Bang & Olufsen

Instruktion

VOLTMETER
RV 11

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INTRODUCTION

The Bang & Olufsen RV11 Multimeter is a modern, versatile instrument for measurement of AC and DC voltages as well as ohmic resistance.
The RV11 may be used in a multitude of measurement applications in electronic service shops and professional laboratories because of its wide range of capabilities. In additions to voltage and resistance measurement capability, the intrument may be used to measure many other parameters such as temperature, frequency, RF voltage current and magnetic flux with the aid of probe adapters. All this means that the RV11 will come to be the most utilized instrument in the service shop and laboratory. The RV11 will soon come to replace an entire spectrum of expensive measurement instruments.

Full-scale AC and DC voltage measurements ranging from 3 mV to 1000 V may be made and the instrument has built in protection against excessive input-terminal voltage.
Ohmic resistance measurement is based upon the constant-current principle; this results in a linear scale graduation. However, resistance in the higest range is measured based on the traditional variable current - variable voltage method. Here the scale graduations is logarithmic.
The chassis of the instrument may be earth-grounded, when required, with the aid of a slider-swithch, mounted onto the rear panel of the instrument.

TECHNICAL DATA

DC VOLTMETER

Voltage range	0.2 mV .... 1000 V in 12 ranges.
Full-scale deflection for	3.16 mV, 10 mV, 31.6 mV, 100 mV, 316 mV, 1 V, 3.16 V, 10 V, 31.6 V, 100 V, 316 V and 1000 V.
Scales	0 .... 3.16 and 0 .... 10.
Accuracy	±3% F.S.D.
Input resistance	10 Mohms.
Polarity indication	Automatic polarity indication at >5% F.S.D.

AC VOLTMETER

	Mean value but calibrated in RMS value.
Voltage range	0.2 mV .... 1000 V, in 12 ranges.
Full-scale deflection for	3.16 mV, 10 mV, 31.6 mV, 100 mV, 316 mV, 1 V 3.16 V, 10 V, 31.6 V, 100 V, 316 V and 1000 V.
dB range	(0 dB = 1 V) -80 dB .... +60 dB, in 12 ranges.
Full-scale deflection for	—50 dB, —40 dB, —30 dB, —20 dB, —10 dB, 0 dB, +10 dB, +20 dB, +30 dB, +40 dB, +50 dB and +60 dB.
Scales	0 .... 3.16, 0 .... 10 and -30 .... 0 (dB).
Accuracy	±3% (±3 dB) F.S.D.

Input impedance

V - ranges	1 Mohm ±1%//35 pF.
mV - ranges	1 Mohm ±1%//60 pF.

OHM-METER

	Measurements based upon the constant-current principle in all ranges with the exception of the »Mohms« range.
Resistance range	0.2 ohm .... 50 Mohm in 13 ranges.
Full-scale deflection for	3.16 ohms, 10 ohms, 31.6 ohms 100 ohms, 1000 ohms, 3.16 kohms, 10 kohms, 31.6 kohms, 100 kohms, 316 kohms, 10,000 kohms and 0.1 .... 50 Mohms (nonlinear range).

Accuracy

Linear ranges	±3% F.S.D.
Mohms range	±5% at 1 Mohm.

Circuit current	
Ohms ranges	1 mA
Kohms ranges	1 µA
Mohms range	0 .... 1 µA
PROBE INPUT	5 pole DIN
Voltage range	
DC	3.16 mV .... 1000 mV, full-scale.
AC	3.16 mV .... 1000 V, full-scale.
Input impedance	
DC	<300 Mohm.
AC, V-ranges	1 Mohm//35 pF.
AC, mV-ranges	1 Mohm//60 pF.
Power supply (for active probes)	+15 V 30 mA/ -15 V 30 mA.
Protection against excessive voltage	Protected against excessive voltage in all ranges with the exception of the ohms-ranges.
Spark gap	1600 V (DC + AC peak) ±10%.
Fuse (series conected in mains input)	20 mA medium slow.
Mains connection	110/220 V ±10%, 50 .... 400 Hz.
Power consumption	Approx. 2 VA.
Dimensions	Width: 163 mm Depth: 210 mm Height: 160 mm.
Weight	3.1 kg (6.8 lbs).
Surface finish	Silver-grey and grey enamel.
Accessories	1 instruction book, 1 set of leads.

Subject to change without notice.

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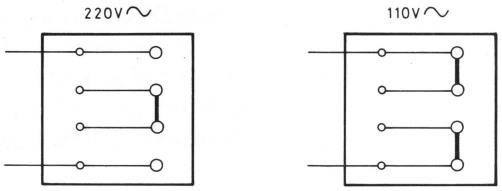
APPLICATION

The RV11 Multimeter may be connected to different mains voltages but is, however, factory wired for 220 V~. If 110 V~ mains voltage connection is desired, solder the jumper wires as shown in the drawing:



The mains cable is made up of the three conductors, affixed with a Schuko three-pole connector, designed for connection to a mains supplied with a protective ground. An ordinary mains receptacle may also be used.
Operation of the RV11 is presented in Figs. 1 and 2 and is divided into a functional section (to the right of the meter) and an attenuator section (lower-front on the panel). The functions of the RV11 are as follows.

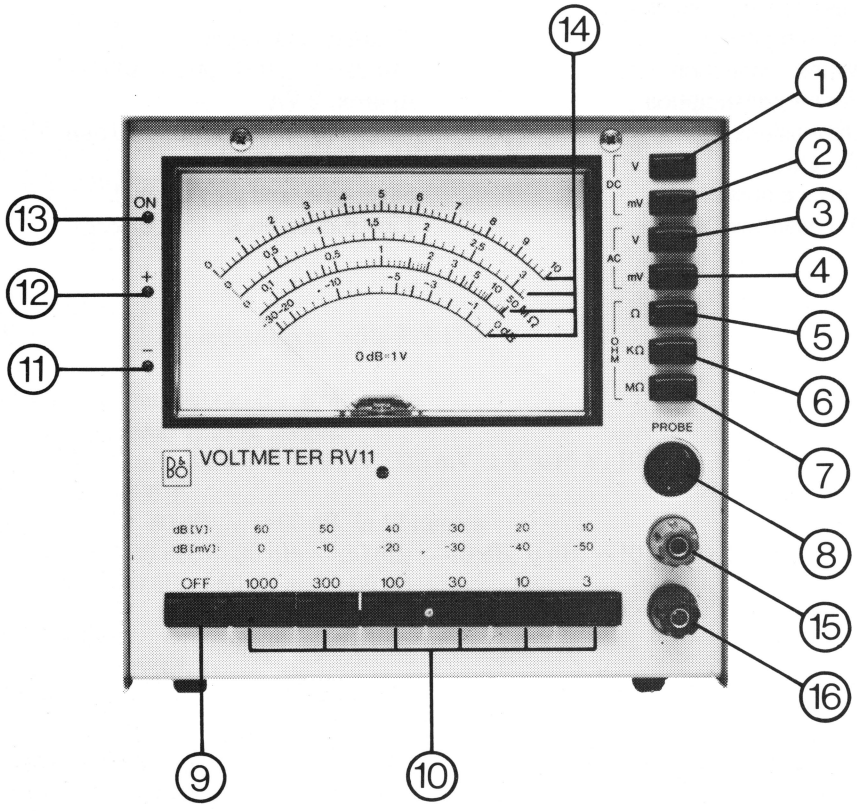


Fig. 1

1. Function-switch: DC, V (3 V - 1000 V).
2. Function-switch: DC, mV (3 mV - 1000 mV).
3. Function-switch: AC, V (3 V - 1000 V).
4. Function-switch: AC, mV (3 mV - 1000 mV).
5. Function-switch: ohms (3 ohms - 1000 ohms).
6. Function-switch: kohms (3 kohms - 1000 kohms).
7. Function-switch: Mohms (the 0.1 - 50 Mohm scale, only, is logarithmic here).
8. DIN connector for probe connection.
9. Mains on/off switch.
10. Attenuator panel that, in conjunction with the function switches, determines the scale selected from among: 3, 10, 30, 100, 300 and 1000.

11. Negative DC voltage indicator LED.
12. Positive DC voltage indicator LED.
13. Mains »ON« indicator LED.
14. Meter scale, **linear** for DC, V; DC, mV; AC, V; AC, mV; Ohms and kohms; - **logarithmic** for Mohms and dB indication.
15. »high« connecting terminal.
16. »low« connecting terminal.

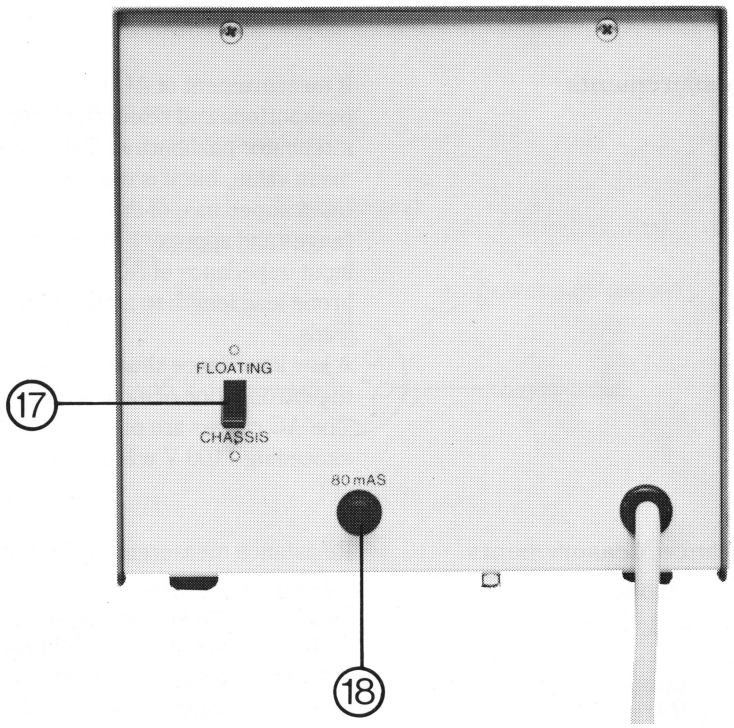


Fig. 2

17. Slider switch for selection between floating and chassis earth-ground.
18. Mains fuse. (The input protection fuse is found inside the instrument.)

When the RV11 is activated, the »ON« indicator (LED) will light and the instrument will operate in the function and range to which the attenuator and function selector are set.
The following is also valid for the different types of measurements:

DC Measurements

If measurement of DC voltage is desired, press in the DC, V or DC, mV pushbuttons and select the desired attenuator setting by pressing the relevant attenuator pushbuttons. If the voltage to be measured is with respect to chassis reference, place the rear panel slide switch in the »CHASSIS« position. If for example, voltage is to measured across a resistor connected in a working circuit, the rear panel slider switch may be placed to the »FLOATING« position.
Polarity of the DC voltage will be shown on the LED indicators at the left of the meter, automatically. Measurement of zero or minimum points, such as those made in conjunction with discriminator adjustment or offset adjustment in operational amplifiers is greatly facilitated by the ± indicators since optimum adjustment is found at the point where both LED indicators go out and where a minimum reading on the meter occurs.

DC input impedance is 10 Mohms and the automatic ± indication will already go into operation at <5% of full scale. The RV11 is protected against excessive voltage such that DC voltages greater than approx. 1600 V will be bypassed to ground. (This is valid for DC + AC peak value, too).

If a DC voltage under measurement is superimposed with RF (frequencies in excess of 1 MHz), the instrument may show a false reading. To avoid this eventuality, a bypass capacitor should be connected directly across input terminals as shown in Fig. 3. A series resistor should also be used.

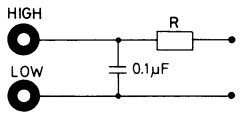


Fig. 3

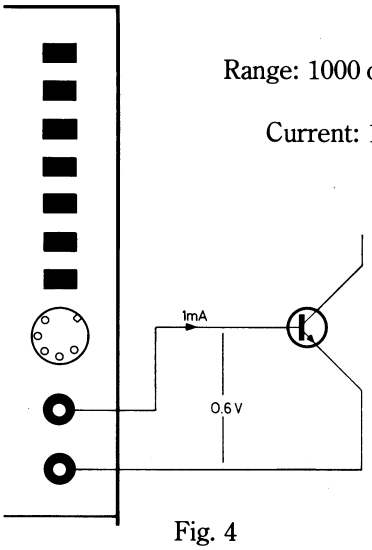
AC Measurements

If measurement of AC voltage is desired, press in the AC, V or AC, mV pushbuttons and select the desired attentuator setting by pressing the relevant attenuator pushbutton. Take note of the fact that the AC voltmeter measures mean value, but it is calibrated in sinusoidal effective value.
Input impedance of the AC voltmeter is approx. 1 Mohm//35 pF in the V ranges and approx. 1 Mohm//60 pF in the mV ranges. Because of the high input impedance of AC measurements, special effort should be made to hold probe lead length to a minimum so as to hinder the induction of AC in the probe leads.
A low impedance shunt should be connected across the input terminals to avoid the introduction of induced AC.
The AC ranges are protected against excessive voltage in that voltages exceeding 1100 V will be bypassed to chassis.

Resistance Measurements

Resistance measurement with the RV11 Multimeter may be divided into two categories, namely:
1. Measurement in the ohms and kohms ranges.
2. Measurement in the Mohms range.

If measurement of a resistance in the ohms of kohms range is desired, one of these two ranges is chosen and the attenuator is set to the desired range.
Resistance measurement is based upon the constant current principle, i.e., current through the object under measurement will remain constant.
The advantage of this method of measurement lies in the fact that the meter scales are linear and the same scales can thereby be used for voltage measurements as well. Current in the ohms range is 1 mA; in the kohms range, 1 µA.
NOTE! This measurement method results in the meter »pinning« at the low end when no load is placed across the input terminals!
If, for example, a semiconductor is to be measured, constant current, in an open base-to-emitter measurement, (silicum) will show a resistance of approx. 600 ohms if measured in the ohms range since the voltage drop across the semiconductor will be approx. 0.6 V (see Fig. 4).
Measurement of base-emitter path:



Range: 1000 ohms

Current: 1 mA

The meter will indicate:

$$\frac{0.6\ \text{V}}{1\text{mA}} = 600\ \text{ohms}$$

Fig. 4

Resistance measurement in the Mohms rangs is carried out based upon the traditional method and here, current varies from 0 to 1 μA

Probe Input

The probe input on the front panel of the instrument is designed to accept a frequency probe, temperature probe, RF probe and other probe types, as well. A voltage is present at the probe connector for use with these different probe types. A switch is mounted into the probe connector; its function is to disconnect the remaining input terminals when a probe is to be used.
The different probes will function in the DC, mV and AC, V and AC, mV ranges, only.

DIN probe connector:

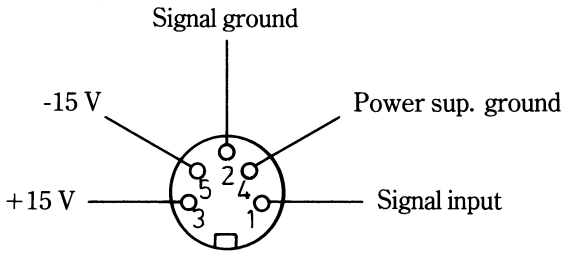


Fig. 5

Protection against excessive voltage

All DC and AC ranges are protected against excessive voltages and the instrument can not be destroyed by the presence of excessively high voltage at its input.
In the DC range, voltages in excess of 1600 V will short circuit to ground and in the AC range, the same will take place for voltages higher than 1100 V. A 20 mA fuse is connected in series with the input terminals to protect the instrument.
Therefore, check this fuse before sending the instrument to repair.
Note that the instrument is not protected in the ohms range, but will not be damaged if voltage at the input does not exceed 20 V.

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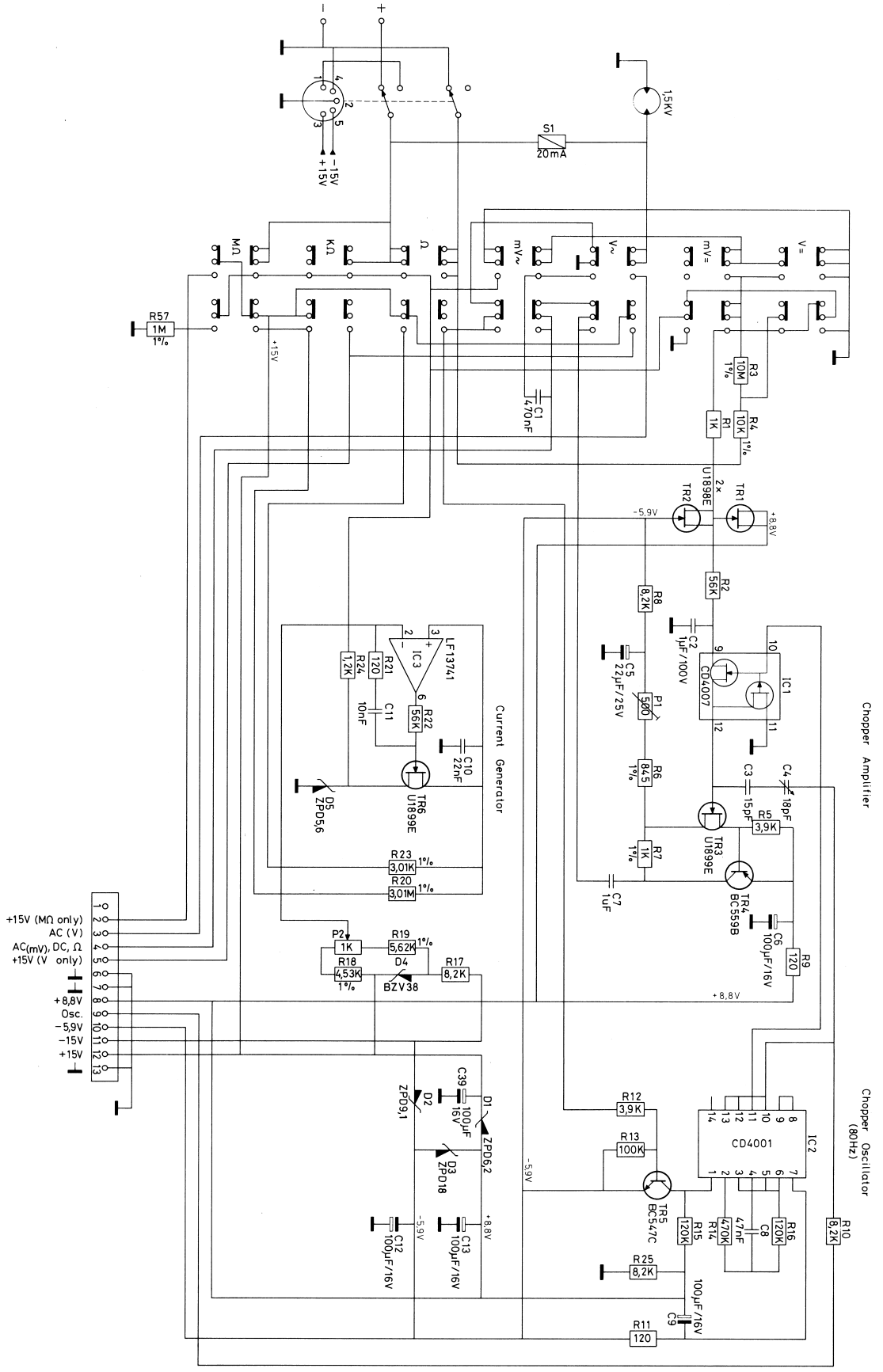
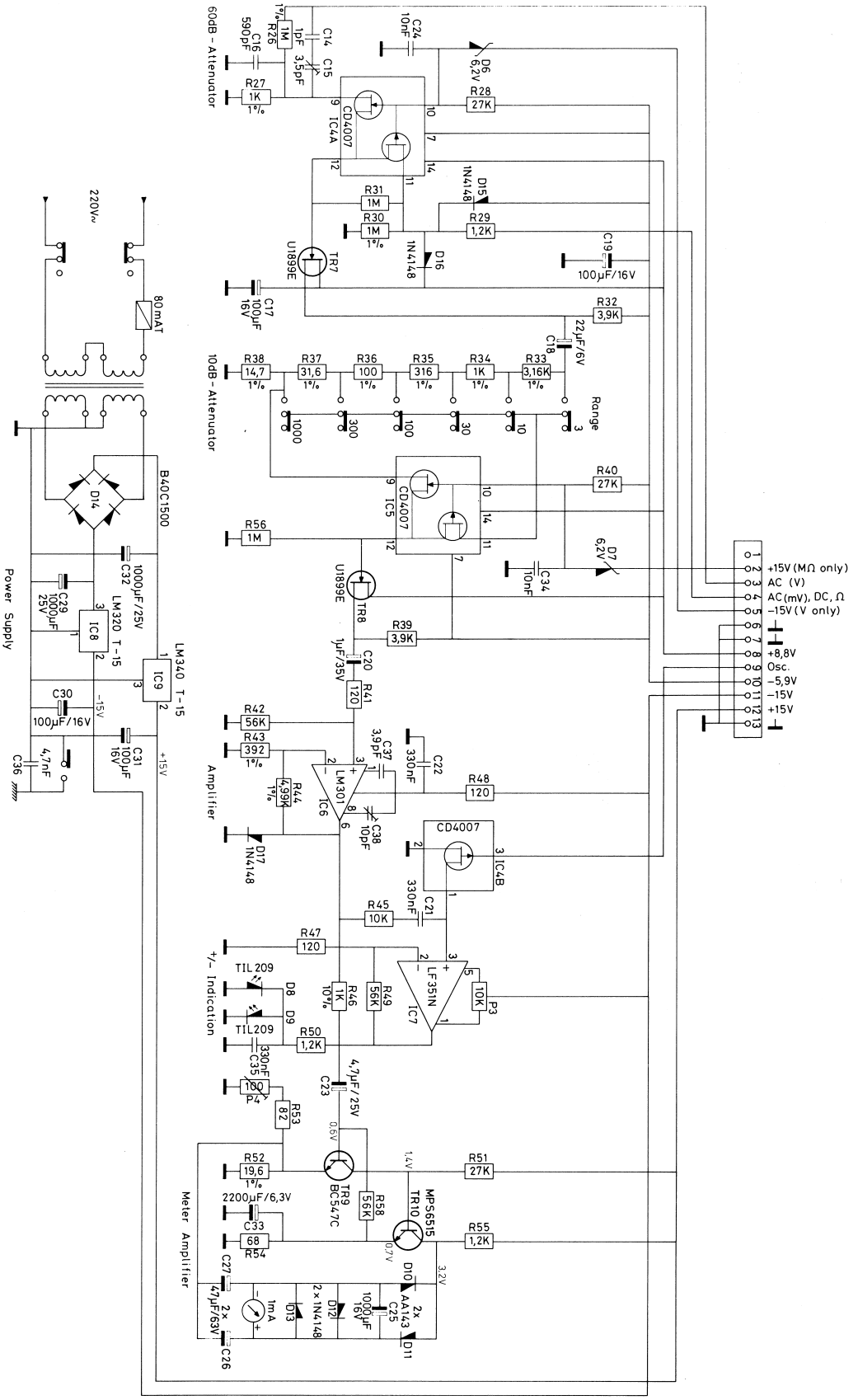
DIAGRAM




60dB - Attenuator
10dB - Attenuator
Range
Power Supply
Amplifier
+/- Indication
Meter Amplifier
220V~
80 mAT
B40C1500
LM320 T-15
LM340 T-15
LM301
LF351N
CD4007
BC547C
MPS6515
TIL 209
+15V (MΩ only)
AC (V)
AC(mV), DC, Ω
-15V (V only)
+8,8V
Osc.
-5,9V
-15V
+15V

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