
205	<u>Frequency processing</u>)	1340.041-01221	
24	Reference frequency	1340.037-01254	
25	Oscillator 2	1340.037-01255	
26	Frequency divider 2	1340.037-01256	
28	F1 demodulator	1340.041-01258	
30	<u>Signal path 1</u>)	1340.041-01311	(EKD 511)
		1340.041-01312	(EKD 512)
31	Preselector 1	1340.037-01351	
32	Preselector 2	1340.041-01352	
33	Mixer 1	1340.041-01353	
34	Mixer 2	1340.041-01354	
305	<u>Signal path 2</u>)	1340.041-01321	(EKD 511)
		1340.041-01322	(EKD 512)
35	Carrier oscillator	1340.037-01355	
36	IF2/B	1340.041-01356	(EKD 511)
		1340.041-01366	(EKD 512)
37	IF2/A	1340.041-01357	(EKD 511)
		1340.041-01367	(EKD 512)
38	Demodulator and AF section	1340.039-01358	
40	<u>Control unit</u>)	1340.041-01401	
41	Diode board	1340.041-01451	
42	Transistor board	1340.041-01452	
43	Input-output logic	1340.041-01453	
44	Control computer	1340.041-01454	
45	Register and interface	1340.041-01455	
46	Display	1340.041-01456	
47	Keyboard, complete	1340.041-01402	
50	<u>Power supply section</u>)	1340.039-01500	
51	Transverter	1340.039-01551	

*) Spare subassemblies according to spare part list E7



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Figure 1
Plug-in with the front plate swung down

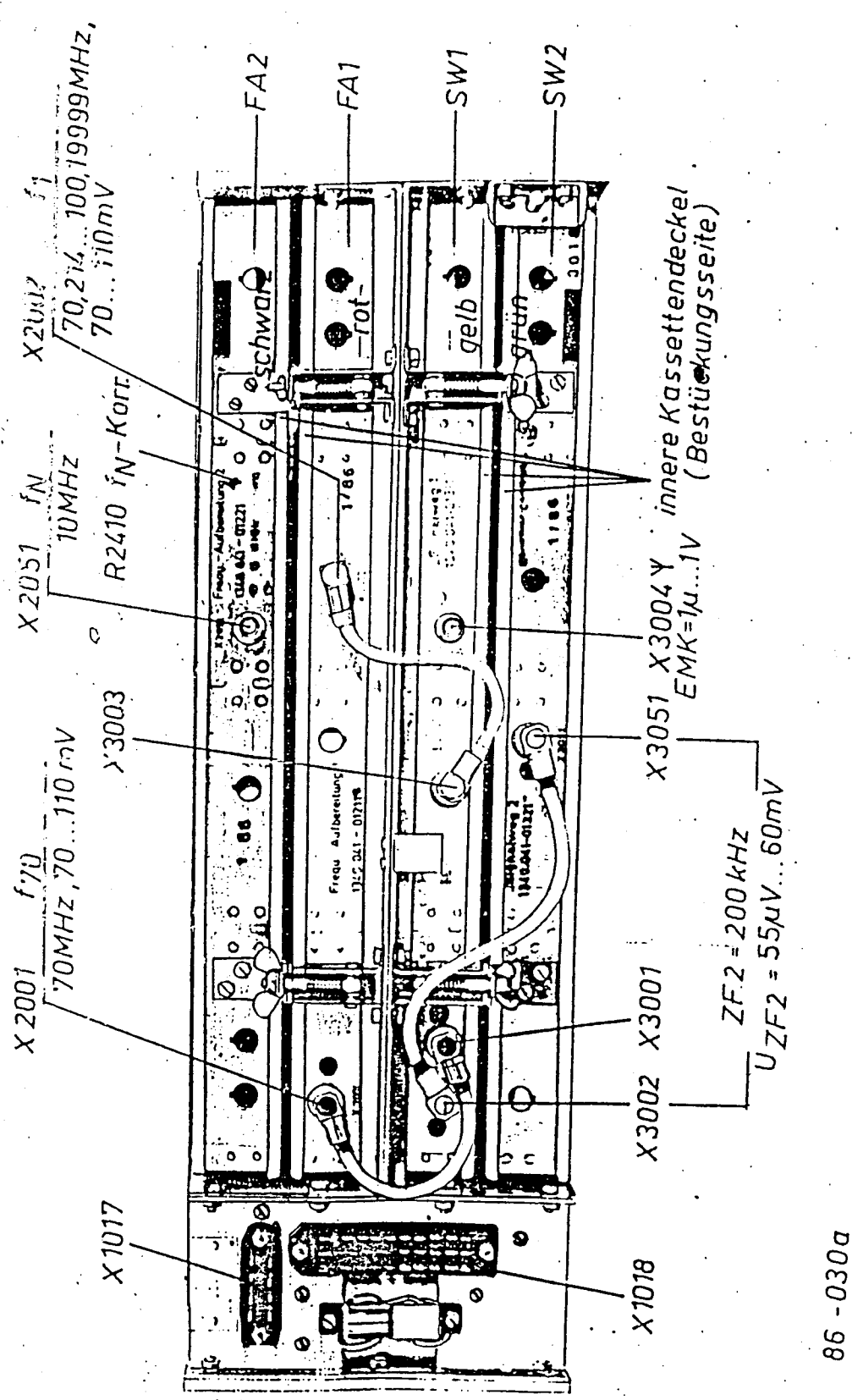


Figure 2
 Plug-in - Rear view

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the functionability of the receiver by subassembly exchange

To make service work easier and to reduce the outage times of the receiver, we recommend to replace entire subassemblies. For this purpose, the manufacturer of the equipment offers spare subassemblies according to the spare part list E7.

Variant	EKD 511	EKD 512
Spare subassembly	1340.042-01871 E7	1340.042-01872 E7
Frequency processing 1	1340.041-01211	1340.041-01211
Frequency processing 2	1340.041-01221	1340.041-01221
Signal path 1	1340.041-01311	1340.041-01312
Signal path 2	1340.041-01321	1340.041-01322
Control unit	1340.041-01401	1340.041-01401
Power supply section	1340.039-01500	1340.039-01500

Attention!

The cassettes of receiver EKD 500 and of EKD 300 are not inter-changeable.

The Power supply sections of receiver EKD 500 and EKD 300 can be exchanged with each other.

Subassembly exchange requires no readjustment for the functionability of the receiver.

Sections 6.1. to 6.5. contain hints on readjustment in order to minimize tolerances.

In case that the fault symptoms detected during functional check (carried out in accordance with Section III/5) did not result in localization of the faulty subassembly, checks on the receiver plug-in outside the casing are necessary.

- . Attention! Pull mains plug before taking the plug-in out of the casing.
- . Establish electric connections between casing and plug-in via the 30-core adapter cable (contained in the accessories). For checks via interfaces EXT and EXP, connect additionally the 8-core adapter cable.
- . Dismounting and mounting according to Section 3.
- . For all checks mentioned in Section 5 opening the cassette lids is not necessary.

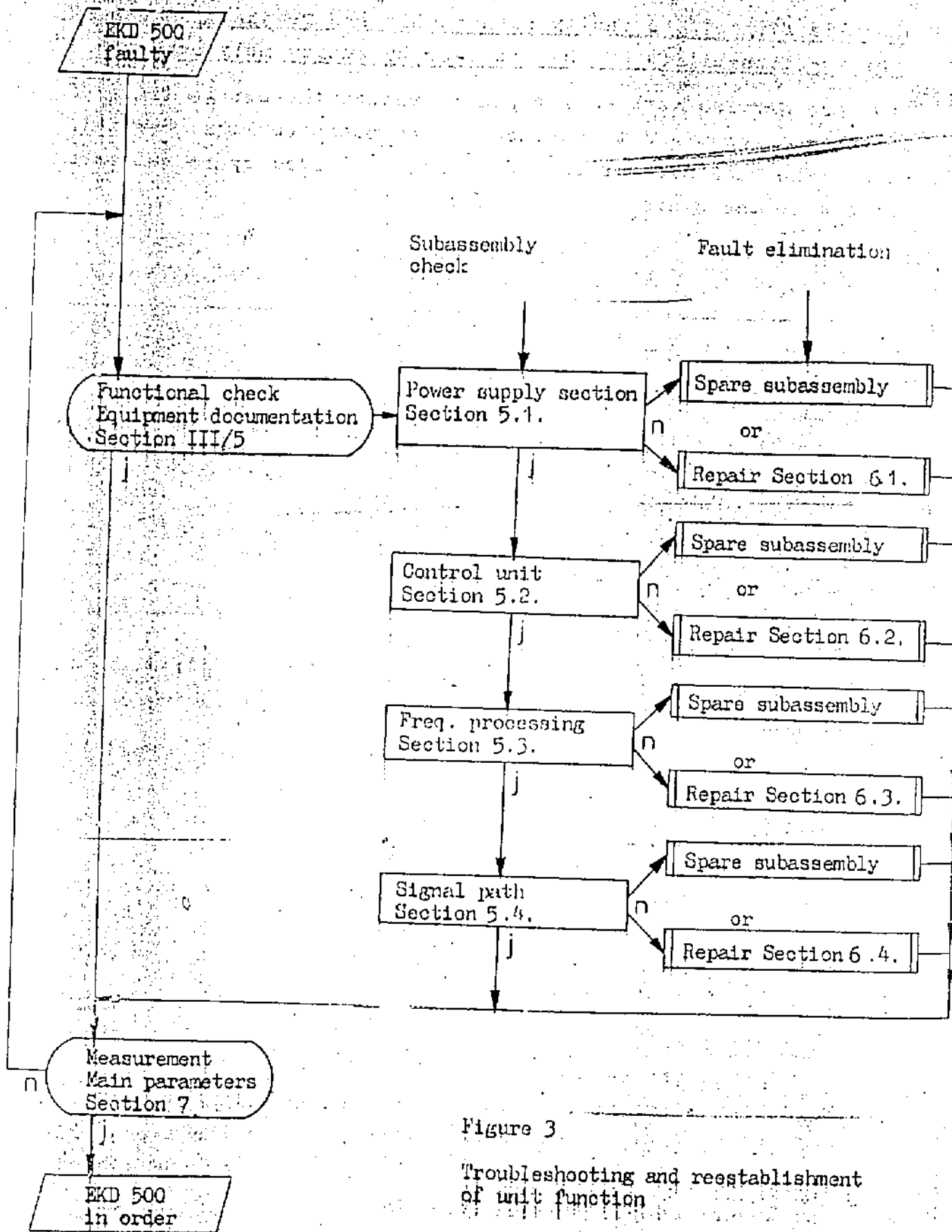


Figure 3

Troubleshooting and reestablishment
of unit function

The undermentioned remarks serve to detect the faulty subassembly with only a few test means.

1. Check 'power supply section'

5.1.1. Measuring of the output voltages with digital voltmeter (P9)

	Test point	Correction with
+18 V \pm 0.2 V	X1001/A7, B7	R 5213
+ 5 V \pm 0.1 V	X1003/A1, B1	R 5217
+22 V \pm 2 V	X1003/A7, B7	-
-12 V \pm 0.1 V	X1003/A5, B5	R 5114

5.1.2. In case of voltage breakdowns

+18 V, +5 V, +22V, -12 V: F 1001 and F 1002

+18 V, +5 V, +22V: F 5101

For battery operation: battery cable
fuse

} to be
checked

For localizing short-circuits in the subassemblies, the cassettes are to be withdrawn one after the other.

5.1.3. In case of faulty power supply section

→ replacement by spare part subassembly
(Pay attention to the correct voltage adjustment
(X 5002) or

→ repair according to Section 6.1.

5.2. Check 'control unit'

5.2.1. When the functional check of the receiver (equipment documentation Section III/5) proved the control unit being faulty

- . fault recognition by control test A1 to A5
- . no correspondence between operation and display

the following has to be carried out:

- replacement by spare subassembly
(required readjustment: tolerance minimization for receiving level display;
balance R 45145, R 45146, R 45148, R 45147 according to Section 6.2.) or
- repair in accordance with Section 6.2.

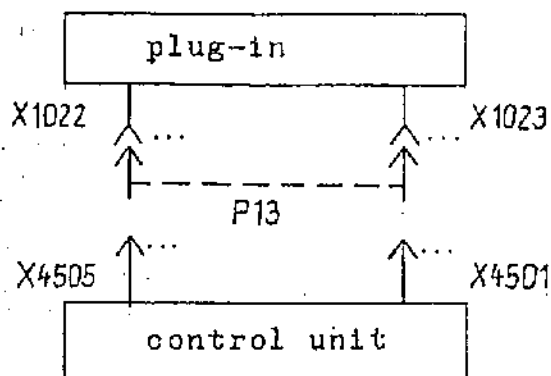
5.2.2. Functional breakdown of the receiver although operation and display correspond with each other

- Possible fault reasons:

- . Register and interface - output faulty
- . Frequency processing faulty
- . Signal path faulty

- Fault delimitation by substitution of the control unit by test plug pair P 13

— (Drwg.-No. 1340.042-01602)




- The test result supplies other hints on possible fault sources: 'control unit'

'frequency processing1' and '2'

'signal path 1' and '2'

unscrew front plate fastening and swing front plate down by 90°.

Separate terminal sockets X 1022 and X 1023 from the control unit and connect them with test plug pair P 13.

Changeover switch at P 13 to position  according to EKD adjustment


13 E	0.00
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 GC 1, SEL 0
i.e.: PLL2: $f_2/100 = 400 \text{ kHz}$
PLL3: $f_3 = 69.6 \text{ MHz}$
 $\pm f_70$

If: A1 tone audible in the loudspeaker, at the IF output (X 0003): 200.000 kHz (measure with P1),

Then: frequency processing 1: }
frequency processing 2: } troublefree
signal path 1 (from mixer 1): }
signal path 2: }
register and interface output: } faulty
(incl. connection cables)

- Replace control unit by spare subassembly (required readjustment: tolerance minimization for receive level display according to Section 6.2.)
- or repair in accordance with Section 6.2.

Changeover switch at P 13 to position  according to EKD adjustment

13 E	9999.99
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 GC 1, SEL 0
i.e.: PLL2: $f_2/100 = 300.01 \text{ kHz}$
PLL3: $f_3 = 69.69999 \text{ MHz}$
 $\pm \Delta f_70$

Connect X 2051 ($f_N = 10 \text{ MHz}$) with receiver input (X 0001) by means of RF cable 1340.037-01124 (in the accessories).

If: A1 tone audible in the loudspeaker, at the IF output (X 0003): 199.99 kHz (measure with P1),

Then: frequency processing 1: }
frequency processing 2: } troublefree
signal path 1: }
signal path 2: }

register and interface output: faulty
(incl. connection cables)

- Replace control unit by spare subassembly
(required readjustment: receive level display
according to Section 6.2.)
- or repair in accordance with Section 6.2.

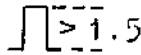
5.3. Check 'frequency processing'

5.3.1. Cassette 'frequency processing 2'

- f2/100 to X 1004/A 8 (frequency divider 2)

. Check of frequency (with P1) and voltage

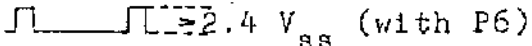
(with P6)

f_E input (kHz)	f2/100 (kHz)	$u_{f2/100}$ (V_{SS})
0.00	400.00	
99.99	300.01	

. Potential conversion of all logic conditions for 'frequency divider 2' drive.

f_D input (kHz)	f2/100 (kHz)
77.77	322.23
88.88	311.12

- 200 kHz at X 1002/B 11 (reference frequency)
 check of frequency: 200.000 kHz (with P1)
 and voltage: 150 mV to 300 mV (with P2)

- 50 kHz at X 1002/B 1 (reference frequency)
 check of frequency: 50.000 kHz (with P1)
 and voltage:  $\geq 2.4 V_{SS}$ (with P6)

- In case of faulty 'frequency processing 2':
 → replacement by spare subassembly
 → or repair in accordance with Section 6.3.

5.3.2. Cassette 'frequency processing 1'

- f1 to X 2002 (rear of the plug-in)

. Check of frequency (with P1) and voltage (with P2) for the subranges of oscillator 1

Range of csc. 1	f_D input (kHz)	f1 (kHz)	admissible fault Δf (Hz)	u_{f1} across 50 ohm (mV)
1a	0.00 1999.00	70200.00 72199.00	$\cong \pm 150 *$	80 ... 100
1b	2000.00 9999.00	72200.00 80199.00		
2	10000.00 29999.00	80200.00 100199.00		

Check of f1 with potential conversion of all logic conditions for the drive of 'frequency divider 1'

f _E input (kHz)	f1 (kHz)	admissible fault Δ f1 (Hz)
17700.00	87900.00	} ≅ ± 150 *)
28800.00	99000.00	

* Δ f1 = Δ f70 ≅ 150 Hz
 Δ f70 is eliminated with the 2nd frequency conversion (mixer 2)

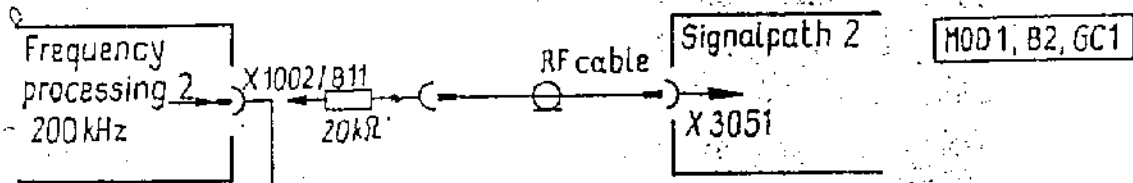
- f 70 to X 2001 (rear of the plug-in)
 Check of frequency (with P1) and voltage (with P2)

f70	70 MHz ± ≅ 150 Hz
u _{f70}	80 mV to 100 mV

- In case of faulty 'frequency processing 1':
 - replacement by spare subassembly
 - or repair in accordance with Section 6.3.

Precondition: 'power supply section' } troublefree
 'control unit' }
 'frequency processing' }

5.4.1. Check 'signal path 2' with 200 kHz from 'frequency processing 2'

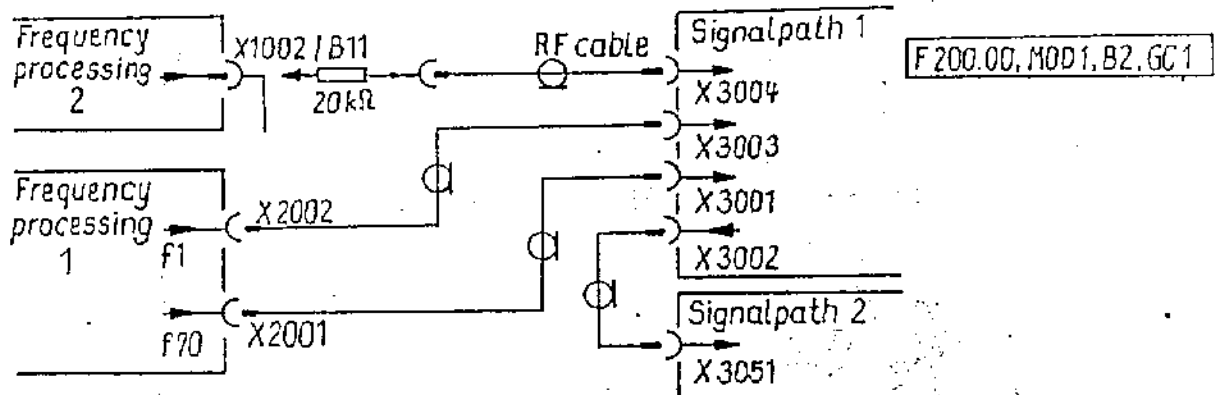


- 'signal path 2' in order: E_γ display .. LED row: 80 to 100 dB (μV)
 digital: 42 ... 52
 A1 tone available

- 'signal path 2' faulty:

- replace it by spare subassembly
 (readjustment: tolerance minimization for E_γ display according to Section 6.2.)
- or repair in accordance with Section 6.4.

5.4.2. Check 'signal path 1' and '2' with 200 kHz from 'frequency processing 2'

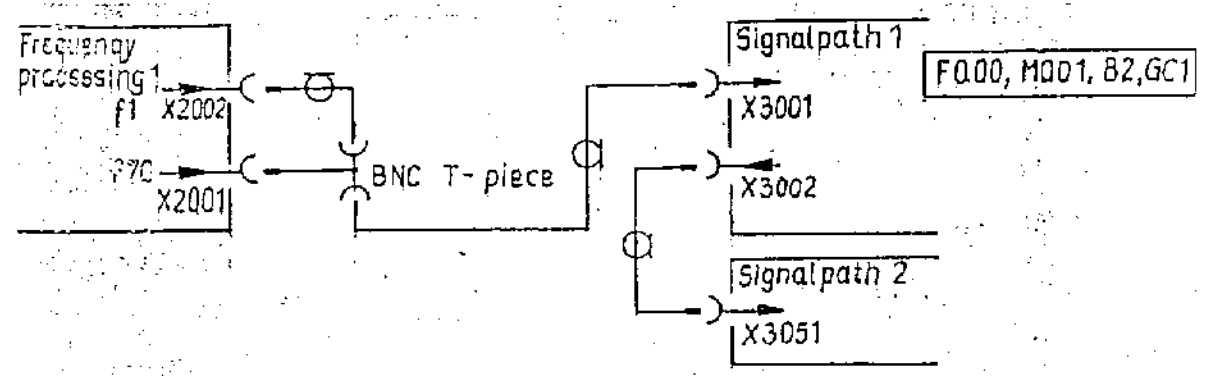


- 'signal path 1' and '2' in order:
 E_γ display: .. LED row: approx. 60 dB (μV)
 digital: 28 ... 35

A1 tone available

- 'signal path 1' faulty:
- replacement by spare subassembly
(readjustment: tolerance minimization for E_y display according to Section 6.2.)
- or repair in accordance with Section 6.4.

5.4.3. Check 'signal path 1 - subsections'
 5.4.3.1. Mixer 2 → X.3002 → signal path 2



- Signal path 1 - subsections in order:
- E_y display . LBD row: 80 ... 90 dB (μV)
- . digital: 38 ... 45
- A1 tone available

- Signal path 1 - subsections F70 ampl. → mixer 2 → X 3002: faulty
- replace signal path 1 by spare subassembly
(readjustment: tolerance minimization for E_y display according to 6.2.)
- or repair in accordance with Section 6.4.

5.4.3.2. Mixer → IF-1 ampl. → Mixer 2 → X 3002 → signal path 2

