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ATENCIÓN

AKSJESELSKAPET

N E R A

MANUAL DE SERVICIO

para el

RECEPTOR SM 186 A

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Cartagena – España - CE

Abril de 2001

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NOTICE

AKSJESELSKAPET
N E R A
TECHNICAL MANUAL
for
RECEIVER SM 186 A

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M/S SOMERVILLE

AKSJESKAPET
NERA

Mottaker type
SM 186 A

DESCRIPTION No. 269E

Description and Operating Instruction

for NERA Receiver Model SM-186A and SM-186AU

I GENERAL

The receiver circuit refers to circuit diagrams S-1438/3 and S-1487/3. SM-186A is a superheterodyne receiver employing six tubes in all, viz.: 1 stage RF amplification, mixer stage incorporating oscillator, 1 stage intermediate frequency amplification incorporating second detector, two stages LF amplification and a separate beat oscillator.

Tube Complement:

1 tube EF 11 RF amplifier
1 " ECH 11 Mixer
1 " EBF 11 IF amplifier and second detector
1 " EF 11 LF amplifier
1 " EF 11 Beat oscillator.
1 " 25L6 Power amplifier
1 " 117Z3 Rectifier (for SM-186AU only)

Auxiliary tubes:

1 Neon tube 110 Volts 0.25 w.
1 Dial lamp 18 " 0.1 A

Frequency coverage:

100 Kc/s - 24 Mc/s (3000 - 12,5 m)
in 7 overlapping bands, thus
Band 1 - 100 - 250 Kc/s (3000 - 1200 m)
" 2 - 250 - 600 " (1200 - 500 m)
" 3 - 600 - 1500 " (500 - 200 m)
" 4 - 1400 - 3500 " (215 - 85 m)
" 5 - 3,5 - 8,5 Mc/s (85 - 35 m)
" 6 - 8,5 - 14 " (36 - 21 m)
" 7 - 14 - 24 " (21 - 12.5 m)

The intermediate frequency is 655 Kc/s. As the receiver range 3 tunes right through the IF, a band of approx. 20 Kc/s each side of 655 Kc/s in scale 3 will be found unstable.

Power Supply:

The receiver is normally connected to 110/220 V DC mains, current consumption being approximately 0,35 A. Alternatively, by operating a switch in the filament and plate voltage supply leads, the filaments may be run from a 24 V storage battery with a current consumption of approximately 0,7 A, the plate voltage being supplied by a 90-135 V dry battery, current consumption approximately 48 mA.

Battery operation, should only be used as an emergency measure.

On the switch box is mounted a small neon tube which shows fairly rapid flashes when the high-voltage battery is in use. When the battery voltage has decreased below 70 Volts, the flasher ceases to ignite, thereby indicating that the useful life of the battery is almost at an end.

Sensitivity:

On A₂ and A₃ the required signal voltage (30% modulated 400 c/s) is less than 30 uV at 50 mW output.

On A₁ the sensitivity is better than 5 uV.

Selectivity:

The IF selectivity is better than 35 dB down at ± 9 Kc/s off resonance.

Power Output:

Without perceptible distortion the output signal is approximately 250 mW. Max. output: 1 watt.

Tuning Dial:

Indirectly lighted, full vision glass dial, scales calibrated in Kc/s and Mc/s. The emergency frequencies 500 Kc/s, 2182 Kc/s and 8364 Kc/s have red markers, the other maritime frequencies printed with black markers.

Tuning:

The tuning knob is provided with two reduction speeds, 1 : 5 and 1 : 25. A separate knob controls the band-spread tuning.

Volume control:

The RF gain may be switched between AVC or manual control. The LF gain is adjusted manually.

Description No. 269E.

Terminals:

Coax cable plug is mounted for antenna, ground through screw and nut connection.

For screw contacts on the back of the receiver connect a low-impedance loudspeaker and a 600 ohms telephone line. 2 jacks on the front accomodates the headphone (impedance 600 ohms).

The receiver is furnished with a 6-lead screened cable for connection to the master switch and filter unit.

Overall Dimensions:

Max. Width: 425 mm

" Depth: 295

" Height: 265 mm

Weight:

Approximately 15 Kgs.

II. Circuit Description. (Refer to circuit diagram S-1438/3 or S-1487/3).

The RF stage employs the pentode tube EF 11. Ganged tuning of the two signal frequency circuits and of the oscillator circuit is provided by means of the 3-section variable tuning condenser pos.6. The stators of this condenser are each divided into two unequal parts, only the smaller of these being utilized in the two highest frequency bands (bands 6 and 7), thus providing greatly improved tuning ease. In all other bands the two stator parts are utilized in parallel, the necessary switching being automatically carried out by the band switch (pos.7). Auxiliary bandspread is provided by means of a separate small variable condenser (approx. 3 pF, pos. 183), shunting the oscillator section of the main tuning condenser, and acting as a vernier control of the main tuning adjustment. The effect of the slight mistuning of the ganged circuits thus occuring is negligible.

The mixer stage employs the triode-hexode ECH 11. The triode part is connected to the oscillating circuit, the frequency of which on all bands is 655 Kc/s higher than the signal frequency.

The IF amplifier tube EBF 11 is duo-diode-pentode type tube, the diode part of which is being used as second detector.

The low frequency voltage component is via the volume control pos.87 applied to the grid of the low frequency amplifier tube EF 11, which in turn drives the power amplifier tube 25L6.

Loudspeakers and headphones are connected to the 25L6 through the output transformer pos.88.

The AVC voltage arising in the detector circuit is applied to the control grids of all tubes preceding the second detector, furnishing efficient regulation.

By means of the potentiometer pos. 86 the screen voltage and thereby the RF gain of the first two tubes may be adjusted. The potentiometer shaft further operates a switch which in closed position connects the resistor pos. 76 to the chassis, effecting a sharp decrease in the amount of AVC voltage reaching the grids. Opening the switch by turning the RF potentiometer shaft to extreme anti-clockwise position (AVC position), re-introduces the full AVC voltage.

The bias of the LF amplifier tube EF 11 is supplied by the voltage drop across resistor pos. 78, while the voltage drop across resistor pos. 79 effects the biasing voltage of the power amplifier tube.

The beat oscillator circuit employs an EF 11 pentode tube. This circuit is well screened and loosely coupled to the second detector. The beat oscillator frequency is approximately 2 Kc/s lower than the IF. The oscillator is controlled by means of the ON-OFF switch pos. 92.

The tube filaments are connected in series for 110 V operation, while a series-parallel combination of filament connections is employed with 24 V. The proper sequence is automatically selected by operating the switch on the main filter unit.

The receiver is furnished with an IF wavetrap Pos's 189-190.

III CONSTRUCTIONAL FEATURES

The receiver is assembled on a chassis made of 2 mm aluminium. The chassis is mounted on two metal frames, the frames being insulated from the chassis proper. The two frames also form the base to which the outer covering plates are secured. These plates are finished in a light grey lacquer. The top cover is fashioned to render it drip-proof, and is kept in place by two knurled screws. For routine inspection or replacement of tubes, the top cover must be removed. All tubes and the plug-in type electrolytic condenser pos. 60 are mounted on the chassis. The tube positioning is shown in a diagram placed on the screening plate, covering the main tuning condenser in the center of the chassis.

Description 269E

The two IF transformers are mounted to the rear of the chassis, while the metal cans to the right contains the oscillator and signal frequency coils of bands 1-4. The IF wavetraps are fastened on to the right side plate just above the coil cans. The main wiring and the various other components are located underneath the chassis.

After removal of the bottom plate which is secured to the frames with screws, all essential parts are accessible for inspection and replacement.

The coils are wound on small polystyrene forms with iron core trimmers, all coils also being provided with air-dielectric capacity trimmers.

The dial is placed in the middle of the front panel, back of which is the dial indicator and the reflector plate.

All controls and the Jack's for headphones are mounted on the front panel. Antenna ground, loudspeakers and telephone Line are connected on the receiver's back side.

A 6-lead screened cable connecting the receiver to the power supply is passed through the rear covering plate of the cabinet.

IV. NOISE FILTER AND MAIN SWITCH UNIT - SF-310-U.

For maximum elimination of line noise, the receiver is provided both with a LF and a RF filter. The LF filter consists of the iron core chokes (pos. 89) and the electrolytic condensers (pos. 609 both in one can) and is mounted within the receiver cabinet. The RF filter is assembled as a separate unit inside the main switch box SF-310-U, the screened conductor connecting it to the receiver proper. The RF filter consists of the coils (pos. 8) and the decoupling condenser (pos. 4 and pos. 4a)

The main switch (pos. 9) effects selection of supply voltages, either from 110/220 V. mains or from a 24 V. storage battery. The switch has three positions, the intermediate of which is the "OFF"-position.

The receiver consequently may be operated independent of the mains, although mains operation is normally to be used. A neon tube will flash off and on when the battery is in use.

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The switchbox is provided with glasstube fuses in all four supply leads (1 Amp.). All components are mounted on an iron foundation sheet, covered by a metal housing. All metal parts are cadmium plated, the exterior of the housing being finished with lacquer to match the receiver cabinet.

The bottom is constructed for facilitating mounting of the box on the wall in the vicinity of receiver.

A terminal strip is conveniently positioned on the bottom plate. The metal cover is provided with accomodating holes for the switch shaft and fuse holders, allowing easy replacement of fuses. The metal cover is fastened to the bottom plate by means of two knurled screws, providing quick removal of cover. By 220 V. mains voltage, a dropping resistor must be inserted in one of the mains conductors ahead of the switch unit. Upon request a suitable wire-wound, caged resistor 300 ohms 40 watts is supplied.

V. INSTALLATION AND OPERATION INSTRUCTIONS

A 6-lead screened cable, interconnecting the receiver and the noise filter and switching unit is supplied, one end of which already being connected to the receiver. The free ends of the individual conductors have been adjusted to proper length and colour coded as shown in the installation diagram.

Red conductor

To be connected to terminal marked + 110/24 V

Blue conductor

To be connected to terminal marked ÷ 110/24 V

White conductor

To be connected to terminal marked + 24 V

Black conductor

To be connected to terminal marked ÷ 24 V

Yellow conductor

To be connected to terminal marked + 110/90

Green conductor

To be connected to terminal marked + 110 V

The outer screenig of the cable must be securely connected to the metal housing (ground) of the filter unit. Concerning the remaining connections (main and battery), reference should be made to the installation diagram.

A final check should be made to insure that all tubes, dial lamp) electrolytic condensers and fuses are properly accommodated in their respective sockets and that antenna, ground and loud-speaker are connected.

Switching the receiver "ON-OFF" may be performed in two specific ways, i.e.:

1. By means of the switch on the LF potentiometer pos.87
2. By means of the main switch of the filter unit.

Turning the filter unit switch to "NETT"-"MAINS" effects continuous operation of the filaments. The anode voltage may then be interrupted by turning the LF potentiometer to its extreme left position.

Both the anode- and filament voltages are turned off when the main switch of the filter is placed in "AV" - ("OFF")- position, attention being made to the fact that the operation of this switch is the only means of interrupting the filament voltage.

To sum up:

With mains operation:

1. LF volume control switch not being turned off, and receiver being put into and out of operation by means of the switch on the filter unit,
2. The switch on the filter unit being left in "NETT"-"MAINS" Position. Control of the receiver being effected by means of the switch on the LF potentiometer shaft.

The procedure outlined in (2) is the more advantageous, as it involves pre-heated tube filaments. The receiver is consequently ready for instant operation at any time, and initial frequency drift is greatly reduced.

Total life of tube filaments is not appreciably shortened, as the detrimental effect of turning the heat on and off is avoided.

Battery operation may be secured as follows:

The switch on the filter unit turned to "Battery" position. The filaments are then supplied from the 24 V storage battery, power for the anodes being taken from a separate 90-135 V dry battery, to be connected to the filter units.

CAUTION: Battery operation should only be used in emergency reception.

Telephony reception:

The beat oscillator switch must be in "OFF" position. To facilitate adjustments, the AVC should be operating, i.e. the RF volume control left in extreme anti-clockwise position. The receiver output may then be adjusted by operating the LF volume control only.

For duplex communication, the "Duplex-wavetrap", type BF350 and BF351, as described in description No. 191 and 233, may be delivered.

The wavetraps effect a considerable decrease of the interference from the ship's transmitter, with consequent improvement of reception.

Telegraphy reception:

By reception of type A₁ (CW) communication, the beat oscillator must be switched on. (Toggle switch upwards). The musical note of the signal should be adjusted to a proper height by slightly turning the tuning control (or adjusting the bandspread control) as the case may be.

The signal may be heard on each side of the zero beat, the one towards the left side of scale is the strongest and should always be selected.

AVC may be left operating, and the volume control adjusted by means of the LF potentiometer as in the case of telephony reception. However, in general, and especially so in the case of receiving very strong signals, it is recommended that the LF volume control is set in max.position (extreme clockwise rotation), adjustment of the volume then being performed by operating the RF volume control only. This means turning the RF volume control from its extreme left position, thereby rendering the AVC inoperative and utilizing the full sensitivity of the receiver.

PARTS LIST
Receiver Models SM-186A, SM-186P and SM-186AU

Circuit Diagram S-1483/3 and S-1487/3

Pos. No.:	
1	Tube type EF 11
2	" " ECH 11
3	" " EBF 11
4	" " EF 11
5	" " EF 11
5a	" " 117Z3 for SM-186P and SM-186AU only
6	2 x 3 gang condenser abt. 150 + 350 pF each sect.
7	Frequency switch NTR 875/3
8	Tuning coil assembly containing 7 ant.coils K _{1A} , K _{2A} , K _{3A} , TA, MA, L _{1A} , L _{2A}
9	7 tuning coils: K _{1B} , K _{2B} , K _{3B} , T _B , M _B , L _{1B} , L _{2B}
10	Tuning coil assembly K _{1B} , K _{2B} , K _{3B} , T _B , M _B
11	7 oscillator coils: K _{1C} , K _{2C} , K _{3C} , T _C , M _C , L _{1C} , L _{2C}
12	Intermediate frequency coils I
13	Intermediate frequency coils II with secondary tap
14	" " " " " "
15	Beat oscillator tank coil
16	Beat oscillator feed-back coil
17	Air trimmer condenser 3 - 30 pF
18	Padding condenser, MICA 1000 pF ± 5%
19	" " " 1000 pF 5%
20	" " " 1600 pF 5%
21	" " " 800 pF 5%
22	" " " 350 pF 5%
23	" " " 160 pF 5%
24	" " " 50 pF 5%
25	Mica condenser 40 pF 5%
26	" " " 15 pF 5%
27	" " " 15 pF 5%
28	" " " 30 pF 5%
29	" " " 30 pF 5%
30	" " " 5700 pF 10%
31	" " " 5700 pF 10%
32	Paper condenser 1000 pF 500 V
33	Mica condenser 100 pF ± 10%
34	Mica condenser 25 pF 5%
35	" " " 350 pF 10%
36	" " " 50 pF 10%
37	" " " 100 pF 10%
38	Paper condenser 0,1 uF 350 V
39	" " " 5000 pF type CP45 W TCC
40	" " " 0,1 uF 350 V
41	Blocking condenser 0,1 uF 1000 V type CP47 WTCC
42	Paper condenser 0,05 uF 350 V
43	" " " 0,1 uF 350 V
44	" " " 0,1 uF 350 V

Pos. No.:			
45	Paper condenser	0,1 uF	350 V
46	Mica condenser	200 pF	± 10%
47	" "	350 pF	10%
48	Electrolytic condenser	8 uF	150 V
49	Paper condenser	0,1 uF	350 V
50	" "	0,1 uF	350 V
51	" "	0,1 uF	350 V
52	" "	0,1 uF	350 V
53	Electrolytic condenser	25 uF	25 V
54	Paper condenser	5000 pF	350 V
55	" "	1000 pF	350 V
56	" "	0,1 uF	350 V
57	" "	1000 pF	350 V
58	" "	0,02 uF	350 V
59	Paper condenser	0,1 uF	350 V
60	Electrolytic condenser plug-in type 2 sep-neg. connections	40 + 40 uF	150 V DCW/Rifa PEH108E/4 or Aero- vox E2C21
61	Resistor 4700 ohms	0,5W.	
62	" 0,1 meg.ohm	0,5W	
63	" 56000 ohms	0,5W	
64	" 1000 "	0,5W	
65	" 22000 "	0,5W	
66	" 47000 "	0,5W	
67	" 0,47 meg.ohm	0,5W	
68	" 33000 ohm	0,5W	
69	" 15000 "	0,5W	
70	" 1000 "	0,5W	
71	" 0,22 meg.ohm	0,5W	
72	" 47000 ohm	0,5W	
73	" 0,22 meg.ohm	0,5W	
74	" 0,47 " "	0,5W	
75	" 1 " "	0,5W	
76	" 0,47 " "	0,5W	
77	" 1000 ohm	0,5W	
78	" 2000 "	0,5W	
79	" 200 "	0,5W	
80	" 10000 "	0,5W	
81	" 10000 "	0,5W	
82	" 0,22 meg.ohm	0,5W	
83	" 10000 ohm	0,5W	
84	" 0,1 meg.ohm	0,5W	
85	Wirewound resistor 250 ohm	6W	
86	Potentiometer 0,1 meg.ohm linear	0,15 watt with d.p.switch	
87	Potentiometer 2 meg.ohm	0,15 watt Audio tapered	
88	Output transformer, turns ratio for 4 ohm loudspeaker and for 500 ohm phones, nr. Sp. 3426		
89	LF choke L- 5 Hy at 70 mA, 100 ohm, nr. Sp. 2877		
90	Dial lamp 19 V, 0,1 A E 10 socket		
92	Switch, single pole		
93	Wirewound resistor 260 ohm 17 watt tapped at 63 and 148 ohm type ZW0 20/80 Rosenthal		
94	Resistor 47000 ohm	0,5 w	
95	P.A. tube RCA 25L6		
97	Ceramic perl condenser	2-3 pf	
98	Mica condenser	100 pf ± 10%	

Pos.

No.:

99 Neon lamp 100 V 0,25 W E 14 socket without resistor

102 Resistor, 0,1 meg.ohm 1,5 W
183 Bandsread condenser, Plessey Airtrimmer 9261/115
263 Paper condenser 10000 pF type CP45W TCC for
SM186P and SM186AU only.

I. F. Wavetrap

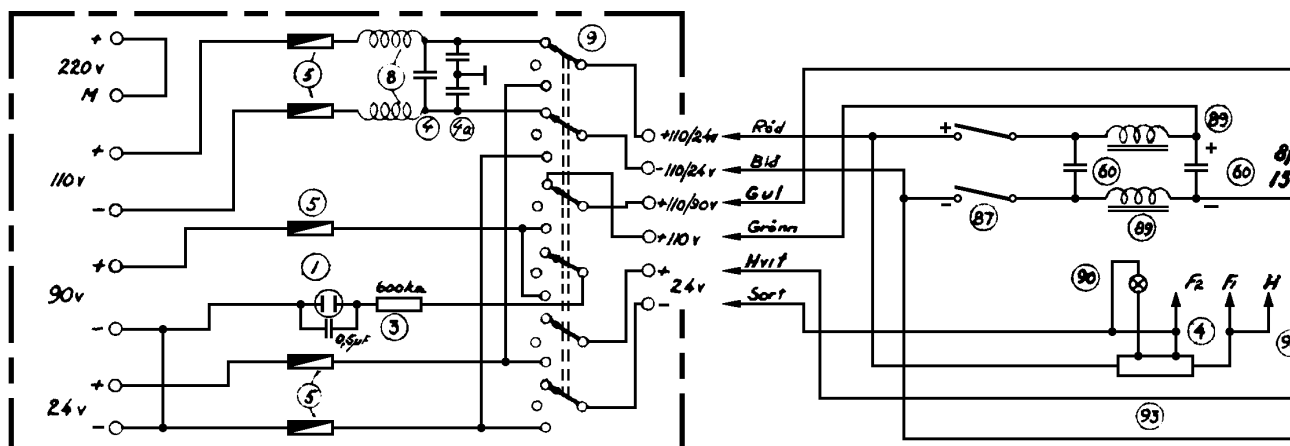
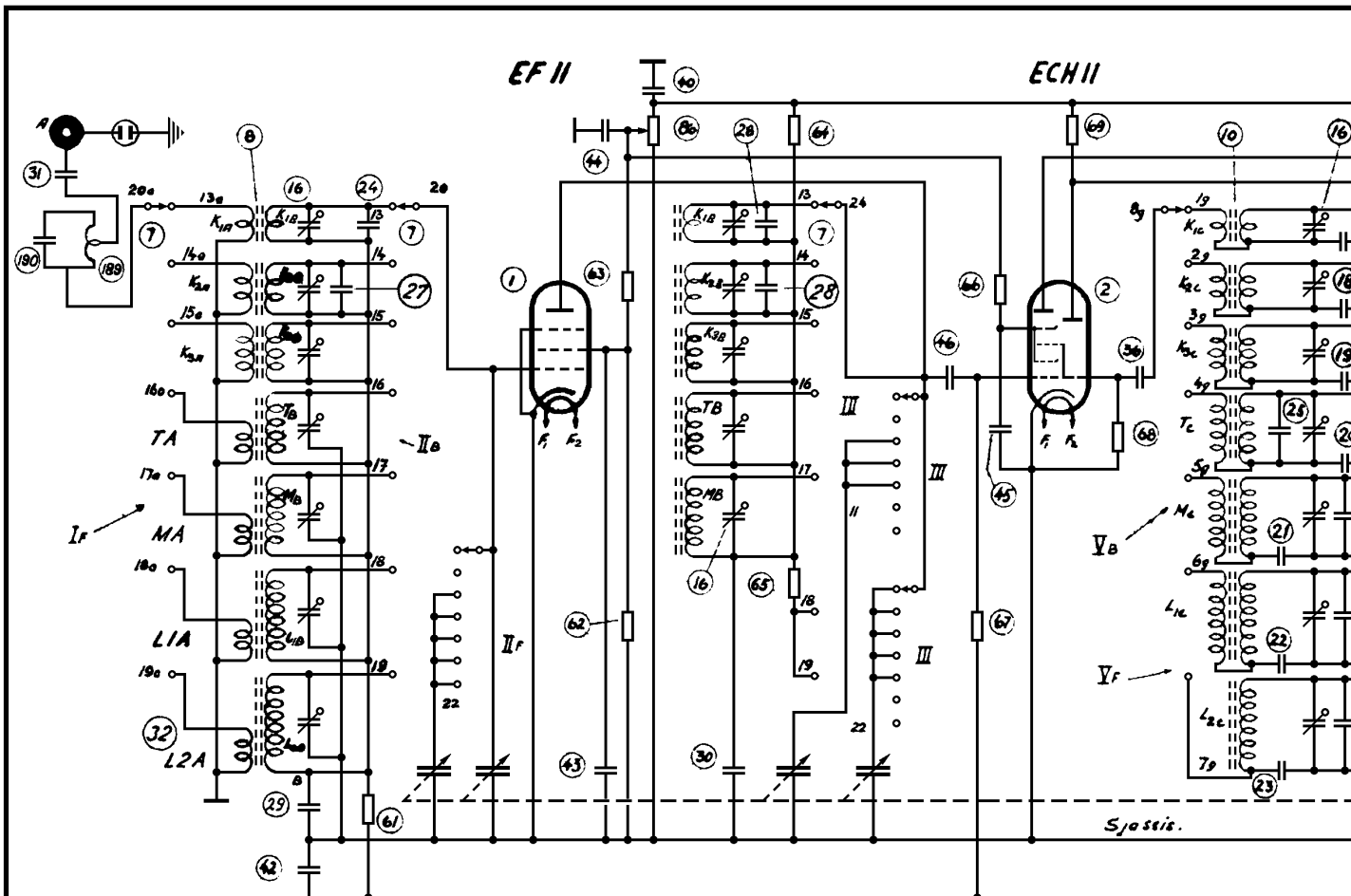
189 Wavetrap coil
190 Mica condenser 100 pF \pm 5%

Filter Unit SF-310

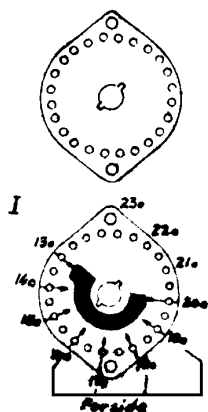
9 Switch
8 RF choke' approx. 1 mHy
4 Paper condenser 5000 pF type SKT1078 Siemens
4a " " 0,05 uF " SKT1075 "
5 Fuses 1 Amp, type H 5 Ø x 20 mm
2 Paper condenser 0,5 uF 350 V
3 Resistor 0,6 meg.ohm 0,5 watt

11/7-1955

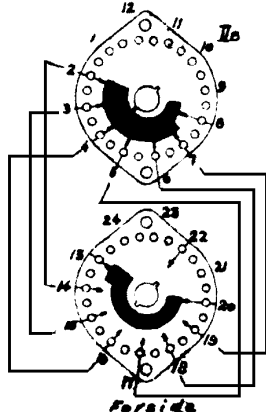
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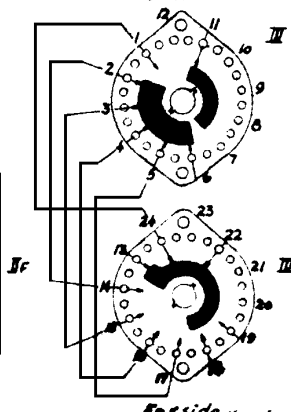
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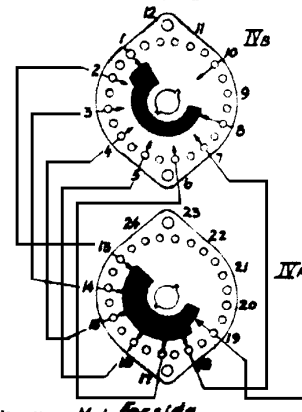
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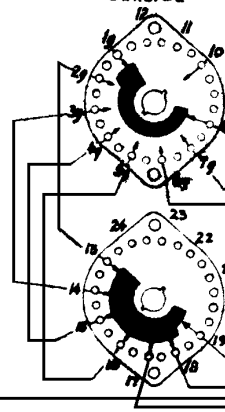
Seksjonspl. 3.
Baksida.



Seksjonspl. 4.
Baksida.



Seksjonspl. 5.
Baksida.



Forsida Vender stilling 14-24 M₀/s Forsida

