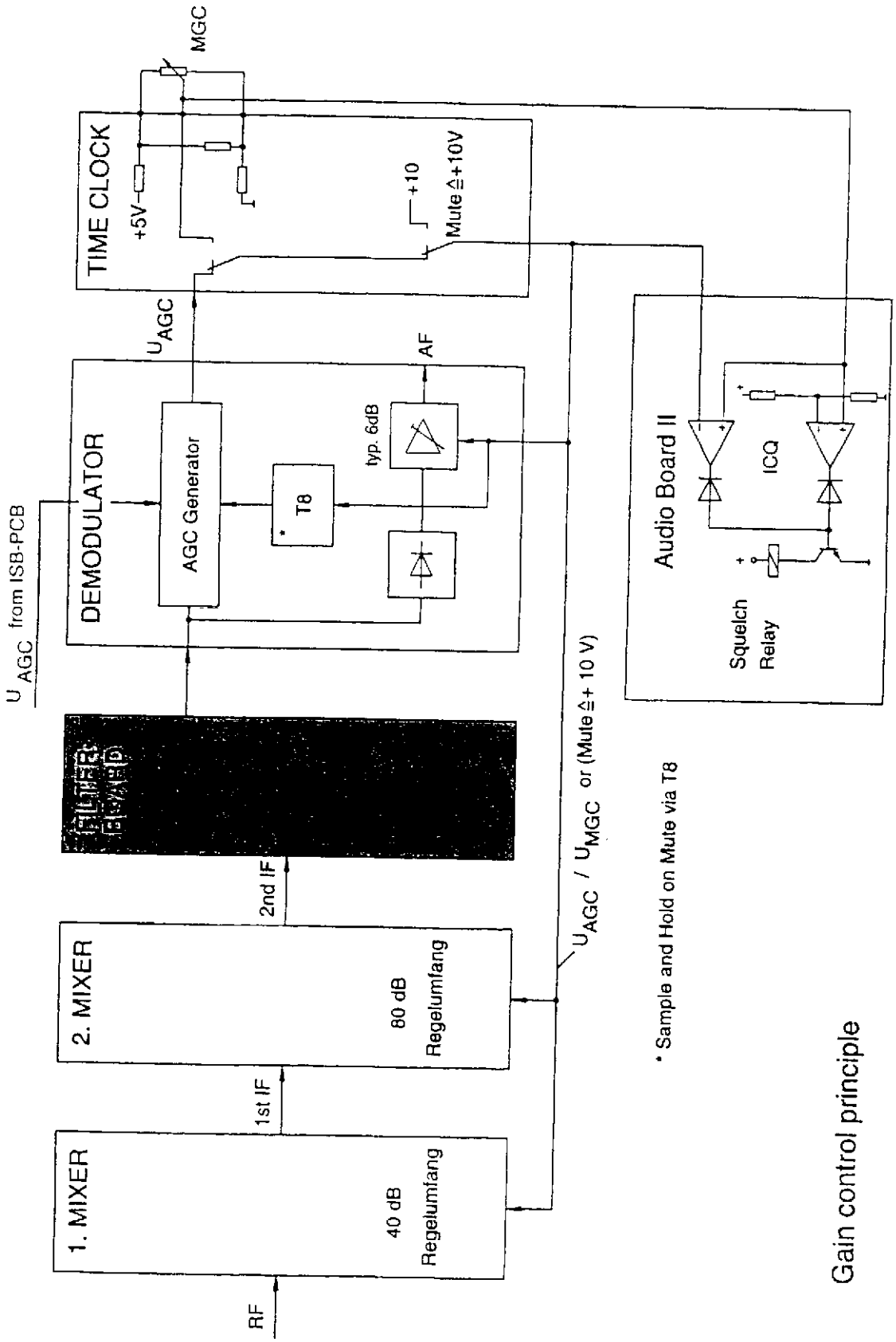
-Filterboard-

Technical description

The filterboard contains six crystal filters of different bandwidths and an oscillator with mixing stage, which converts the 5 MHz IF to a 30 kHz IF. This is mixed and amplified in the IC C. The oscillation amplitude of the quartz oscillator with T1 and Q1 is monitored with the level sensor. The oscillator level is rectified by diode D15 and sent to the microprocessor via an operation amplifier IC D.
The input and output impedances of the crystal filters are 50 Ohm. The microprocessor determines which filter is activated (depending on bandwidth selected). The information is written into IC - A (LINE DECODER + LATCH), which then controls the switching diodes via IC - B DRIVER OPEN COLLECTOR (e.g., D 3, D 4 for filter F 1). To allow full utilization of the bandwidths of the crystal filters in the 2nd MIXER (B = 3 kHz, B = 6 kHz), there is a bypass circuit using diodes D 1, D 2.
Since one pair of diodes is always switched irrespective of the filter selected, a defined DC voltage is present on the diode buses. This voltage is monitored by IC - D, which signals any fault to the microprocessor via the HELP OUT output.

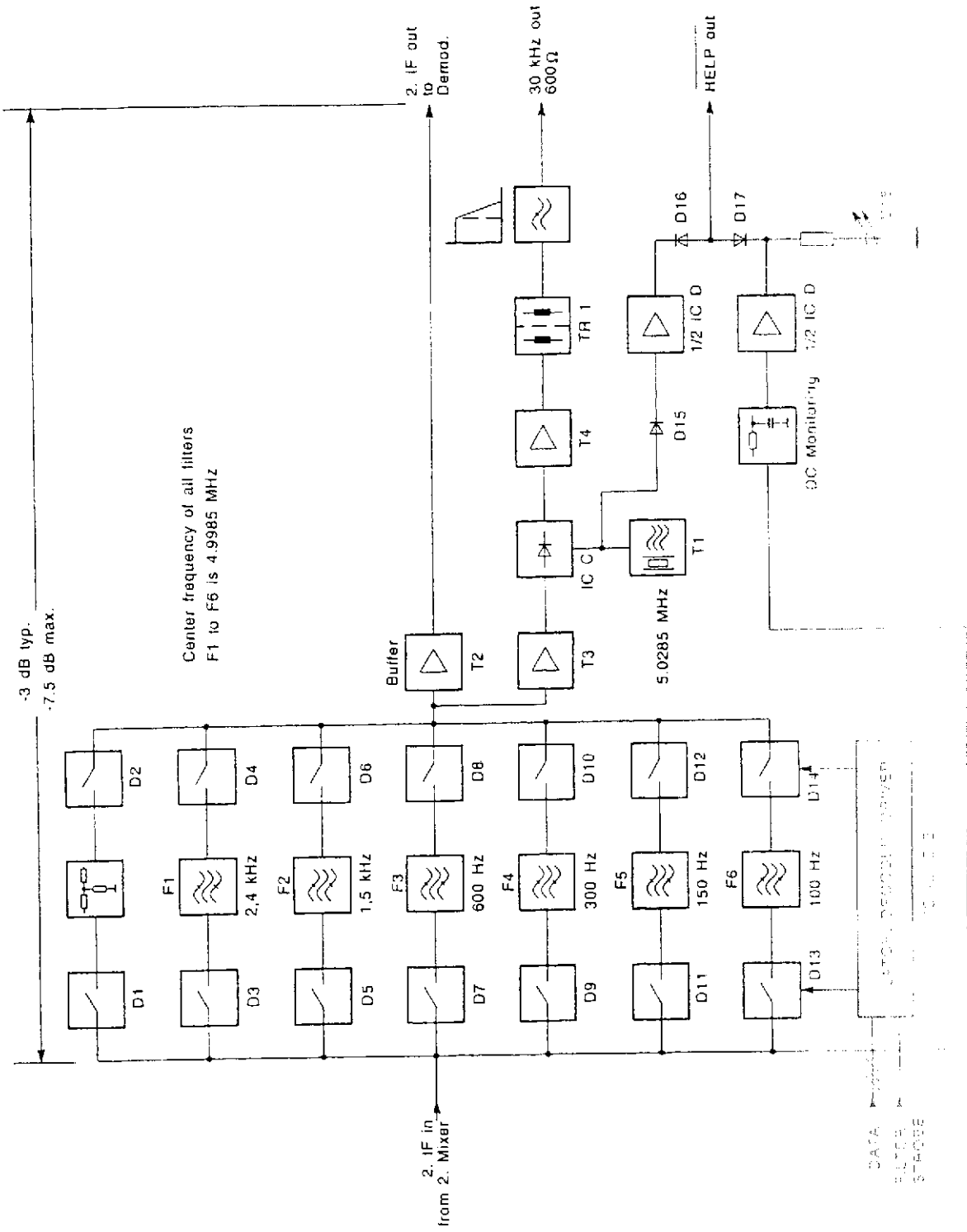
The crystal oscillator with T 1 has a frequency f = 5.0285 MHz, which, together with the IF of f = 4.9985 MHz, gives a new IF of f = 30 kHz.

-Filterboard-



Gain control principle

-Filterboard-



-Filterboard-

Test and alignment instructions

Required: Circuit diagram FILTERBOARD - Hagenuk Drawing No. 97 Sa C 2.155.76
tracking generator, spectrum analyser

Test configuration: The FILTERBOARD is removed and remains connected to the receicer only by the ribbon cable to plug S 1. Connect tracking generator to socket Bu 3. Connect spectrum analyser to socket Bu 2.

Measurement of current consumption
Connect an ammeter into the 5 V and 18 V power supplies. Select bandwidths 0.10 kHz to 3 kHz on the receiver in succession

Test values:
In all ranges I_5 V = 55 mA ± 10 mA
In all ranges I_{18} V = 30 mA +± 10 mA

Measurement of attenuation with no filter or bypass selected
The +18 V power supply must be disconnected for this purpose.
Tracking generator settings: P_{out} -20 dBm
Spectrum analyser settings: reference level -20 dBm
Test values:
attenuation > 60 dB in all bandwidths (see item 1).

Measurement of passband attenuation of bypass circuit
Reconnect +18 V power supply.
Select bandwidth 3.00 kHz.
Test values:
The passband attenuation should be 6 dB ± 3 dB.

Measurement of passband and stopband attenuation of crystal filters
Measurement of F 1 = 2.40 kHz
Select bandwidth 2.40 kHz on receiver.
Test values:
Passband attenuation < 4 dB; offband attenuation > 60 dB
(see filter curve 97 E a.140.78-2).

Measurement of F 2 = 1.50 kHz
Select bandwidth 1.50 kHz on receiver.
Test values:
Passband attenuation < 6 dB; offband attenuation > 60 dB
(see filter curve 97 E 2.140.78-16)

-Filterboard-

Measurement of F 3 = 0.60 kHz
Select bandwidth 0.60 kHz on receiver.
Test values:
Passband attenuation < 6 dB; offband attenuation > 60 dB
(see filter curve 97 E 2.140.78-15)

Measurement of F 4 = 0.30 kHz
Select bandwidth 0.30 kHz on receiver.
Test values:
Passband attenuation < 6 dB; offband attenuation > 60 dB
(see filter curve 97 E 2.140.78 14)

Measurement of F 5 = 0.15 kHz
Select bandwidth 0.15 kHz on receiver.
Test values:
Passband attenuation < 7 dB; offband attenuation > 60 dB
(see filter curve 97 E 2.140.78-13).

Measurement of F 6 = 0.10 kHz
Select bandwidth 0.10 kHz on receiver:
Test value:
Passband attenuation < 7 dB; offband attenuation > 60 dB.
(see filter curve 97 E 2.140.78-12)

Testing the 30 kHz IF
Connect a signal generator (f = 4.9985 MHz, level -30 dBm) to socket Bu 3; connect frequency counter to socket Bu 4.
Test values:
The output frequency should be 30.00 kHz ± 10 Hz.
The crystal oscillator can be accurately tuned with capacitor C 56.

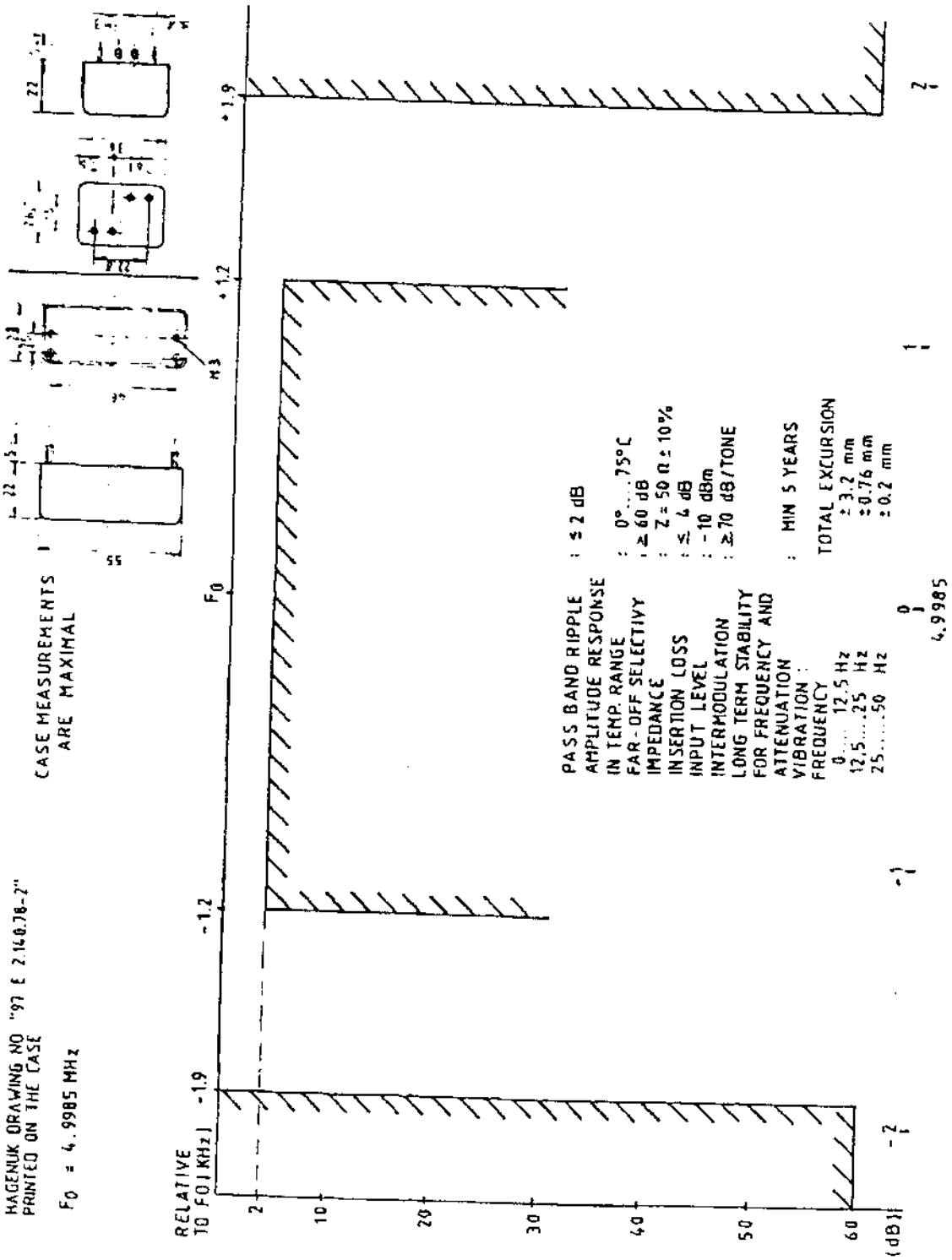
Connect spectrum analyser to socket Bu 2 and terminate socket Bu 3 with 50 Ohm.

Test values:
The oscillator level at f = 5.0285 MHz should be < -88 dBm.

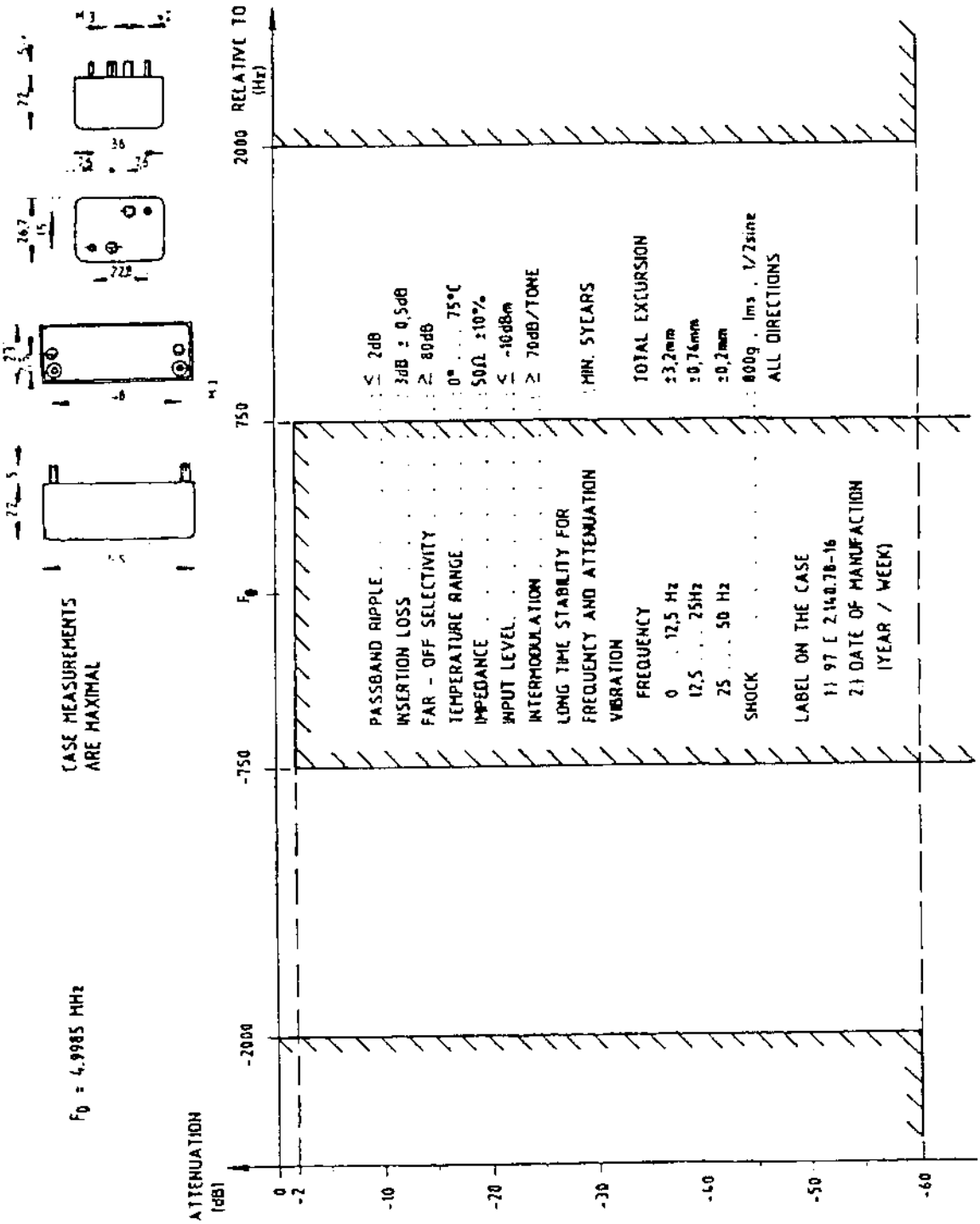
Connect a signal generator (f = 4.9985 MHz) to socket Bu 3 and terminate socket Bu 4 with 600 ohm.
Test values:

Level on socket Bu 3 (dBm)	Level on socket Bu 4 (dBm)	Voltage accross 600 ohm (V_{pp})		
		min.	nom.	max.
-50	-16 ± 6	0.062	0.123	0.692
-40	-7 ± 6	0.5	1.0	2.0
-30	-7 ± 6	0.5	1.0	2.0

-Filterboard-

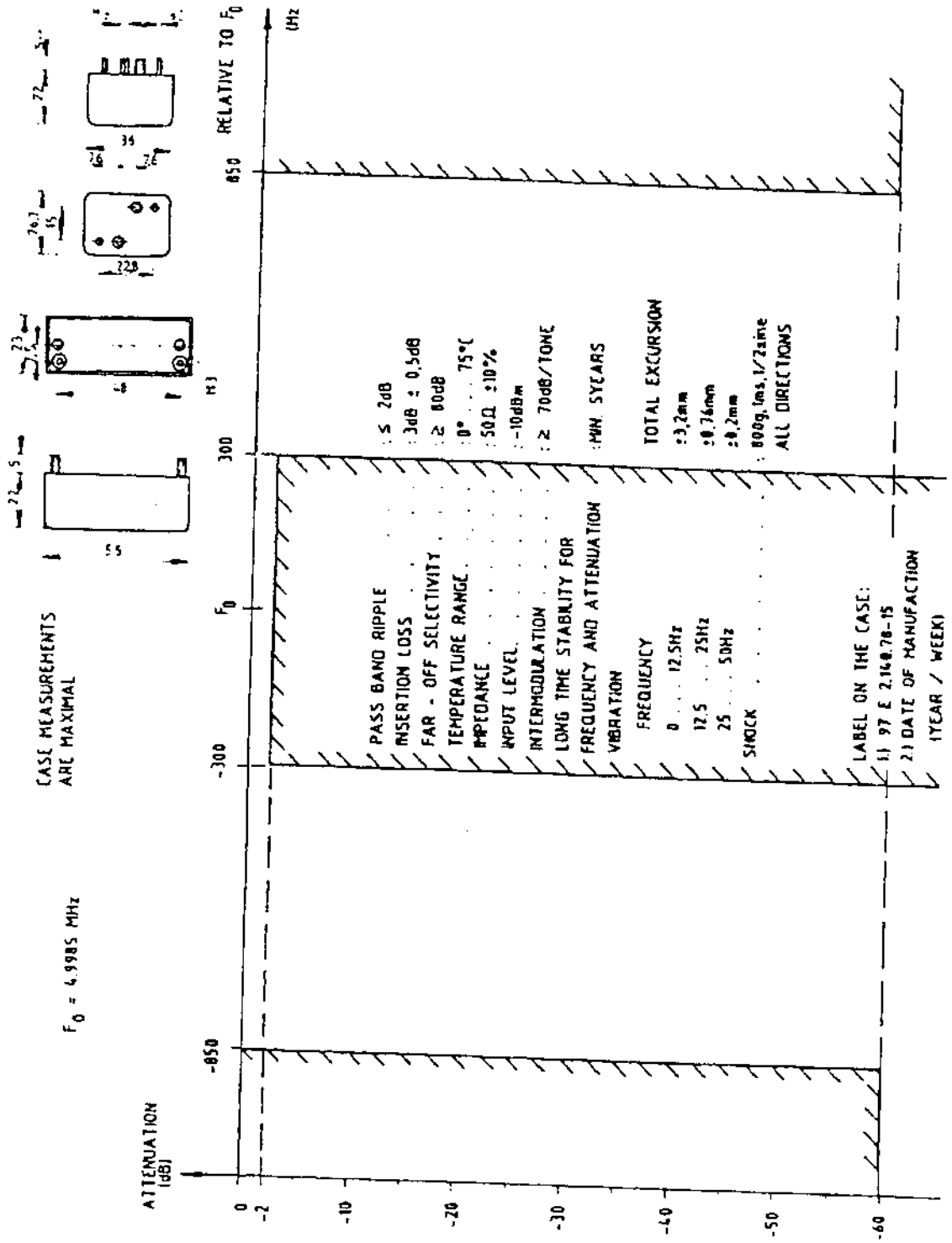


Quartz Filter drawing No. 97 E 2.140.78-2



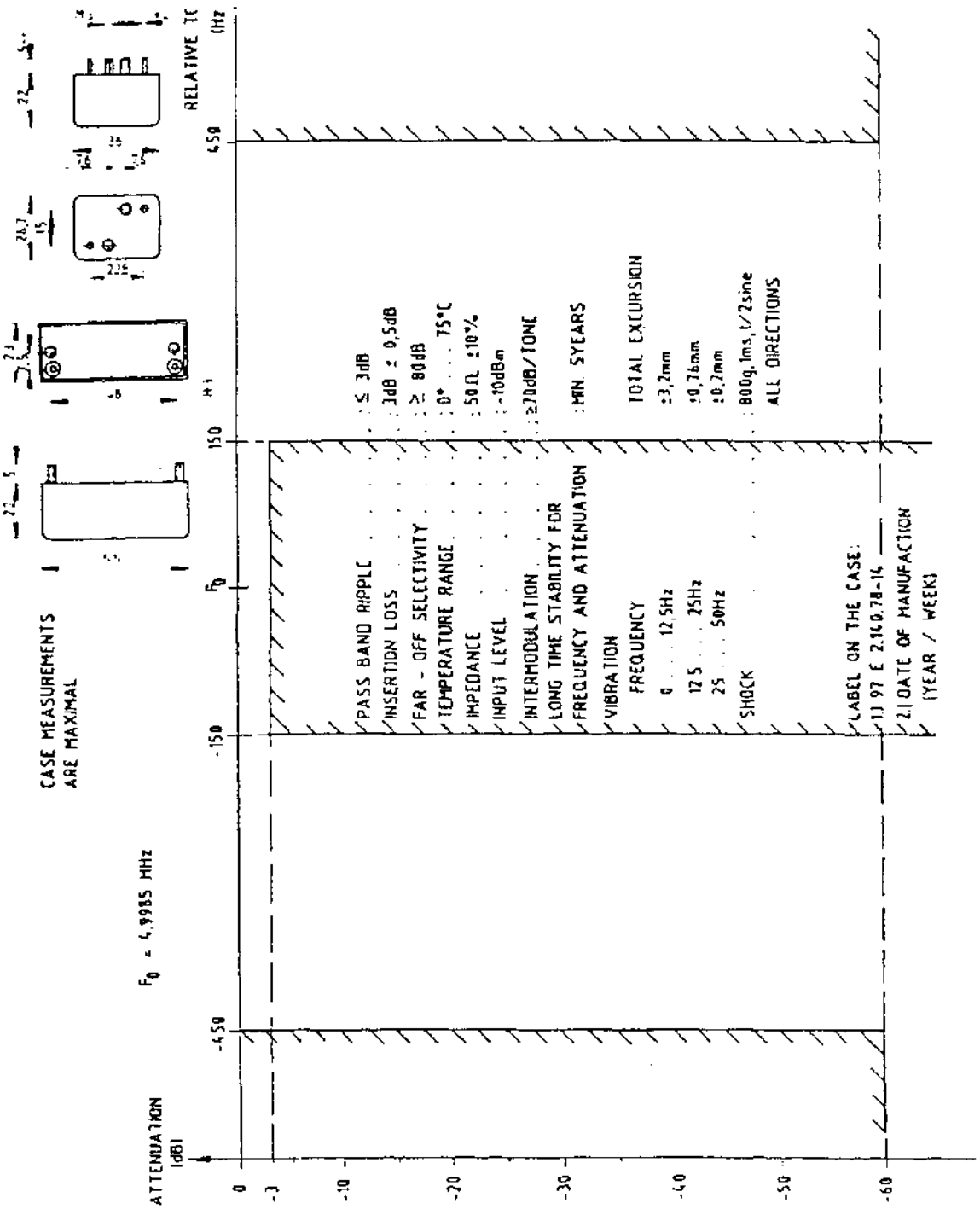
Quartz Filter drawing No. 97 E 2.140.78-16

-Filterboard-



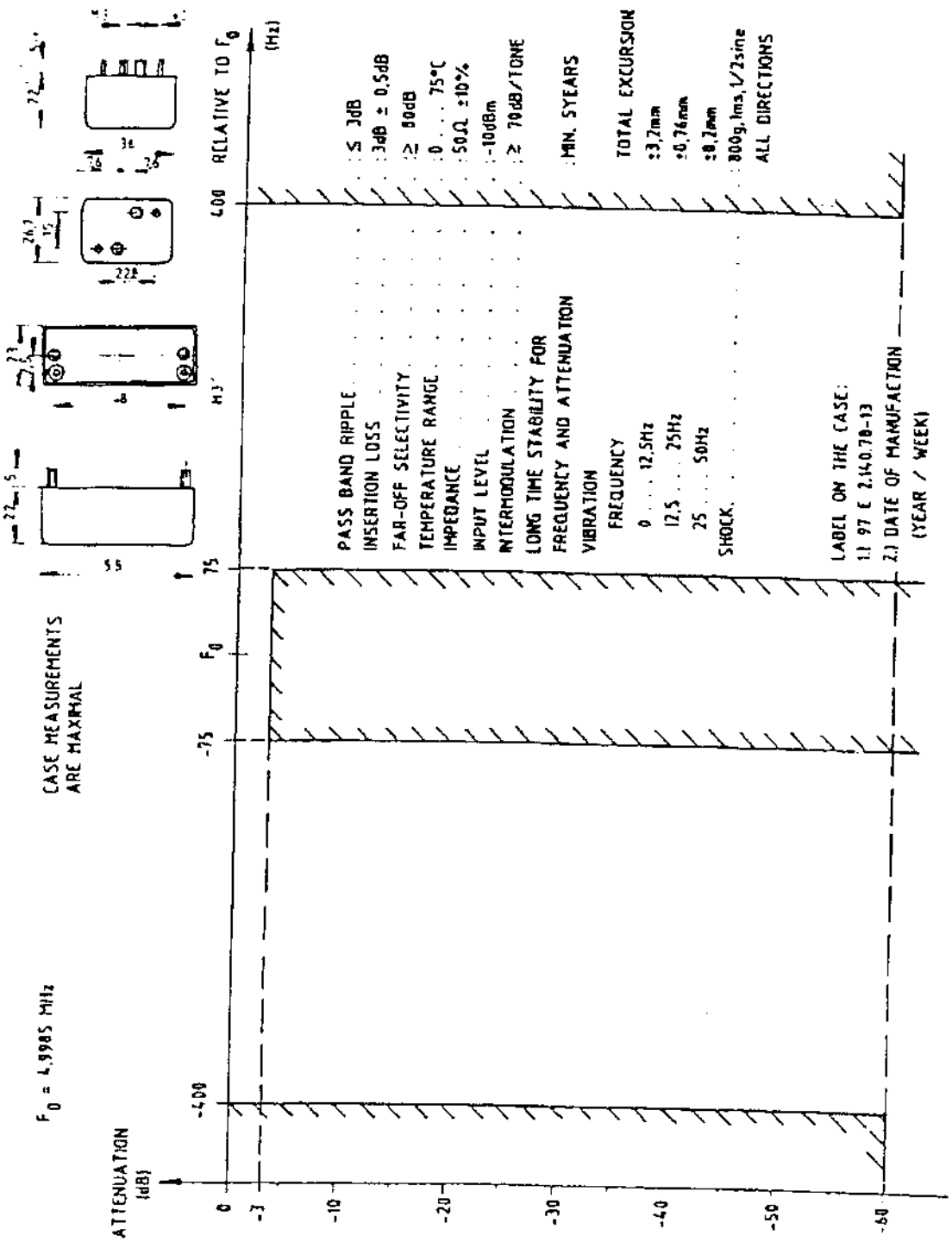
Quartz Filter drawing No. 97 E 2.140.78-15

HAG/ROD 018-09 92

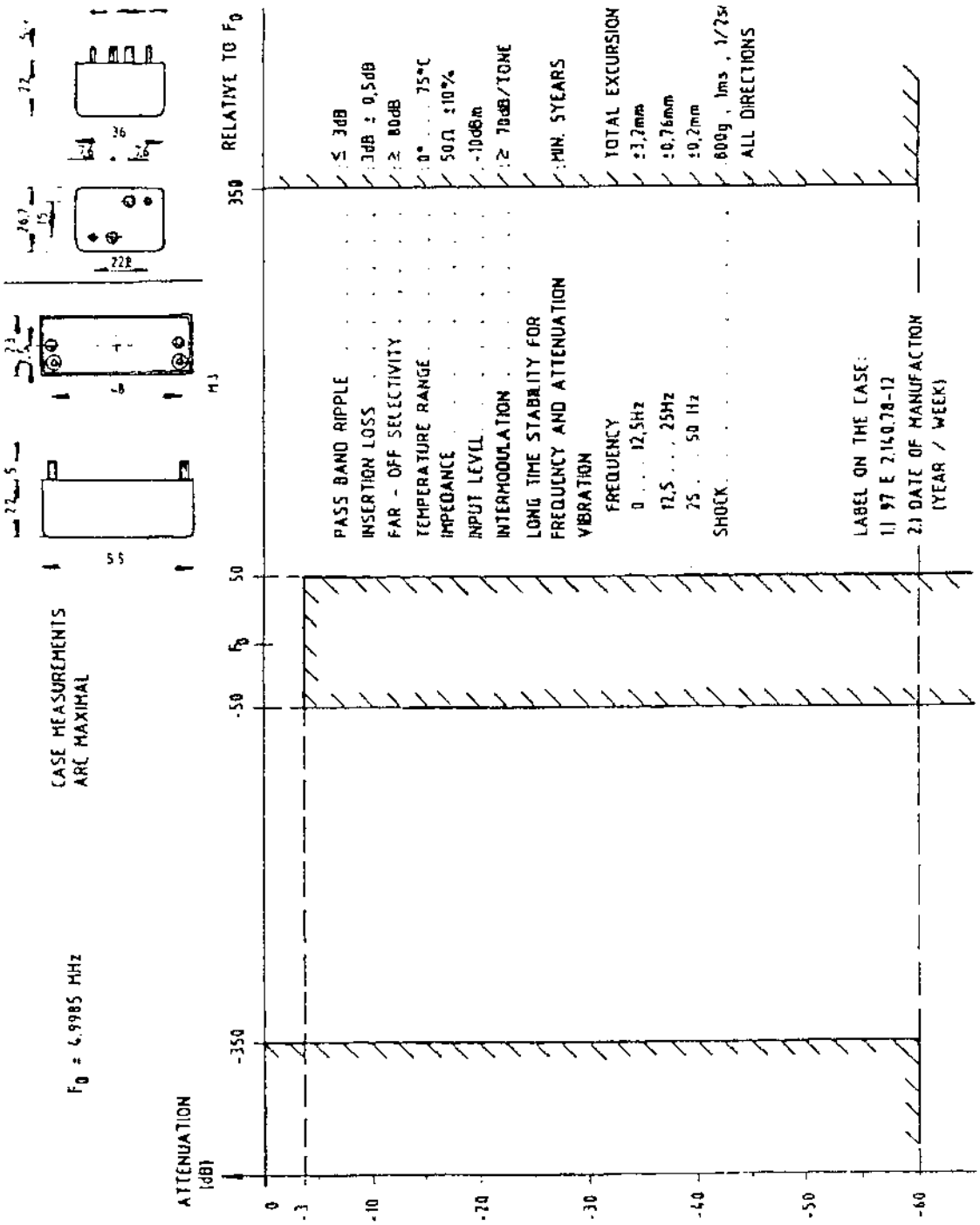


Quartz Filter drawing No. 97 E 2.140.78-14

-Filterboard-



Quartz Filter drawing No. 97 E 2.140.78-13



Quartz Filter drawing No. 97 E 2.140.78-12

-Filterboard-

Customer specified Quartz Filter drawing

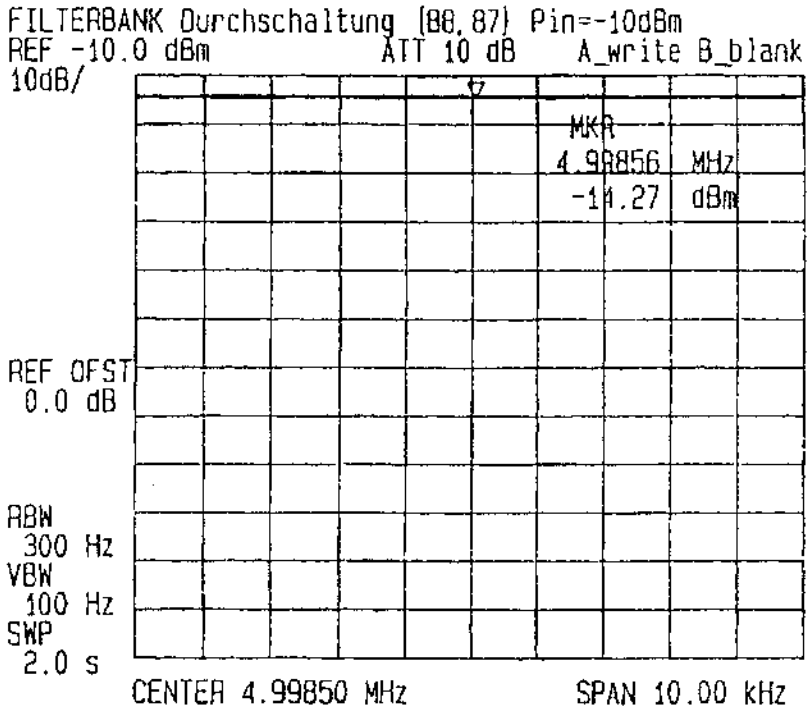
Customer specified Quartz Filter drawing

-Filterboard-

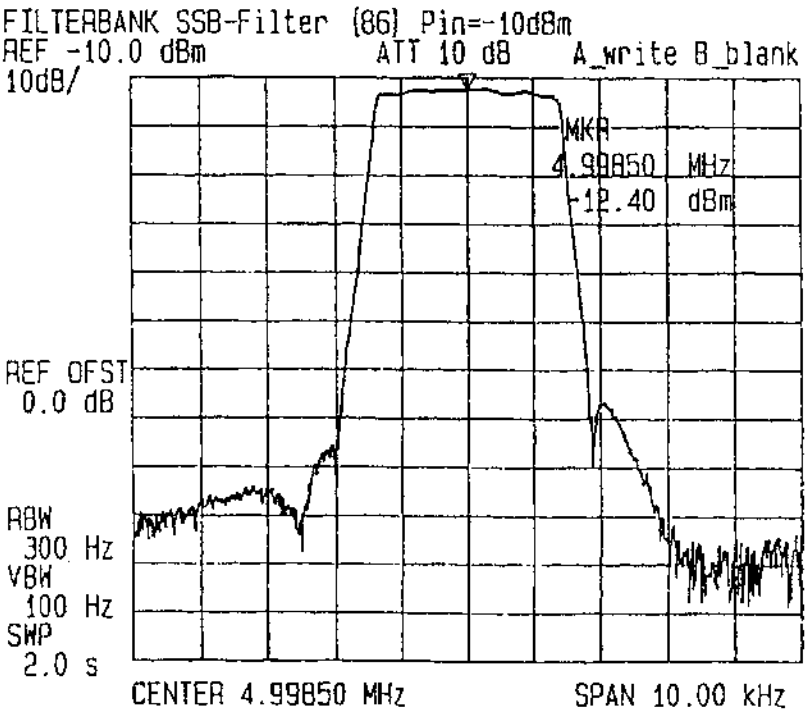
Customer specified Quartz Filter drawing

-Filterboard-

Filterboard -by passed- (88, 87)

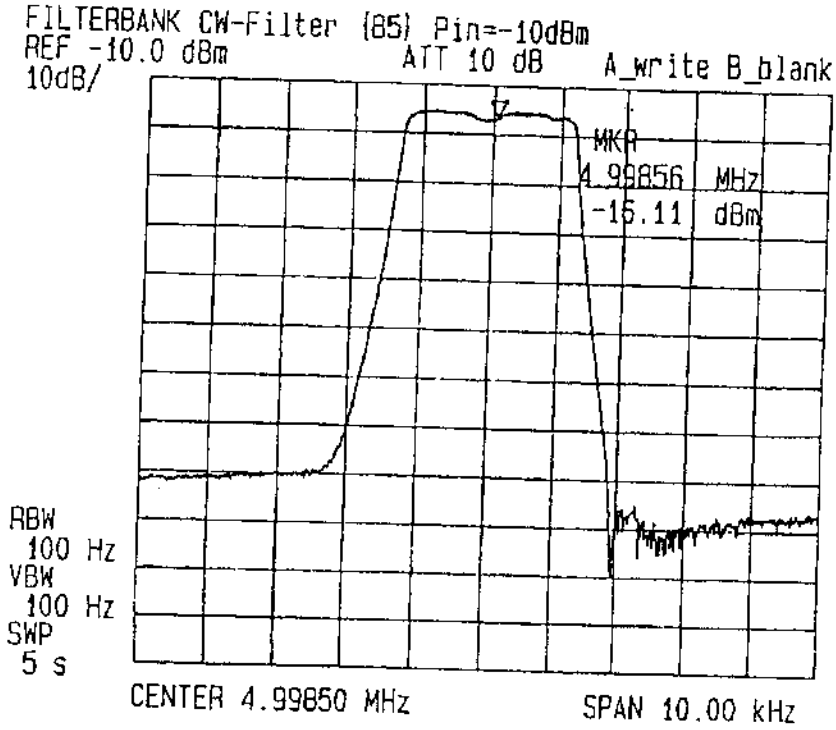


Filterboard -SSB-Filter- (86)

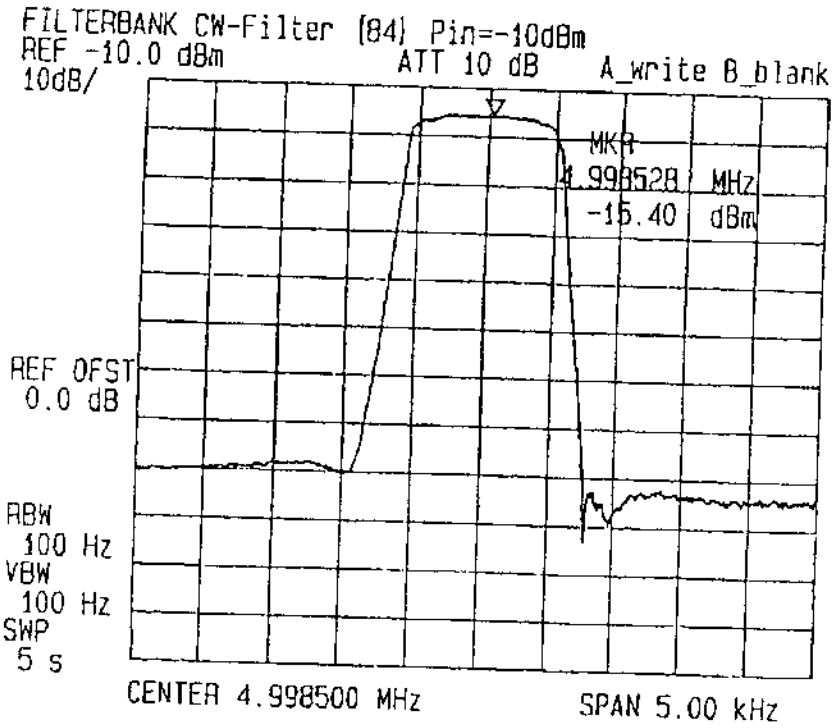


-Filterboard-

Filterboard -CW-filter- (85)

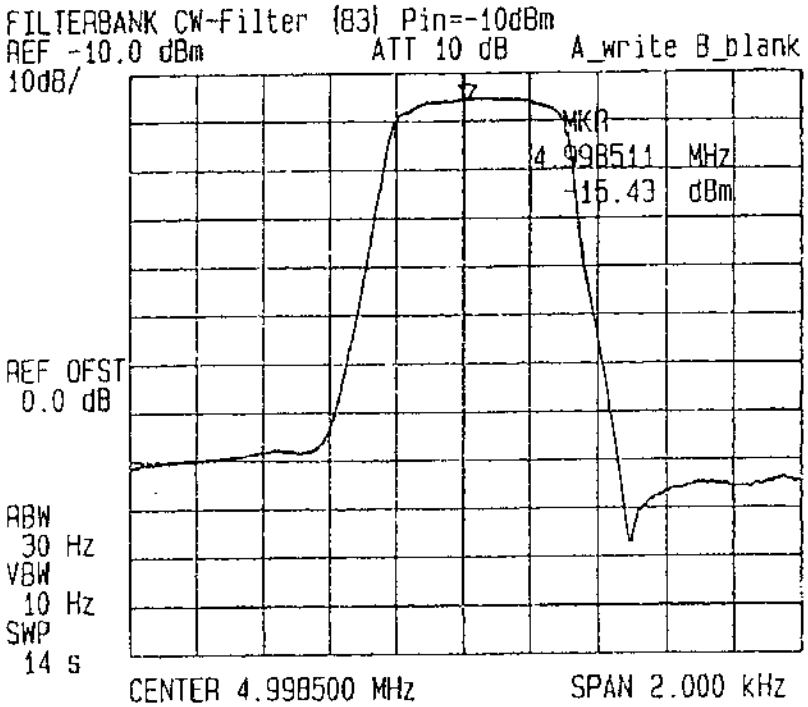


Filterboard -CW-filter- (84)

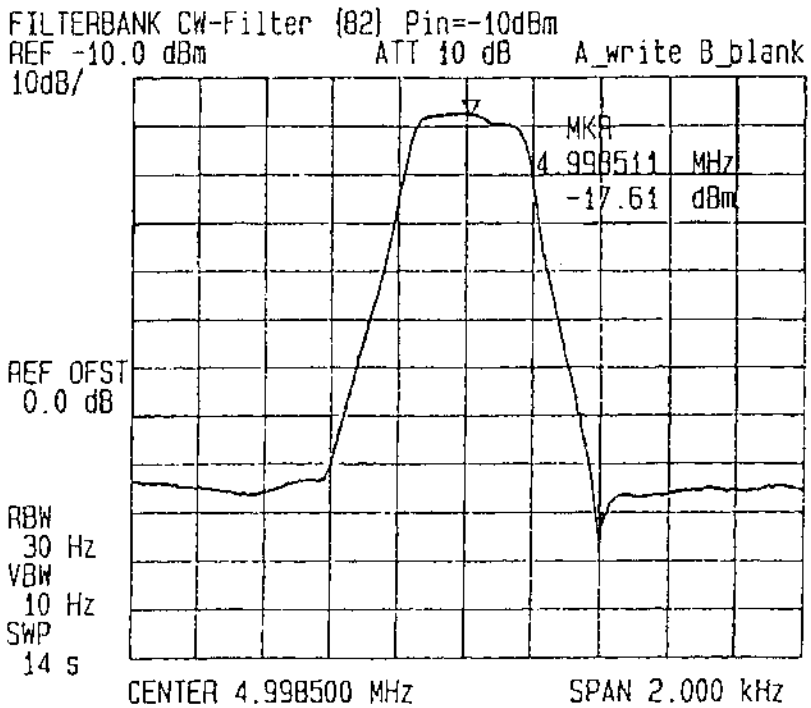


-Filterboard-

Filterboard -CW-filter- (83)

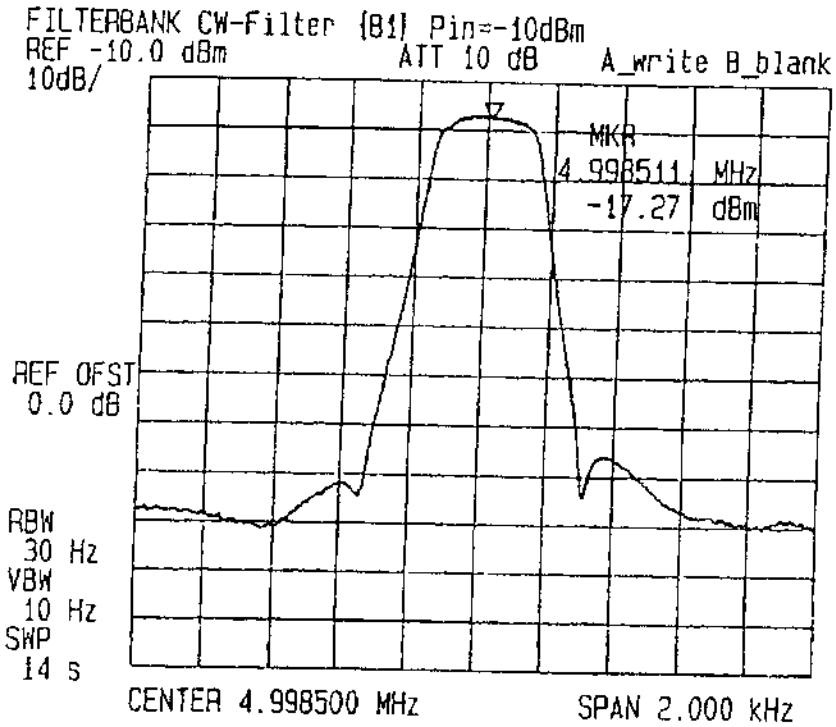


Filterboard -CW-filter- (82)

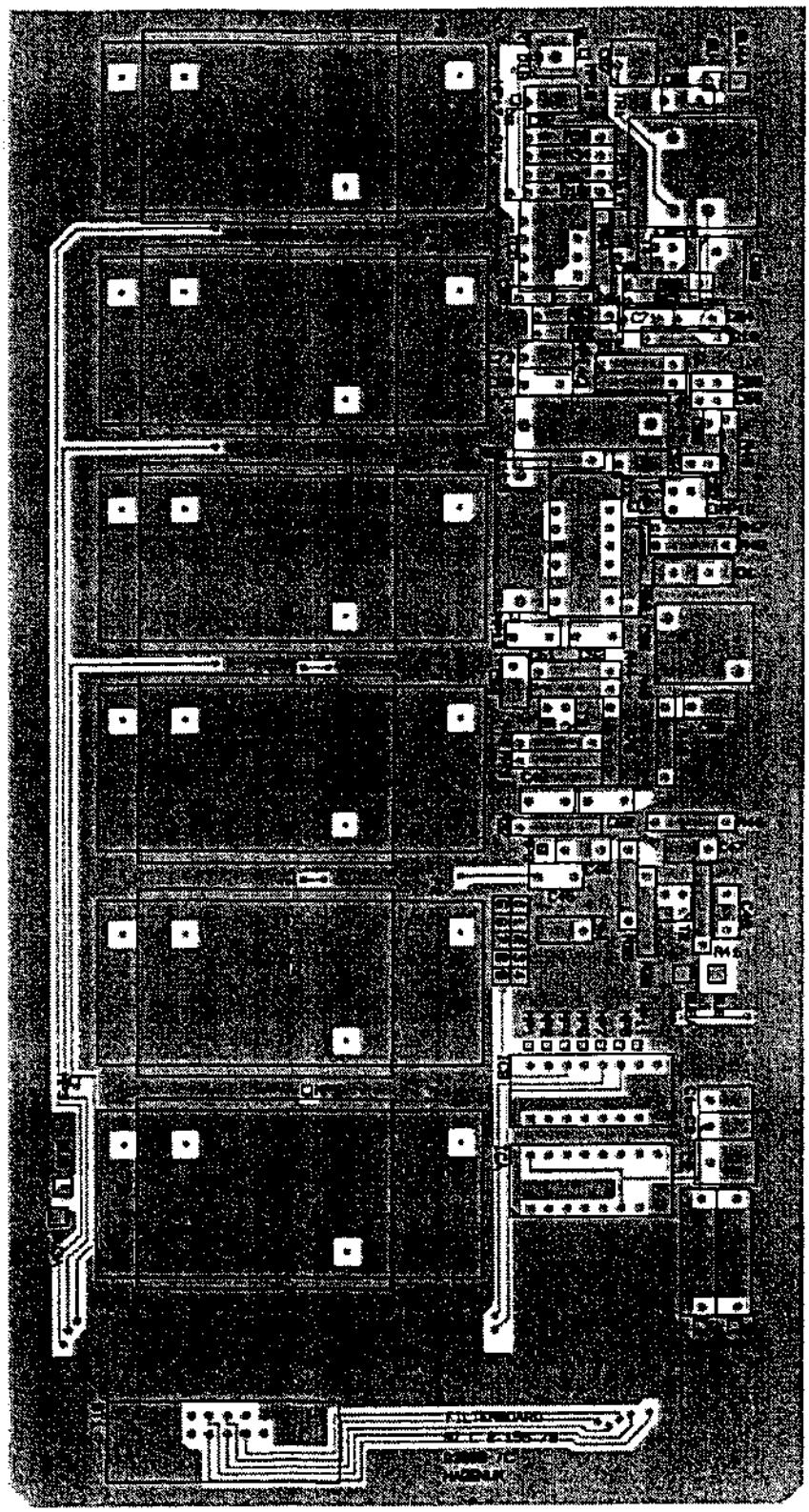


-Filterboard-

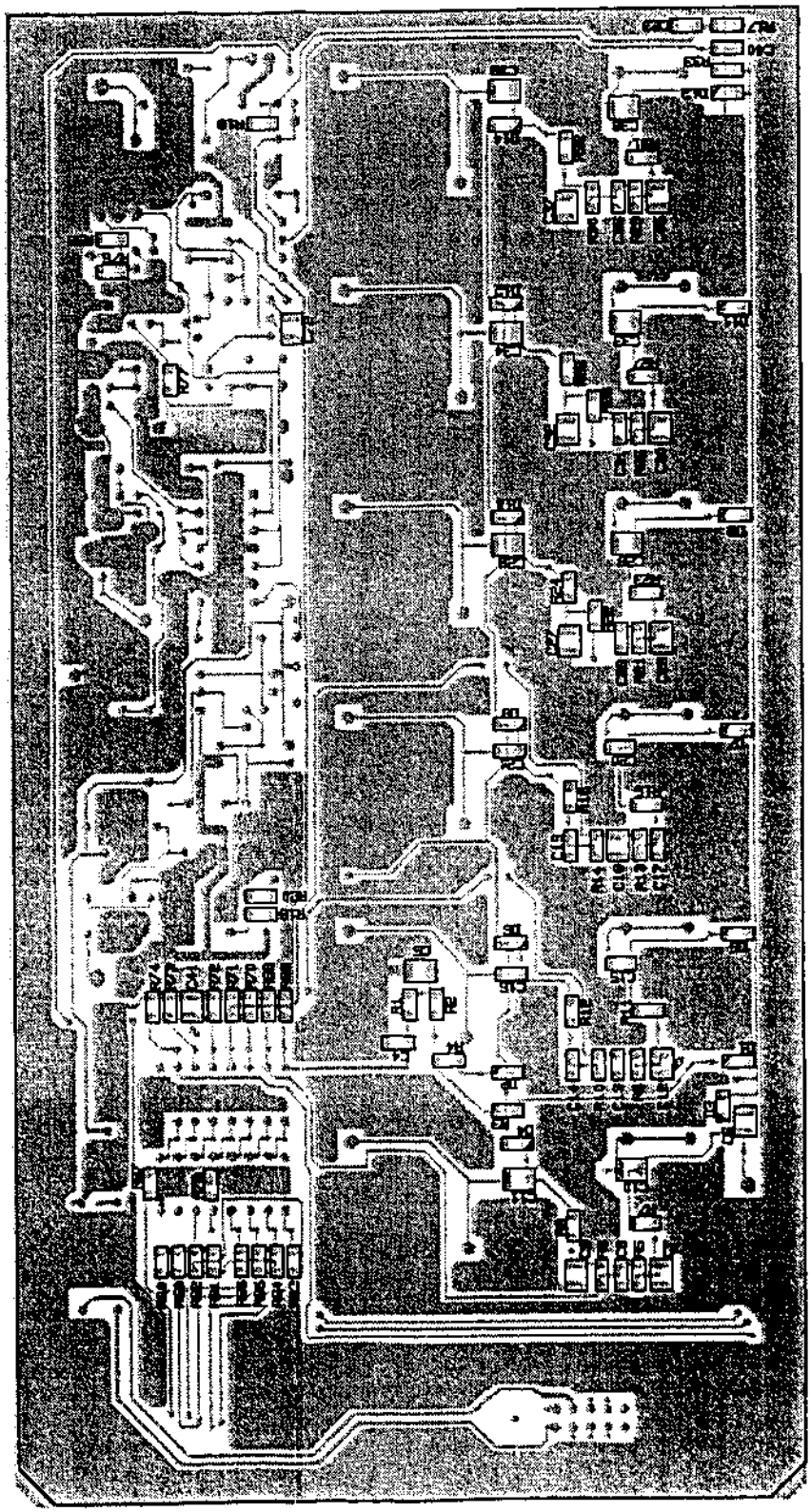
Filterboard -CW-filter- (81)



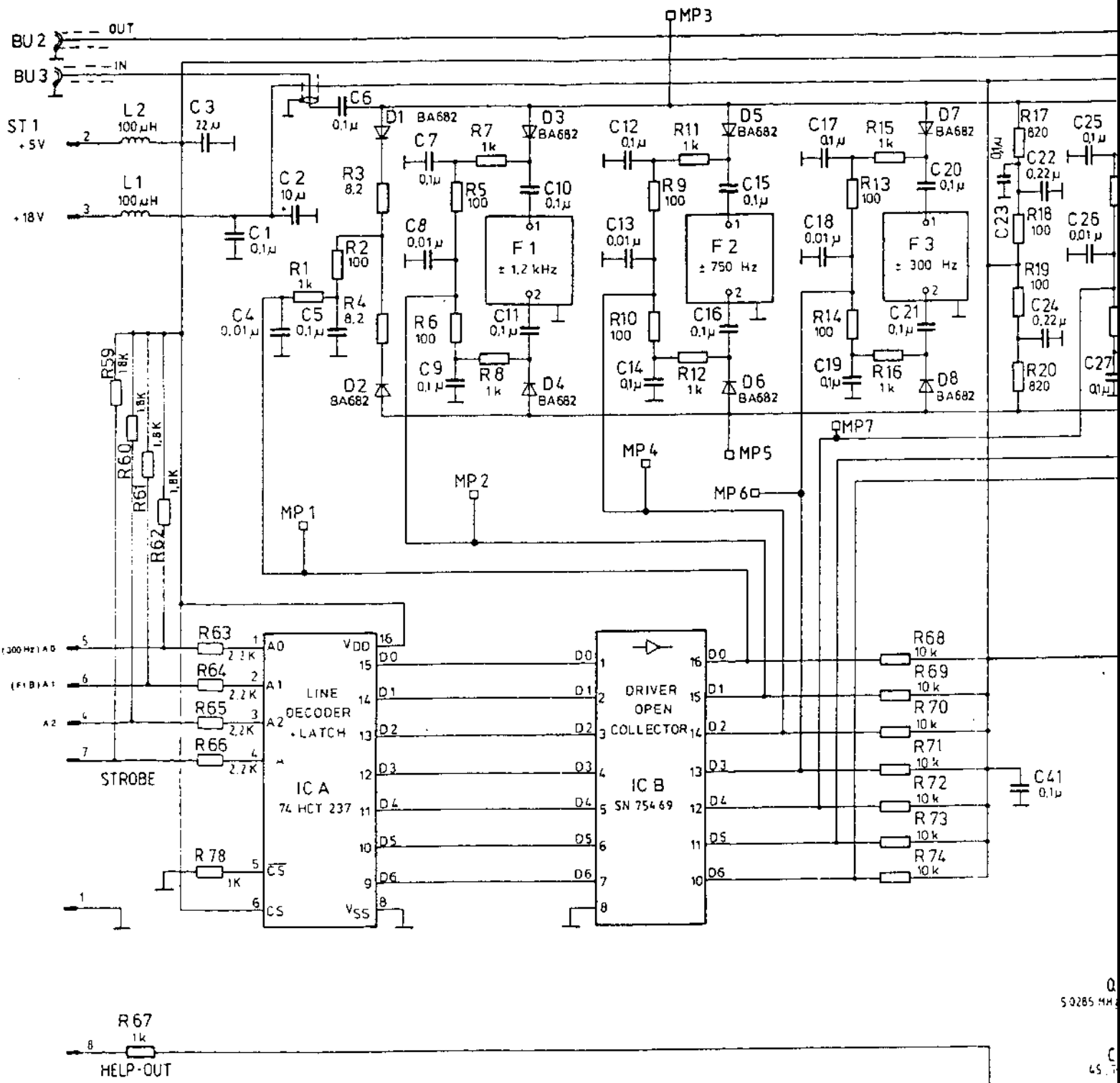
see circuit diagr



see circuit diagram - FILTERBOARD 97 Sa B 2.155.76



Printed Circuit Board
Filterboard
97 C 2.155.76



Filter	Zeichnungs - Nr.
F 1 ±1,2kHz	97 E 2.140 78 - 2
F 2 ±750Hz	97 E 2.140 78 - 16
F 3 ±300Hz	97 E 2 140 78 - 15
F 4 ±150Hz	97 E 2.140.78 -14
F 5 ± 75Hz	97 E 2 140 78 - 13
F 6 ± 50Hz	97 E 2 140 78 - 12

all filters center frequency 4.9985 MHz

L S 97 E 2 155.150

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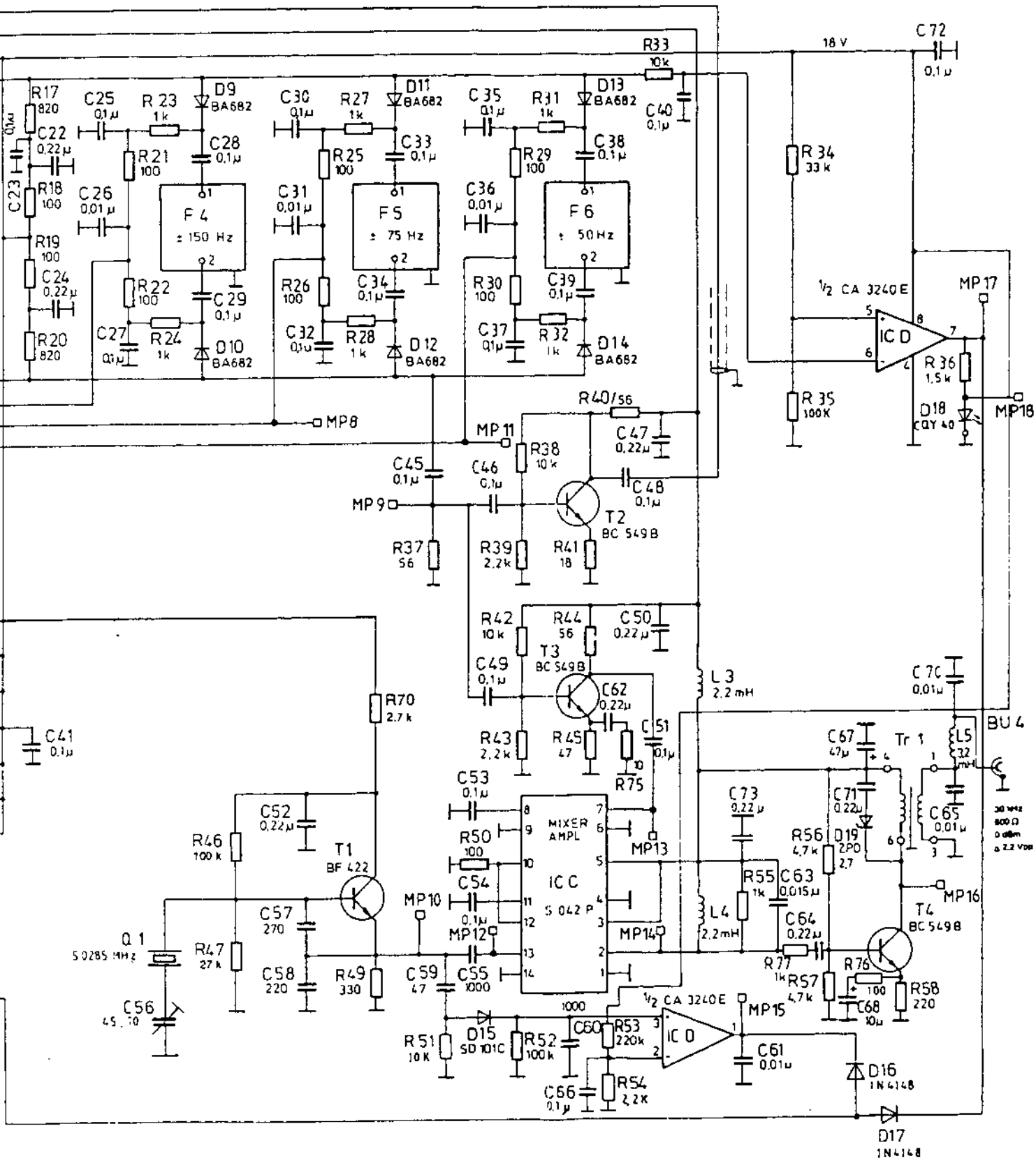

FILTERBOARD
Circuit Diagram
97 Sa C 2.155.76

-Filterboard-

Ident-No.	Mark	Electr. value	Identity	Manufacturer
Capacitors:				
1423.037	C1	0,1/20/63 V	MKS 2	WIMA
1423.304	C2	10/20/25 V	SAL 2222 122 90006	VALVO
1401.343	C3	22/20/10 V	MKS SAL RP	WIMA
1853.724	C4	0,01/10/63 V	KEFQ 1210	VALVO
1646.990	C5	0,1/10/63 V	KEFQ 1210	VALVO
1646.990	C6	0,1/10/63 V	KEFQ 1210	VALVO
1646.990	C7	0,1/10/63 V	KEFQ 1210	VALVO
1853.724	C8	0,01/10/63 V	KEFQ 1210	VALVO
1646.990	C9	0,1/10/63 V	KEFQ 1210	VALVO
1646.990	C10	0,1/10/63 V	KEFQ 1210	VALVO
1646.990	C11	0,1/10/63 V	KFFQ 1210	VALVO
1646.990	C12	0,1/10/63 V	KEFQ 1210	VALVO
1853.724	C13	0,01/10/63 V	KEFQ 1210	VALVO
1646.990	C14	0,1/10/63 V	KEFQ 1210	VALVO
1646.990	C15	0,1/10/63 V	KEFQ 1210	VALVO
1646.990	C16	0,1/10/63 V	KEFQ 1210	VALVO
1646.990	C17	0,1/10/63 V	KEFQ 1210	VALVO
1853.724	C18	0,01/10/63 V	KEFQ 1210	VALVO
1646.990	C19	0,1/10/63 V	KEFQ 1210	VALVO
1646.990	C20	0,1/10/63 V	KEFQ 1210	VALVO
1646.990	C21	0,1/10/63 V	KEFQ 1210	VALVO
1400.568	C22	0,22/10/63 V	MKS 2	WIMA
1853.724	C23	0,01/10/63 V	KEFQ 1210	VALVO
1400.568	C24	0,22/10/63 V	MKS 2	WIMA
1646.990	C25	0,1/10/63 V	KEFQ 1210	VALVO
1853.724	C26	0,01/10/63 V	KEFQ 1210	VALVO
1646.990	C27	0,1/10/63 V	KEFQ 1210	VALVO
1646.990	C28	0,1/10/63 V	KEFQ 1210	VALVO
1646.990	C29	0,1/10/63 V	KEFQ 1210	VALVO
1646.990	C30	0,1/10/63 V	KEFQ 1210	VALVO
1853.724	C31	0,01/10/63 V	KEFQ 1210	VALVO
1646.990	C32	0,1/10/63 V	KEFQ 1210	VALVO
1646.990	C33	0,1/10/63 V	KEFQ 1210	VALVO
1646.990	C34	0,1/10/63 V	KEFQ 1210	VALVO
1646.990	C35	0,1/10/63 V	KEFQ 1210	VALVO
1853.724	C36	0,01/10/63 V	KEFQ 1210	VALVO
1646.990	C37	0,1/10/63 V	KEFQ 1210	VALVO
1646.990	C38	0,1/10/63 V	KEFQ 1210	VALVO
1646.990	C39	0,1/10/63 V	KEFQ 1210	VALVO
1853.724	C40	0,01/10/63 V	KEFQ 1210	VALVO
1646.990	C41	0,1/10/63 V	KEFQ 1210	VALVO
1423.037	C45	0,1/20/63 V	MKS 2	WIMA

-Filterboard-

Parts lists No.
97 Sa 2.155.76

Ident-No.	Mark	Electr. value	Identity	Manufacturer
1423.037	C46	0,1/20/63 V	MKS 2	WIMA
1400.568	C47	0,22/10/63 V	MKS 2	WIMA
1423.037	C48	0,1/20/63 V	MKS 2	WIMA
1423.037	C49	0,1/20/63 V	MKS 2	WIMA
1400.568	C50	0,22/10/63 V	MKS 2	WIMA
1423.037	C51	0,1/20/63 V	MKS 2	WIMA
1400.568	C52	0,22/10/63 V	MKS 2	WIMA
1423.037	C53	0,1/20/63 V	MKS 2	WIMA
1423.037	C54	0,1/20/63 V	MKS 2	WIMA
0944.971	C55	1000pF/10/63 V	K 2000 EDPU	VALVO
1068.229	C56	5-60 pF	2222 809 07011	VALVO
0945.056	C57	220 pF/2/63 V	N 750 1 B EDPU	DIN 41923
1420.844	C58	330 pF/2/63 V	N 750 1 B EDPU	VALVO
0945.811	C59	47 pF/2/63 V	NPO/1 B EDPU	DIN 41923
0944.971	C60	1000pF/10/63 V	K 2000 EDPU	VALVO
0904.988	C61	0,01/100/20/40 V	K 10000 EDPU	VALVO
1400.568	C62	0,22/10/63 V	MKS 2	WIMA
1405.136	C63	0,015/5/63 V	MKS 2	WIMA
1400.568	C64	0,22/10/63 V	MKS 2	WIMA
1647.288	C65	0,01/5/63 V	MKS 2	WIMA
1423.037	C66	0,1/20/63 V	MKS 2	WIMA
1815.377	C67	47/20/25 V	2222 035 56479	VALVO
1423.304	C68	10/20/25 V	SAL 2222 122 90006	VALVO
1647.288	C70	0,01/5/63 V	MKS 2	WIMA
1400.568	C71	0,22/10/63 V	MKS 2	WIMA
1646.990	C72	01/10/63 V	KEFQ 1210	VALVO
1400.568	C73	0,22/10/63 V	MKS 2	WIMA

Diodes:

1767.089	D1	BA 682	ITT
1767.089	D2	BA 682	ITT
1767.089	D3	BA 682	ITT
1767.089	D4	BA 682	ITT
1767.089	D5	BA 682	ITT
1767.089	D6	BA 682	ITT
1767.089	D7	BA 682	ITT
1767.089	D8	BA 682	ITT
1767.089	D9	BA 682	ITT
1767.089	D10	BA 682	ITT
1767.089	D11	BA 682	ITT
1767.089	D12	BA 682	ITT
1767.089	D13	BA 682	ITT
1767.089	D14	BA 682	ITT

-Filterboard-

Ident-No.	Mark	Electr. value	Identity	Manufacturer
1465.740	D15		SD 101 C	ITT
0745.677	D16		1 N 4148	ITT/FAIRCHILD/ SIEMENS/VALVO/ AEG-TELEFUNKEN
0745.677	D17		1 N 41448	ITT/FAIRCHILD/ SIEMENS/VALVO/ AEG-TELEFUNKEN
1427.121	D18		TLUR 5400	AEG-TELEFUNKEN
0694.959	D19		ZPD 2,7	ITT

Resistors:

1643.460	R1	SMD 1k-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1647.105	R2	SMD 100-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1853.740	R3	SMD 8,2-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1853.740	R4	SMD 8,2-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1647.105	R5	SMD 100-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1647.105	R6	SMD 100-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1643.460	R7	SMD 1k-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1643.460	R8	SMD 1k-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1647.105	R9	SMD 100-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1647.105	R10	SMD 100-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1643.460	R11	SMD 1k-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1643.460	R12	SMD 1k-.5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1647.105	R16	SMD 100-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1647.105	R14	SMD 100-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1643.460	R15	SMD 1k-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1643.460	R16	SMD 1k-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1748.297	R17	SMD 820-5-0,125 W	2x1,25x0,5/0,7	HN 329 T.2
1647.105	R18	SMD 100-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1647.105	R19	SMD 100-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1748.297	R20	SMD 820-5-0,125 W	2x1,25x0,5/0,7	HN 329 T.2
1647.105	R21	SMD 100-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1647.105	R22	SMD 100-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1643.460	R23	SMD 1k-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1643.460	R24	SMD 1k-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1647.105	R25	SMD 100-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1647.105	R26	SMD 100-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1643.460	R27	SMD 1k-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1643.460	R28	SMD 1k-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1647.105	R29	SMD 100-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1647.105	R30	SMD 100-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1643.460	R31	SMD 1k-5-0,125 W	3,2x1,6x0,58	HN 329 T.4

-Filterboard-

Parts lists No.
97 Sa 2.155.76

Ident-No.	Mark	Electr. value	Identity	Manufacturer
1643.460	R32	SMD 1k-5-0,125 W	3,2x1,6x0,58	HN 329 T.4
1710.478	R33	SMD 10k-5-0,06 W	2x1,25x0,5/0,7	HN 329 T.2
0627.895	R34	33k-5-0,6-0207	DIN 44052-G	
0767.190	R35	100k-5-0,6-0207	DIN 44052-G	
0480.444	R36	1,5k-5-0,6-0207	DIN 44052-G	
0530.360	R37	56-5-0,6-0207	DIN 44052-G	
0179.701	R38	10k-5-0,6-0207	DIN 44052-G	
0744.808	R39	2,2k-5-0,6-0207	DIN 44052-G	
0530.360	R40	56-5-0,6-0207	DIN 44052-G	
0779.776	R41	18-5-0,6-0207	DIN 44052-G	
0179.701	R42	10 k-5-0,6-0207	DIN 44052-G	
0744.808	R43	2,2 k-5-0,6-0207	DIN 44052-G	
0530.360	R44	56-5-0,6-0207	DIN 44052-G	
0626.694	R45	47-5-0,6-0207	DIN 44052-G	
0767.190	R46	100k-5-0,6-0207	DIN 44052-G	
0542.830	R47	27k-5-0.6-0207	DIN 44052-G	
0179.639	R48	100-5-0,6-0207	DIN 44052-G	
0744.859	R49	330-5-0,6-0207	DIN 44052-G	
0179.639	R50	100-5-0,6-0207	DIN 44052-G	
0179.701	R51	10 k-5-0,6-0207	DIN 44052-G	
0767.190	R52	100 k-5-0,6-0207	DIN 44052-G	
0799.416	R53	220 k-5-0,6-0207	DIN 44052-G	
0744.808	R54	2,2 k-5-0,6-0207	DIN 44052-G	
0179.698	R55	1 k-5-0,6-0207	DIN 44052-G	
0767.212	R56	4,7 k-5-0,6-0207	DIN 44052-G	
0767.212	R57	4,7 k-5-0,6-0207	DIN 44052-G	
1612.859	R58	220-5-0,125 W 3,2x1,6x0,58		HN 329 T.4
1643.487	R59	1,8 k-5-0,125 W 3,2x1,6x0,58		HN 329 T.4
1643.487	R60	1,8 k-5-0,125 W 3,2x1,6x0,58		HN 329 T.4
1643.487	R61	1,8 k-5-0,125 W 3,2x1,6x0,58		HN 329 T.4
1643.487	R62	1,8 k-5-0,125 W 3,2x1,6x0,58		HN 329 T.4
1643.525	R63	2,2 k-5-0,125 W 3,2x1,6x0,58		HN 329 T.4
1643.525	R64	2,2 k-5-0,125 W 3,2x1,6x0,58		HN 329 T.4
1643.525	R65	2,2 k-5-0,125 W 3,2x1,6x0,58		HN 329 T.4
1643.525	R66	2,2 k-5-0,125 W 3,2x1,6x0,58		HN 329 T.4
1643.460	R67	1k-5-0,125 W 3,2x1,6x0,58		HN 329 T.4
1710.478	R68	10 k-5-0,06 W 2x1,25x0,5/0,7		HN 329 T.4
1710.478	R69	10 k-5-0,06 W 2x1,25x0,5/0,7		HN 329 T.4
1710.478	R70	10 k-5-0,06 W 2x1,25x0,5/0,7		HN 329 T.4
1710.478	R71	10 k-5-0,06 W 2x1,25x0,5/0,7		HN 329 T.4
1710.478	R72	10 k-5-0,06 W 2x1,25x0,5/0,7		HN 329 T.4
1710.478	R73	10 k-5-0,06 W 2x1,25x0,5/0,7		HN 329 T.4
1710.478	R74	10 k-5-0,06 W 2x1,25x0,5/0,7		HN 329 T.4
0626.708	R75	10-5-0,6-0207	DIN 44052-G	

-Filterboard-

Parts lists No.
97 Sa 2.155.76

Ident-No.	Mark	Electr. value	Identity	Manufacturer
1647.105	R76	100-5-0,125 W3,2x1,6x0,58		HN 329 T.4
1643.460	R77	1k-5-0,125 W 3,2x1,6x0,58		HN 329 T.4
1643.460	R78	1k-5-0,125 W 3,2x1,6x0,58		HN 329 T.4
1411.225	R79	2,7k-5-0,5-0204	DIN 44052-G	

Coils:

0747.572	L1	100 µH/10 PCT	Typ 72.1	JAHRE
		or 100 µH	B 78108-S 1104-J	SIEMENS
0747.572	L2	100 µH/10 PCT	Typ 72.1	JAHRE
		or 100 µH	B 78108-S 1104-J	SIEMENS
0745.650	L3	2000 µH	Nr. 2500-42	AMPHENOL
0745.650	L4	2000 µH	Nr. 2500-42	AMPHENOL
1962.523	L5	3,2 mH	97 E 2.155.150	HAGENUK

Integrated circuits:

1767.097	IC-A	IC 74 HCT 237	TEXAS, ITT
1423.711	IC-B	IC 75469	
1739.816	IC-C	IC S 042 P	SIEMENS
1427.156	IC-D	IC CA 3240 E	

Transistors:

1297.783	T1	BF 422	
1291.033	T2	BC 549 B	
1291.033	T3	BC 549 B	
1291.033	T4	BC 549 B	

Connectors:

1765.396	Bu2	coax cabel		97 E 2.155.79
1765.418	Bu3	coax cabel		97 E 2.155.80
0746.096	Bu4	BNC-plog	UG 657/U 31102	
1826.549	St1	Connectorpanel 10-pins	609-1004 E	ANSLEY

-Filterboard-

Parts lists No.
97 Sa 2.155.76

Ident-No.	Mark	Electr. value	Identity	Manufacturer
Supplement:				
1422.952	F1	filter SSB 1,2 kHz		97 E 2.140.78-2
1765.450	F2	filter 750 Hz		97 E 2.140.78-16
1765.442	F3	filter 300 Hz		97 E 2.140.78-15
1765 434	F4	filter 150 Hz		97 E 2 140 78-14
1765.469	F5	filter 75 Hz		97 E 2.140.78-13
1853.708	F6	filter 50 Hz		97 E 2.140.78-12
1739.794	Q1	quartz 5,0285 MHz		97 E 2.140.412-2
1739.433	Tr1	Transmitter		97 E 2.140.414