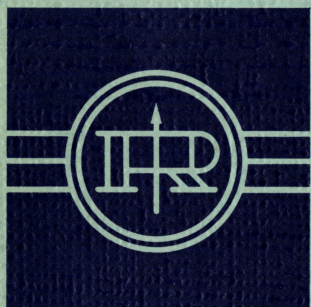


INSTRUCTION MANUAL

AF Millivoltmeter

type RV36 c

from serial No.164675



RADIOMETER

**ELECTRONIC MEASURING INSTRUMENTS
FOR SCIENTIFIC AND INDUSTRIAL USE**

**Instruction Manual
for**

**AF Millivoltmeter
type RV36 c**

from serial No.164675

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AF Millivoltmeter type RV36

Section A. Introduction

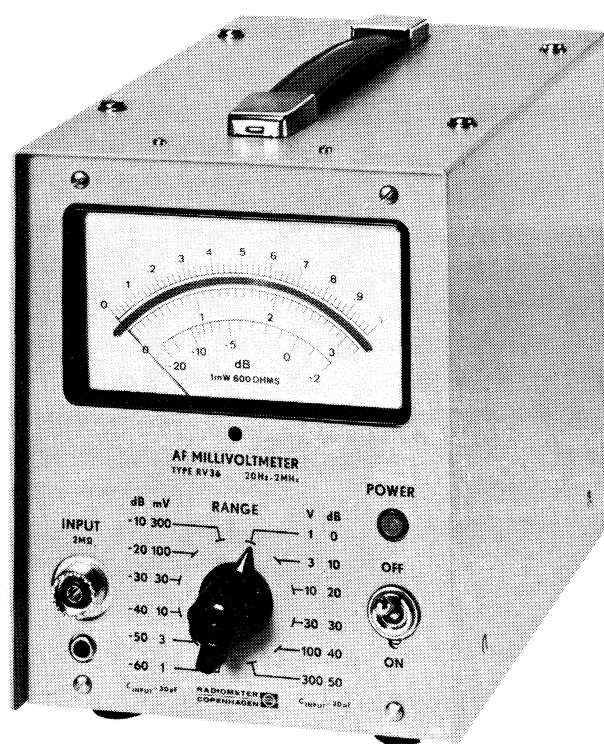


Fig.1. The AF Millivoltmeter, type RV36

The AF Millivoltmeter, type RV36, is a solid-state, line operated, instrument with complete overload protection. Owing to its high measuring-stability, this millivoltmeter is ideal for laboratory and electronic shop work.

Its main features are wide voltage and frequency ranges - from 1 mV to 300 V f.s. and from 20 Hz to 2 MHz, respectively. The input impedance is nominally 2 MΩ at low frequencies in parallel with 30 pF in the millivolt ranges and with 20 pF in the volt ranges.

The AF Millivoltmeter, type RV36, is also suitable for use as an amplifier with an ac

output voltage of 50 mV at full scale deflection on all ranges, and a dc output of 500 mV at full scale deflection on all ranges.

The mirror-backed meter with its two voltage scales from 0 to 1 and from 0 to 3, and its dB scale from -20 to +2 dB (0 dB = 1 mW in 600 Ω), has a knife-edge pointer which combines with fine-scale graduation to give accurate reading, free from parallax. The AF Millivoltmeter, type RV36, reads the rms value of a sine wave, but responds to the average value of the applied voltage.

It is provided with two ordinary banana jacks for connection of an external 52-70 V battery.

Section B. Specifications

VOLTAGE RANGES:

1 mV to 300 V f.s.d. in a 1-3-10 sequence.

TOTAL dB RANGES:

From -80 to 52 dB in 10 steps. (0 dB = 1 mW in 600 Ω)

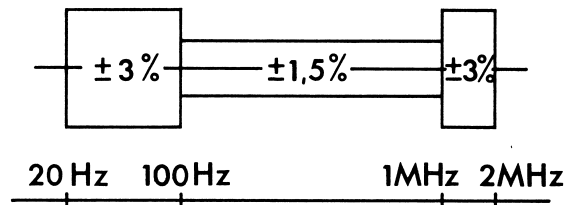
FREQUENCY RANGE:

20 Hz to 2 MHz

ACCURACY

AT 1/1 DEFLECTION

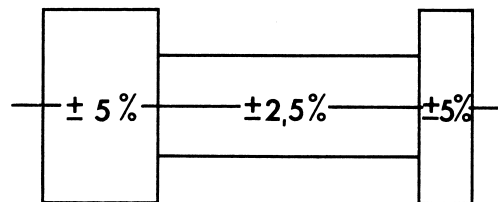
(inclusive of errors due to line voltage variations of $\pm 10\%$)



ACCURACY

AT 1/3 DEFLECTION

(inclusive of errors due to line voltage variations of $\pm 10\%$)



METER:

The Meter reads the rms value of a sine wave, but responds to the average value of the applied voltage

Two linear mirror-backed voltage scales 0 to 1 and 0 to 3

One dB scale -20 to +2 dB. (0 dB = 1 mW in 600 Ω)

Scale length: 100 mm

INPUT IMPEDANCE:

Capacity: 30 pF in the mV ranges, and 20 pF in the V-ranges.

Resistance: nominally 2 M Ω at low frequencies

NOISE:

Approx. 50 μV at a source impedance of zero. Less than 200 μV at a source impedance of 100 k Ω . Both noise voltages are referred to the input.

OVERLOAD PROTECTION:

Protected for inputs up to 500 V rms on all V-ranges, and up to 100 V rms on all mV-ranges.

The dc voltage plus the ac peak voltage must not exceed 700 V on all V ranges, and 250 V on all mV ranges.

AMPLIFIER OUTPUT:

Output voltage: 50 mV \pm 4% at full scale deflection on all ranges.
 Frequency response: within \pm 3% from 20 Hz to 2 MHz.
 Output impedance: 600 Ω .

DC OUTPUT:

Output voltage: 500 mV \pm 4% at full scale deflection on all ranges.
 Output impedance: 100 k Ω .

POWER SUPPLY:

Voltages: 110, 115, 127, 200, 220, and 240 V.
 Line frequency: 50 to 60 Hz.
 Consumption: 3.5 VA.

External battery can be connected through two 4 mm banana jacks.

Battery voltage: 52 to 70 V.
 Current consumption: approx. 26 mA.

TERMINALS:

The voltage INPUT and amplifier AC OUTPUT are UHF coaxial sockets, type SO-239, which also accommodate ordinary 4 mm plugs.

DC OUTPUT and BATTERY input terminals are ordinary 4 mm banana jacks.

DIMENSIONS AND WEIGHT:

Height	Width	Depth	Weight
194	143	266 mm	3.5 kilos
7.7	5.7	10.6 inches	8 lbs

Section C. General Description

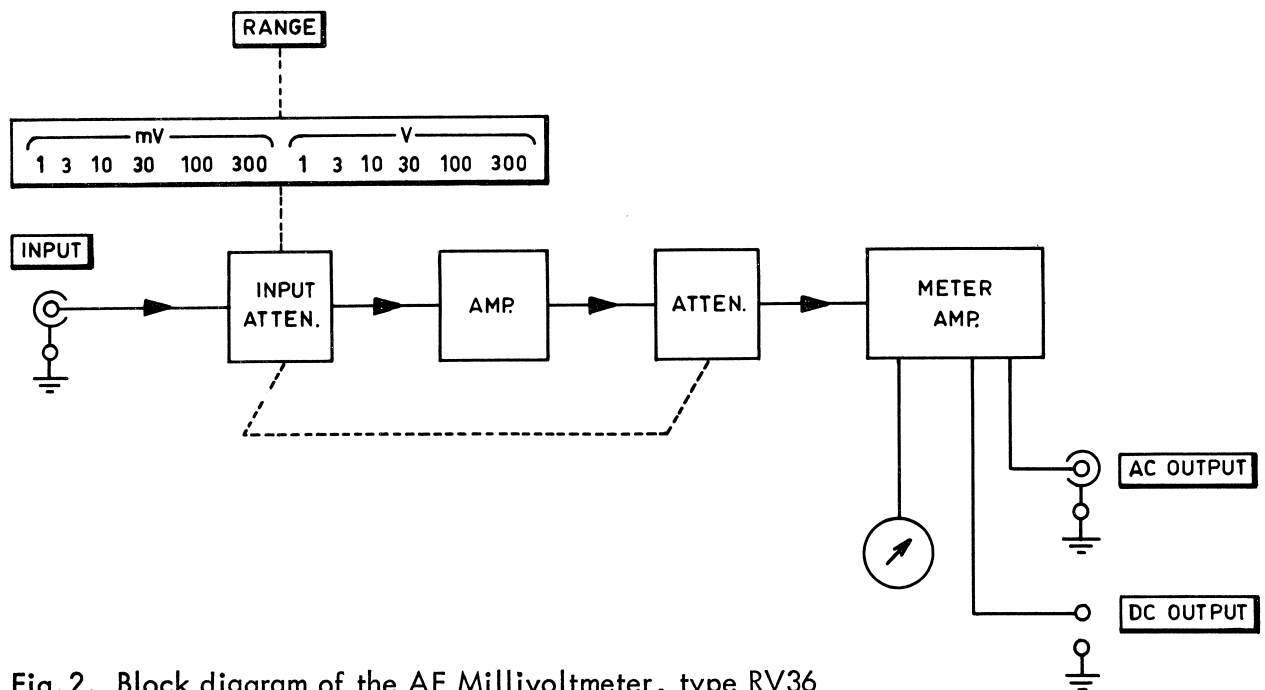


Fig.2. Block diagram of the AF Millivoltmeter, type RV36

The principle of operation is indicated in the block diagram shown in Fig.2.

The AF Millivoltmeter, type RV36, consists of an input attenuator-stage with 0 dB attenuation in the millivolt ranges, 40 dB and 60 dB attenuation in the 1, 10 V and 30, 300 V ranges, respectively, followed by a final 4-stage meter amplifier providing for ac and dc outputs.

CONTROLS, TERMINALS AND METER

As shown in Fig.3, the AF Millivoltmeter,

type RV36, is equipped with the following controls, terminals and meter:

Power Switch ON/OFF (1) and Pilot Lamp (POWER) (2)

Power switch and pilot lamp are located on the front panel.

Voltage Range Selector (3)

The voltage **RANGE** selector switches from 1 mV to 300 V full scale deflection in a 1-3-10 sequence, or from -60 dB (0 dB = 1 mW

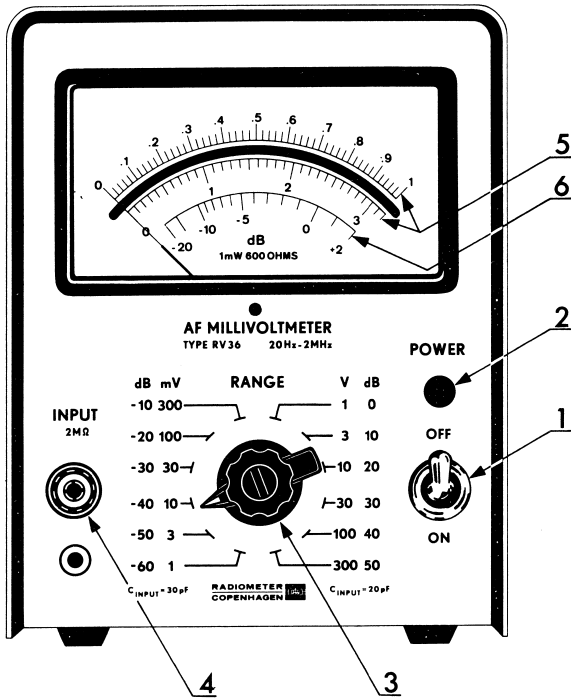


Fig.3. Front plate of the AF Millivoltmeter, type RV36

in 600Ω) to 50 dB full scale deflection in 10 dB steps.

Terminals

Both the voltage INPUT (4) and the amplifier AC OUTPUT (see Fig.4) terminals are UHF coaxial sockets, and accept regular 4 mm banana plugs. The DC OUTPUT (see Fig.4) and the battery input are 4 mm banana jacks.

Power Cord, Fuse and Voltage Indicator

As seen in Fig.4, the power cord, fuse and voltage indicator are all located on the rear of the instrument.

Battery

The AF Millivoltmeter, type RV36, can

be battery-operated, and two input BATTERY jacks for a 52 - 70 V battery are provided on the rear of the instrument.

Meter

The meter is equipped with a mirror-backed scale and a knife-edge pointer providing for accurate reading, free from parallax. It has three scales, the two upper (5), graduated from 0 to 1 and 0 to 3, being used for voltage measurements, the indication being rms millivolts or volts. The lower scale (6) is used for dB-measurements and is graduated in decibels from -20 to +2.

The mechanical zero-setting screw is located right below the meter.

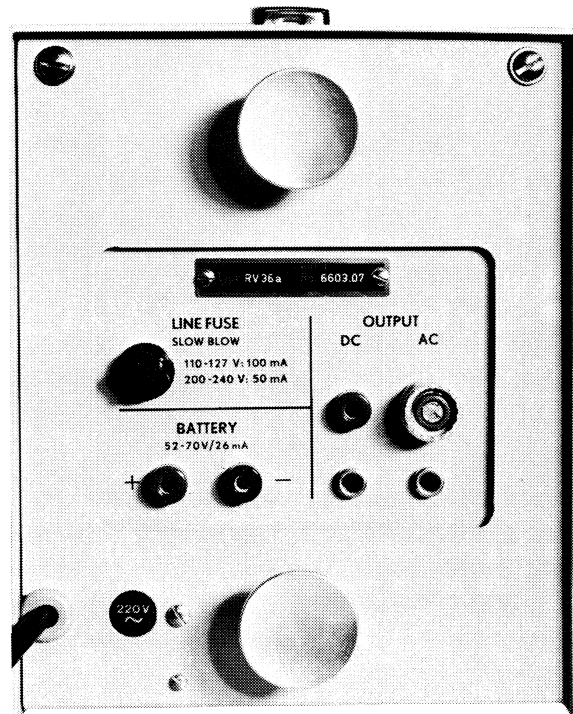


Fig.4. Rear view of the AF Millivoltmeter, type RV36

Section D. Operating Instructions

ZERO ADJUSTMENT

Zero adjustment is seldom required, but may be necessary after long usage, or following transportation. Before making this adjustment, the power switch should be thrown to OFF and the instrument placed in its normal operating position.

PREPARING THE AF MILLIVOLTMETER, TYPE RV36

Check that the instrument is correctly switched to the line voltage as indicated by the plate on the rear of the cabinet.

The AF Millivoltmeter, type RV36, is set at 220 V (unless otherwise specified) when leaving the factory and is furnished with 2 fuses. Change the fuse when switching from 200 - 240 V to 110 - 127 V operation and conversely. Slow-blow fuses, 0.05 A for 200 - 240 V operation, and 0.1 A for 110 - 127 V operation, must be inserted.

Reading of another line voltage on the Voltage Indicator is made possible by loosening the screw located on the right-hand side of it, unscrewing completely the lower screw and rotating the disc.

Connect the supply transformer to other lugs, as follows, when switching to another line voltage:

1. Remove the cabinet.
2. Remove the cable from tap No. 6 (220 V) on the power transformer.

3. Resolder the cable to the appropriate solder lug of the transformer, according to the table below:

Lug No.	Line Voltage
2	110 V
3	115 V
4	127 V
5	200 V
6	220 V
7	240 V

After having checked the fuse and the supply transformer, connect the instrument to the line and switch on.

USING THE RV36 AS A MILLIVOLTMETER

1) Connect the object under test to the input terminals of the AF Millivoltmeter.

2) Select the desired measuring range.

3) Read the value of the unknown voltage directly on the meter. The voltage range selected determines the full scale deflection value of the meter. When measuring dB, the selected range indicates the full-scale deflection value, 0 dB being the reference point.

USING THE RV36 AS AN AMPLIFIER

1) Connect the voltage source to the input terminals of the AF Millivoltmeter.

2) Select the desired measuring range.

3) The output voltage is proportional to the input voltage, but of max. 50 mV ac or 500 mV dc for full scale deflection on all ranges.

Section E. Circuit Description

The input signal is fed via the input attenuator S1, giving no attenuation in the millivolt ranges and 40 dB and 60 dB in the 1-10 V and 30-300 V ranges, respectively. The input attenuator is followed by a two-stage, bootstrapped amplifier Q101 and Q102. This stage provides for impedance conversion. The system Q101-Q102 is protected against overload by CR101 and CR102. From the collector of Q102, the signal is fed to a current divider

and then to the final four-stage output amplifier Q103 - Q104 - Q105 - Q106, with negative overall feedback, thus providing for high stability. The rectifying elements and the meter are in the feedback loop. The meter amplifier is provided with ac and dc outputs.

The power supply is a regulated power supply, with provision for battery operation from a 52-70 V battery having a current consumption of about 26 mA.

Section F. Parts List

In the following parts list a group code prefix number is used. To facilitate the use of this code, the different types of parts and their corresponding group code prefixes are listed below:

Standard resistors	100- to 139-
Precision resistors	140- to 152-
Non-linear resistors	160-
UHF resistors	170- to 172-
Carbon potentiometers	180- to 185-
Wire-wound potentiometers	190- to 195-
Mica capacitors	200- to 208-
Ceramic capacitors	210- to 214-
Paper capacitors	220- to 222-
Metal-paper capacitors	224- to 229-
Plastic capacitors	240- to 245-
Electrolytic capacitors	260- to 267-
Variable capacitors	280- to 286-
Rectifiers	340- to 341-
Diodes	350-
Transistors	360-
Integrated circuits	364-
Switches	500- to 580-
Coils, coil material and transformers	700- to 785-

As we are continually improving our instruments, it is important, when ordering spare parts, that you include the following information:

- The code number and description of the part
- The circuit reference from the wiring diagram
- The complete type designation of your instrument
- The serial number of your instrument.

Please note that the position of any part can easily be found by referring to the last column of the parts list. This indicates on which figure the part can be located.

^xIndicates that the component is made by Radiometer.

CAPACITORS

Designation	Type	Value	Code No.	Shown in Fig.
C1	polystyrene	500 pF 5% 500 V	243-008	
C2	polystyrene	4.7 nF 5% 63 V	243-021	
C3	trimmer	6.4 pF	285-001	
C4	trimmer	6.4 pF	285-001	
C5	ceramic	2.2 nF -20/+80% 25 V	213-012	
C7	ceramic	0.1 μ F 30 V	213-009	
C101	polyester	2.2 μ F 10% 250 V	241-011	5
C102	tantalum	10 μ F 15/18 V	267-000	5
C103	ceramic	6.8 pF 10%	211-168	5
C104	electrolytic	250 μ F 3/4 V	260-002	5
C105	ceramic	20 nF 35 V	213-011	5
C106	electrolytic	100 μ F 35/40 V	261-024	5
C107	ceramic	0.1 μ F 30 V	213-009	5
C109	ceramic	1.5 pF 10%	211-115	5
C110	trimmer	6.4 pF	285-010	5
C111	tantalum	100 μ F \pm 10% 10 V	266-017	5
C112	electrolytic	100 μ F -20/+30% 15 V	260-039	5
C113	ceramic	4.7 nF 65 V	213-010	5
C114	electrolytic	50 μ F -20/+30% 15 V	260-040	5
C115	ceramic	0.1 μ F 30 V	213-009	5
C116	electrolytic	1000 μ F 6/8 V	261-001	5
C117	ceramic	22 pF 5%	211-222	5
C118	tantalum	20 μ F 6/8 V	267-001	5
C119	tantalum	100 μ F \pm 20% 20 V	266-015	5
C120	electrolytic	100 μ F 6 V	260-041	5
C121	ceramic	0.1 μ F 30 V	213-009	5
C122	ceramic	0.1 μ F 30 V	213-009	5
C123	ceramic	0.1 μ F 30 V	213-009	5
C124	electrolytic	250 μ F 3/4 V	260-002	5
C201	electrolytic	250 μ F 35/40 V	261-041	6
C202	electrolytic	100 μ F 35/40 V	261-024	6
C203	electrolytic	250 μ F 70/80 V	261-042	6
C204	ceramic	0.1 μ F 30 V	213-009	6

DIODES

Designation	Type	Code No.	Shown in Fig.
CR101	diode 1N916	350-019	5
CR102	diode 1N916	350-019	5
CR103	zener diode BZY88/C7V5	350-621	5
CR104	zener diode BZY88/C8V2	350-607	5
CR105	diode HD5004	350-017	5
CR106	diode HD5004	350-017	5
CR107	diode OA73	350-006	5
CR201	zener diode BZY88/C7V5	350-621	6
CR202	zener diode BZY88/C7V5	350-621	6
CR203	rectifier B80/C400	340-201	6
CR204	diode BYX10	350-412	6
CR205	diode BAX16	350-023	6

TERMINALS

Designation	Type	Code No.
J1	coaxial bushing, UHF	800-009
J2	phone jack	803-241
J3	coaxial bushing, UHF	800-009
J4	phone jack	803-241
J5	phone jack, red	803-206
J6	phone jack	803-241
J7	phone jack, red	803-206
J8	phone jack, black	803-205

COIL

Designation	Type	Code No.	Shown in Fig.
x L101	coil, 56 nH	4131-A4	5

TRANSISTORS

Designation	Type	Code No.	Shown in Fig.
Q101	2N3906	360-062	5
Q102	2N918	360-059	5
Q103	2N930	360-038	5
Q104	2N3906	360-062	5
Q105	2N3906	360-062	5
Q106	2N918	360-059	5
Q201	2N3904	360-064	6
Q202	2N3906	360-062	6
Q203	2N3904	360-064	6
Q204	2N3906	360-062	6
Q205	2N3906	360-062	6
Q206	2N3906	360-062	6

RESISTORS

Designation	Type	Value	Code No.	Shown in Fig.
R1	carbon film	3.9 M Ω 5% 0.5 W	100-739	
R2	metal film	20.34 k Ω \pm 0.1% 1/4 W	140-549	
R3	metal film	2.003 k Ω \pm 0.1% 1/4 W	140-547	
R4	metal film	2 M Ω 0.2% 1 W	140-421	
R5	metal film	2 M Ω 0.2% 1 W	140-421	
R6	metal film	122.6 Ω 0.5% 1/4 W	140-329	
R7	metal film	33.7 Ω 0.5% 1/4 W	140-328	
R8	metal film	10.23 Ω 0.5% 1/4 W	140-327	
R9	metal film	3.2 Ω 0.5% 1/4 W	140-325	
R10	metal film	22 k Ω 0.5% 1/4 W	140-335	
R11	metal film	1 k Ω 0.5% 1/4 W	140-115	
R12	metal film	732 Ω 0.5% 1/4 W	140-330	
R101	carbon film	1 k Ω 5% 0.2 W	106-410	5
R102	carbon film	4.7 k Ω 5% 0.2 W	106-447	5
R103	carbon film	68 k Ω 5% 0.2 W	106-568	5
R104	carbon film	220 k Ω 5% 0.2 W	106-622	5

R105	carbon film	33 k Ω 5% 0.2 W	106-533	5
R106	carbon film	56 k Ω 5% 0.2 W	106-556	5
R107	carbon film	10 k Ω 5% 0.2 W	106-510	5
R108	metal film	10 k Ω 1% 1/4 W	140-340	5
R109	metal film	1.5 k Ω 0.5% 1/4 W	140-332	5
R110	carbon film	1 k Ω 5% 0.2 W	106-410	5
R111	carbon film	100 Ω 5% 0.2 W	106-310	5
R112	metal film	8.66 k Ω 1% 0.1 W	140-370	5
R113	carbon film	6.8 k Ω 5% 0.2 W	106-468	5
R114	carbon film	10 k Ω 5% 0.2 W	106-510	5
R115	carbon film	39 k Ω 5% 0.2 W	106-539	5
R116	carbon film	27 k Ω 5% 0.2 W	106-527	5
R117	carbon pot., lin.	2 k Ω 20% 0.1 W	182-012	5
R118	carbon film	4.7 k Ω 5% 0.2 W	106-447	5
R119	carbon film	5.6 k Ω 5% 0.2 W	106-456	5
R120	carbon film	12 k Ω 5% 0.2 W	106-512	5
R121	carbon film	2.2 k Ω 5% 0.2 W	106-422	5
R122	carbon film	150 Ω 5% 0.2 W	106-315	5
R123	carbon film	120 Ω 5% 0.2 W	106-312	5
R124	carbon film	5.6 k Ω 5% 0.2 W	106-456	5
R125	carbon film	10 Ω 5% 0.2 W	106-210	5
R126	carbon pot., lin.	100 Ω	182-004	5
R127	carbon film	3.3 k Ω 5% 0.2 W	106-433	5
R128	carbon pot., lin.	1 k Ω	182-001	5
R129	metal film	5.6 Ω 0.5% 1/4 W	140-326	5
R130	carbon film	820 Ω 5% 0.2 W	106-382	5
R131	metal film	1164 Ω \pm 1% 0.2 W	140-546	5
R132	metal film	6120 Ω \pm 1% 0.2 W	140-548	5
R133	metal film	680 Ω 0.5% 1/4 W	140-316	5
R134	carbon film	100 k Ω 5% 0.2 W	106-610	5
R201	carbon film	330 Ω 5% 0.2 W	106-333	6
R202	carbon film	3.9 k Ω 5% 0.2 W	106-439	6
R203	carbon film	330 Ω 5% 0.2 W	106-333	6
R204	carbon film	12 k Ω 5% 0.2 W	106-512	6
R205	metal film	9.1 k Ω 1% 1/4 W	140-321	6

F6

R206	carbon film	3.9 k Ω 5% 0.2 W	106-439	6
R207	carbon pot., lin.	1 k Ω	182-001	6
R208	carbon film	4.7 k Ω 5% 0.2 W	106-447	6
R209	carbon film	6.8 k Ω 5% 0.2 W	106-468	6
R210	carbon film	10 k Ω 5% 0.2 W	106-510	6
R211	carbon film	1 k Ω 5% 0.2 W	106-410	6
R212	carbon film	180 Ω 5% 0.2 W	106-318	6
R213	carbon ilm	1.5 k Ω 5% 0.2 W	100-415	6
R214	carbon film	1.8 k Ω 5% 0.2 W	106-418	6

MISCELLANEOUS

Designation	Type	Code No.
F1	fuse, 50 mA (200-240 V)	450-007
	fuse, 100 mA (110-127 V)	450-010
I1	lamp, 110 V, SCF9C	400-801
M1	meter, 0.5 mA, with scale	482-133
S1	switch "RANGE"	550-949
S2	main switch	500-102
T1	power transformer	770-588
W1	power cable	615-005

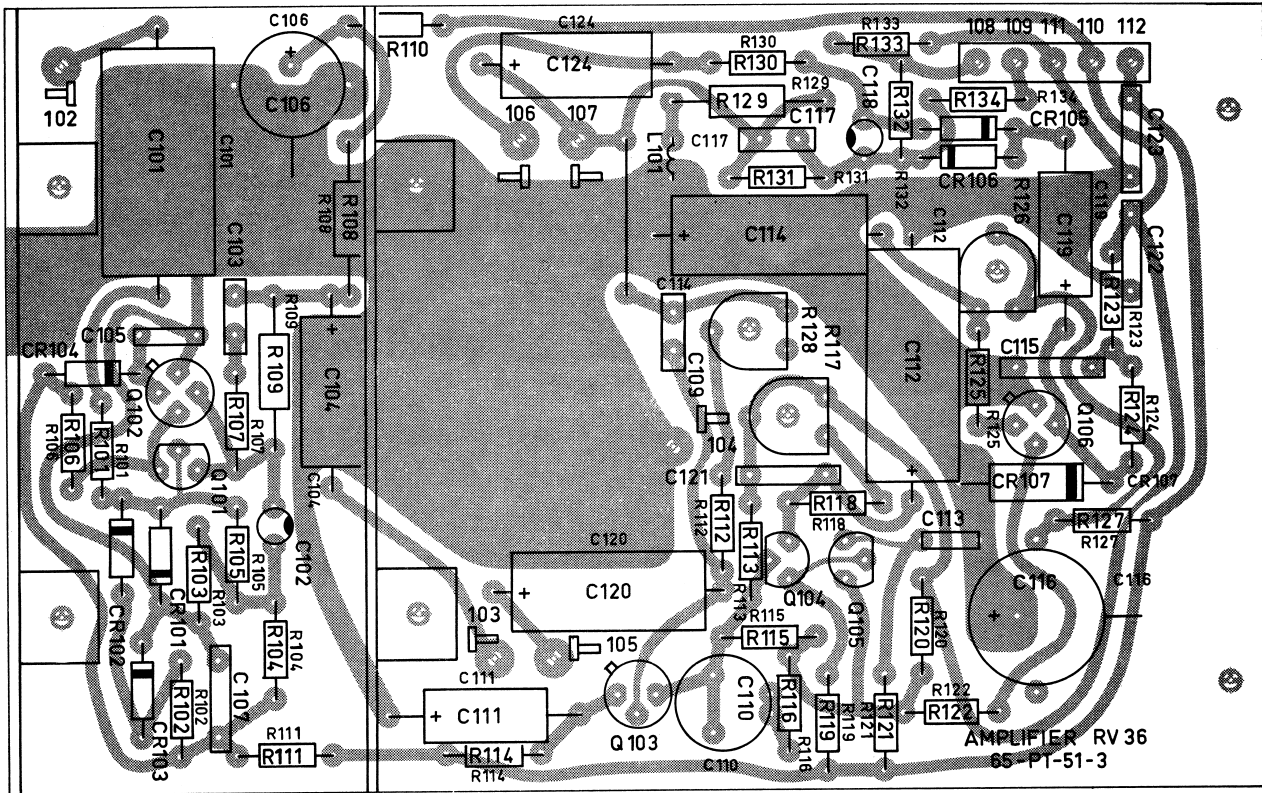


Fig. 5.

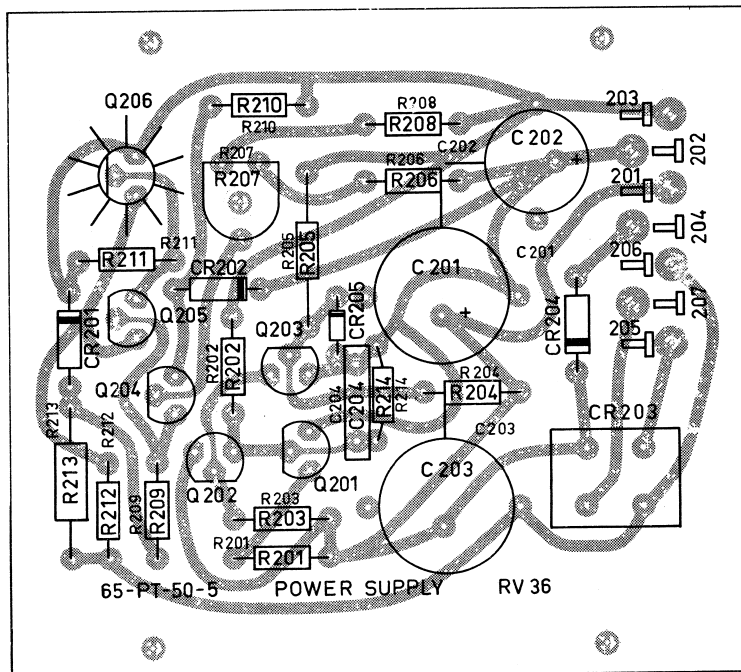
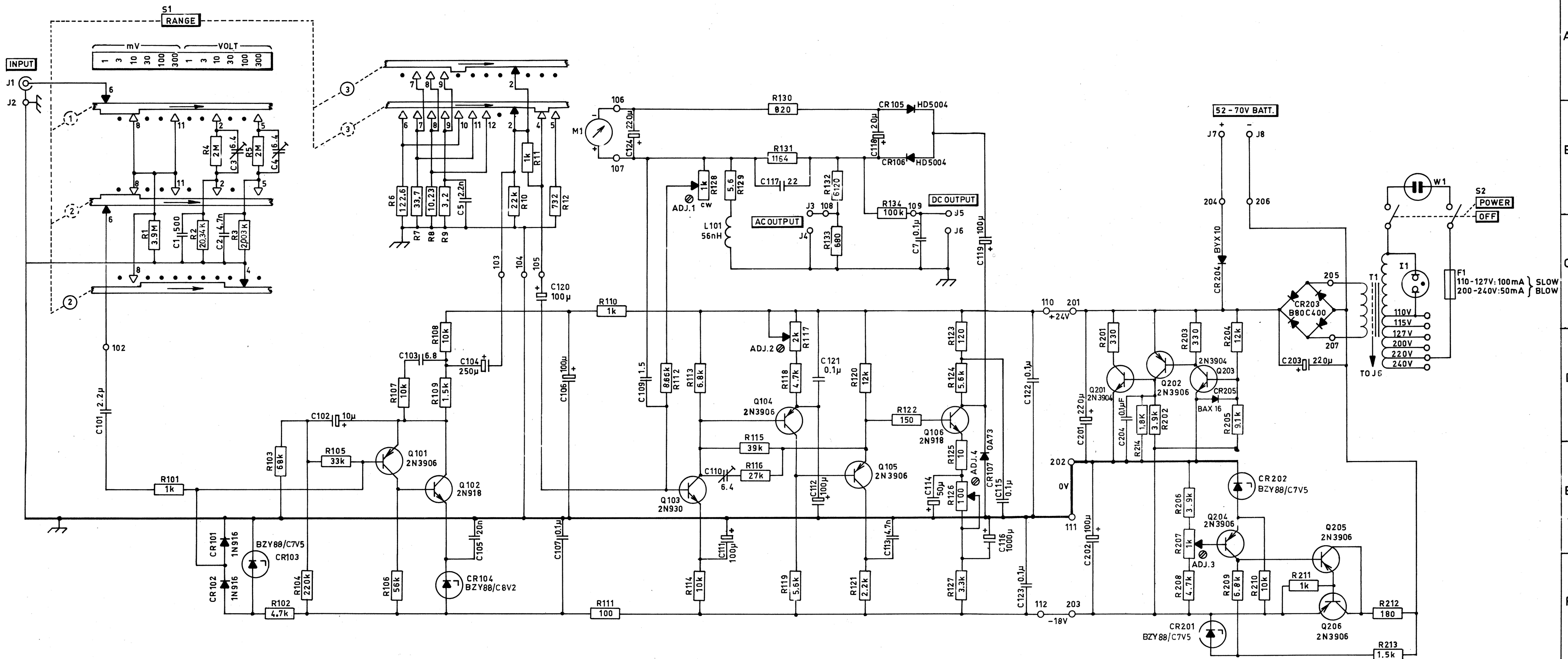


Fig. 6.



VALUES IN pF OR Ω IF NOT OTHERWISE SPECIFIED
 cw: CLOCKWISE POSITION
 101: PRINT TERMINAL

				RADIOETER COPENHAGEN		178721 4.2.71. Bg		PK	
				72 EMDRUPVEJ NV		149550 13-2-69 Je		DU	
				AF-MILLIVOLTMETER		127421 16-4-68 SHM		QU	
				TYPE RV 36c		1179-A1			
				From no. 123893					