INSTRUCTION MANUAL

Wideband Millivoltmeter
Type RV35e

RADIOMETER

ELECTRONIC MEASURING INSTRUMENTS
FOR SCIENTIFIC AND INDUSTRIAL USE

Instruction Manual
for

Wideband Millivoltmeter
Type RV35e

1. edition

Table of Contents

Wideband Millivoltmeter
Type RV35e

Section A. Introduction

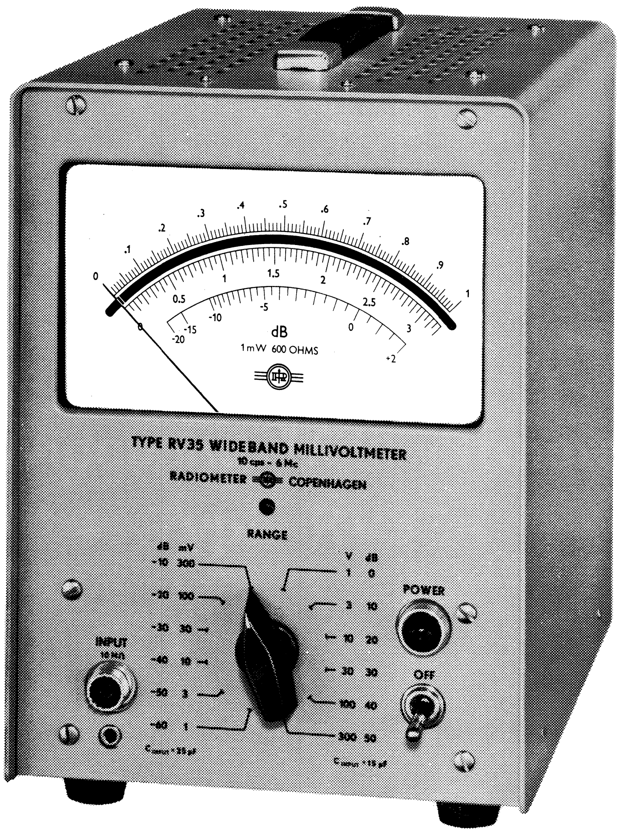


Fig.A1. The Wideband Millivoltmeter, type RV35.

The Wideband Millivoltmeter, type RV35, is a line-operated, sensitive, vacuum-tube millivoltmeter, with high measuring stability. It is therefore ideally suited as a general-purpose voltmeter for laboratory use.

The Wideband Millivoltmeter covers the voltage range from 1 mV to 300 V f.s.d. (-60 to +50 dB, ref. 1 mW in 600 Ω), in the frequency range from 10 Hz to 6 MHz, but can be used as an indicating meter up to 10 MHz. Its meter is provided with two mirror-backed scales from 0 to 1 and 0 to 3, as well as with a knife-edge pointer which combines with fine-scale graduation to give accurate reading. Furthermore, a dB scale from -20 dB to +2 dB in conjunction with the RANGE switch provides for dB readings.

The VTVM measures the average value of the applied voltage, but is calibrated in the rms value of a sinusoidal voltage.

The instrument is provided with a UHF-connector and a grounding jack as input terminal. The input impedance is 10 MΩ-25 pF on the millivolt range, and 10 MΩ-15 pF on the volt ranges, so that most measurements can be carried out with negligible loading of the measuring object.

The VTVM features an amplifier output. Used as an amplifier, the gain of the VTVM is 80 times in the millivolt range. Like the input terminal, the output terminal is provided with a UHF-connector and a grounding jack.

Section B. Specifications

VOLTAGE RANGES	1,3,10,30,100, and 300 millivolts; 1,3,10,30, 100, and 300 volts full scale. First scale division at 10 microvolts. Overload-protected against 500 volts. Max. dc voltage 400 volts.
FREQUENCY RANGE	10 Hz to 6 MHz. Usable as an indicating meter up to 10 MHz.
ACCURACY	(Inclusive of errors due to line voltage variations of: ±10% at frequencies up to 5 MHz ±5% at frequencies above 5 MHz) ±2% of full scale, 20 Hz to 3 MHz. ±3% of full scale, 3 MHz to 5 MHz. ±5% of full scale, 5 MHz to 6 MHz. and 10 Hz to 20 Hz.
CALIBRATION	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. Scale length 140 mm (5 1/2"). One dB scale -20 to +2 dB. (0 dB = 1 milliwatt in 600 ohms).
INPUT IMPEDANCE	
<u>Capacity:</u>	25 pF on all millivolt ranges, and 15 pF on all volt ranges.
<u>Resistance:</u>	Nominally 10 MΩ at low frequencies. The resistance decreases to typically 0.1 megohm at 6 MHz.

AMPLIFIER OUTPUT

Output voltage: approx. 80 millivolts at full scale deflection on all ranges. (1.5 V for type RV35S1.)

Output impedance: approx. 75 Ω.

TERMINALS

Input and output terminals are UHF coaxial sockets, type S0-239, which also accommodate ordinary 4 mm banana plugs.

POWER SUPPLY

Voltages: 110,115,127,200,220, and 240 volts.

Line frequencies: 50 to 60 Hz.

Consumption: 50 watts.

DIMENSIONS

Height: 260 mm (10 1/4 in.)

Width: 200 mm (8 in.)

Depth: 320 mm (12 5/8 in.)

WEIGHT

7.8 kg (17 lbs.)

ACCESSORIES AVAILABLE

Balancing Transformers, types BAT11 and BAT12, for direct mounting on input socket.

100:1 Voltage Divider Probe, type VDP100, for measurements with negligible loading on object.

Low-Capacitance Cable Assemblies, types 3B2, 3B3, 3B9.

Section C. Accessories

BALANCING TRANSFORMERS, TYPE BAT

The 1:1 transformers, type BAT, change the one-side grounded input of an instrument to a balanced input.

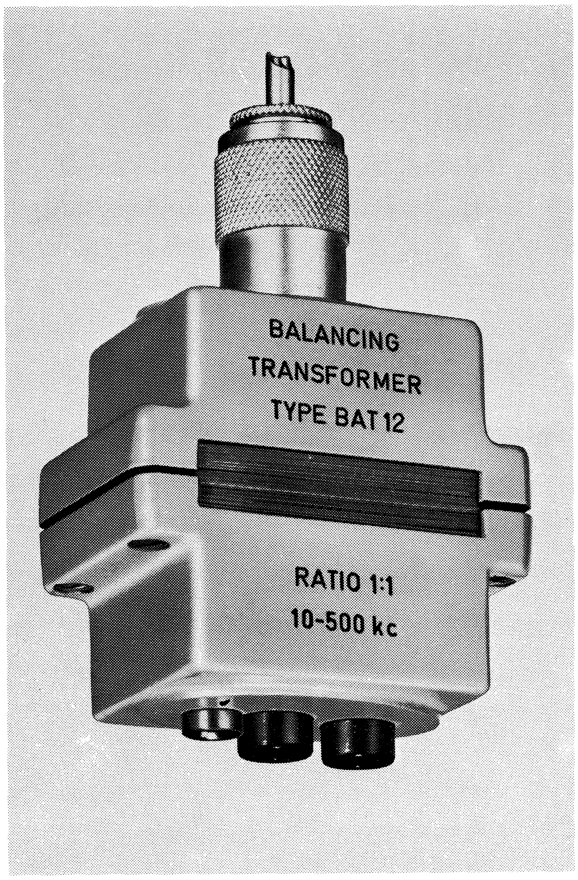


Fig. C1. The Balancing Transformer, type BAT12.

Two models are available:

The type BAT11 is an audio-frequency type for use from 25 Hz to 50 kHz.

The type BAT12 is a carrier-frequency type for use from 10 kHz to 500 kHz.

The Balancing Transformers are designed with special attention to their frequency response, electrostatic shielding and input impedance.

They are provided with UHF plugs, type PL-259 at the output, and regular 4 mm banana jacks at the input.

The illustration shows the type BAT12. The type BAT11 is similar in appearance, although it has a smaller core and a correspondingly smaller weight.

Type BAT11

Voltage Ratio:

1:1

Frequency Response:

25 Hz to 50 kHz within ±0.5 dB.

Input Impedance:

Higher than 10 kΩ throughout the frequency range, provided that the secondary load is less than 20 pF.

Symmetry:

Common-mode signal rejection:

90 dB at 500 Hz
70 dB at 5 kHz
45 dB at 50 kHz

Magnetic Pick-Up:

When the primary is connected to a source with 300 Ω impedance, a typical case, the magnetic pick-up is very low.

Insulation:

The dc leakage between the primary and the shield is less than 5×10^{-10} mhos. The working voltage is 250 V dc, and the test voltage is 1000 V dc.

Signal Voltage:

The input voltage should not exceed 100 V at frequencies above 250 Hz and 0.4 V per Hz below 250 Hz.

Distortion:

With a 5 V input and a 300 Ω primary source impedance, the distortion is:

less than 0.2% 2nd and 0.2% 3rd harmonic above 100 Hz, about 0.6% 2nd and 1% 3rd harmonic at 30 Hz.

Dimensions:

54 by 45 mm (2 3/16 by 1 3/4 in.)
Over-all length: 117 mm (4 5/8 in.)

Weight:

500 grams net (1 lb. 2 oz.).

Type BAT12

Voltage Ratio:

1:1

Frequency Response:

10 kHz to 500 kHz within ±0.5 dB.

Input Impedance:

Higher than 3 kΩ throughout the frequency range, provided that the secondary load is less than 20 pF.

Shielding:

The mutual capacitance between the windings is less than 1 pF.

Symmetry:

Common-mode signal rejection:

65 dB at 50 kHz
60 dB at 100 kHz
50 dB at 500 kHz

Magnetic Pick-Up:

When the primary is connected to a source with 300 Ω impedance, a typical case, the magnetic pick-up is very low.

Insulation:

The dc leakage between the primary and the shield is less than 5×10^{-10} mhos. The working voltage is 250 V dc, and the test voltage is 1000 V dc.

Signal Voltage:

The input voltage should not exceed 100 V.

Dimensions:

58 by 36 mm (2 1/4 by 1 7/16 in.).
Over-all length: 102 mm (4 in.).

Weight:

225 grams net (8 oz.).

100:1 VOLTAGE DIVIDER PROBE, TYPE VDP100

The Voltage Divider Probe, type VDP100, is to be used when minimum loading on the object to be measured is desired.

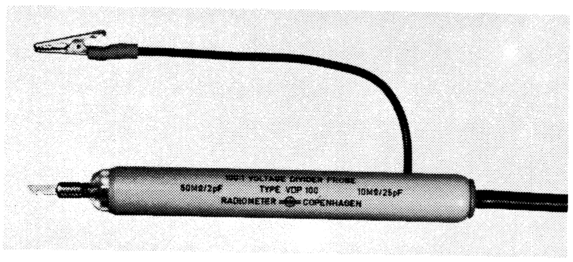


Fig. C2. The 100:1 Voltage Divider Probe, type VDP100.

The probe, which is HF-compensated by means of a variable capacitor, maintains the division ratio from dc to 10 MHz within ±2%.

Division Ratio:

100 to 1

Frequency Range:

dc to 10 MHz.

Accuracy:

Better than 2%.

Input Impedance:

50 MΩ in parallel with 2 pF.

Voltage Range:

100 millivolts to 30 volts for full scale deflection on Wideband Millivoltmeter.

Max. dc voltage: 300 volts.

Length of Cable:

1 meter (40 in.).

LOW-CAPACITANCE CABLE ASSEMBLIES

Coaxial cable, type 3B2, 130 Ω characteristic impedance, 1 m long. Terminated in a UHF plug, type PL-259, and a shielded plug with grounding spring.

Coaxial cable, type 3B3, 130 Ω characteristic impedance, 1 m long. Terminated in two UHF plugs, type PL-259.

Coaxial cable, type 3B9, 130 Ω characteristic impedance, 1 m long. Terminated in a UHF plug, type PL-259, and a banana plug.

Section D. General Description

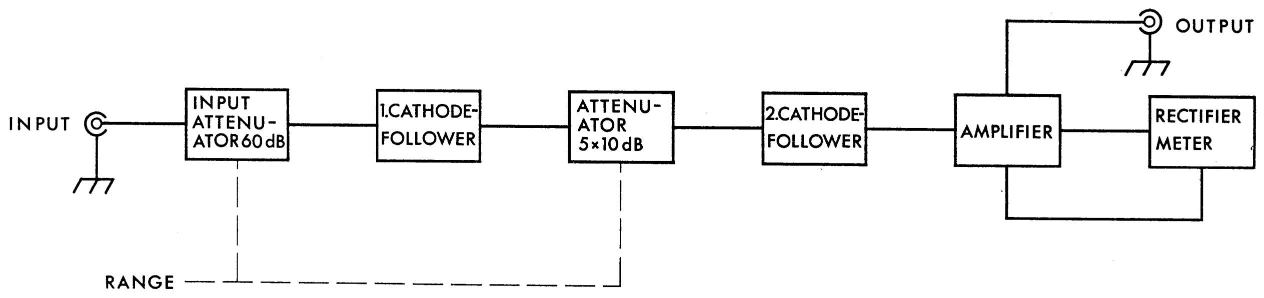


Fig.D1. Block-diagram of the Wideband Millivoltmeter, type RV35.

The principle of the Wideband Millivoltmeter is illustrated by the block diagram as shown in Fig.D1. The VTVM consists of two cathode follower stages followed by an amplifier. The amplifier drives a rectifier which supplies current to the indicating instrument. The rectifier forms part of the amplifier, as it has been inserted in the amplifier feedback loop.

When voltages above 1 mV must be measured, the attenuators are inserted. A resistive-capacitive 60 dB attenuator, which is located at the input of the VTVM, will be activated when the switch RANGE is in the volt ranges. The 10-dB steps between the individual ranges are accomplished by an attenuator located between the cathode follower stages. This 5 x 10 dB attenuator has 6 positions, each being utilized twice - first in the millivolt ranges, next in the volt ranges.

The amplifier is provided with an output. The output resistance is approximately 75 ohms, so that the impedance transformation of the VTVM, used as an amplifier, is large.

The anode voltage of the VTVM is stabilized with a 3-tube regulator which effectively reduces the influence of line voltage variations. To avoid hum from the tube filaments, a dc grid-voltage is fed to the first five tubes.

Printed circuit boards are utilized for the greater part of the VTVM circuitry to ensure a reliable and robust construction, and to reduce weight to a minimum.

CONTROLS, TERMINALS AND METER

As can be seen on Fig.D2, the Wideband Millivoltmeter, type RV35, is provided with the following controls, terminals and meter:

POWER Switch (OFF) (1) and Pilot Lamp POWER (2)

The power switch and the pilot lamp are located on the right hand side of the front panel.

RANGE Switch (3)

The RANGE switch is used to select the desired voltage range. The VTVM has 12 voltage ranges in steps of 10 dB (from 1 mV f.s.d. to 300 V f.s.d.).

INPUT Terminal (4)

The INPUT terminal is provided with a coaxial connector, type UHF S0-239.

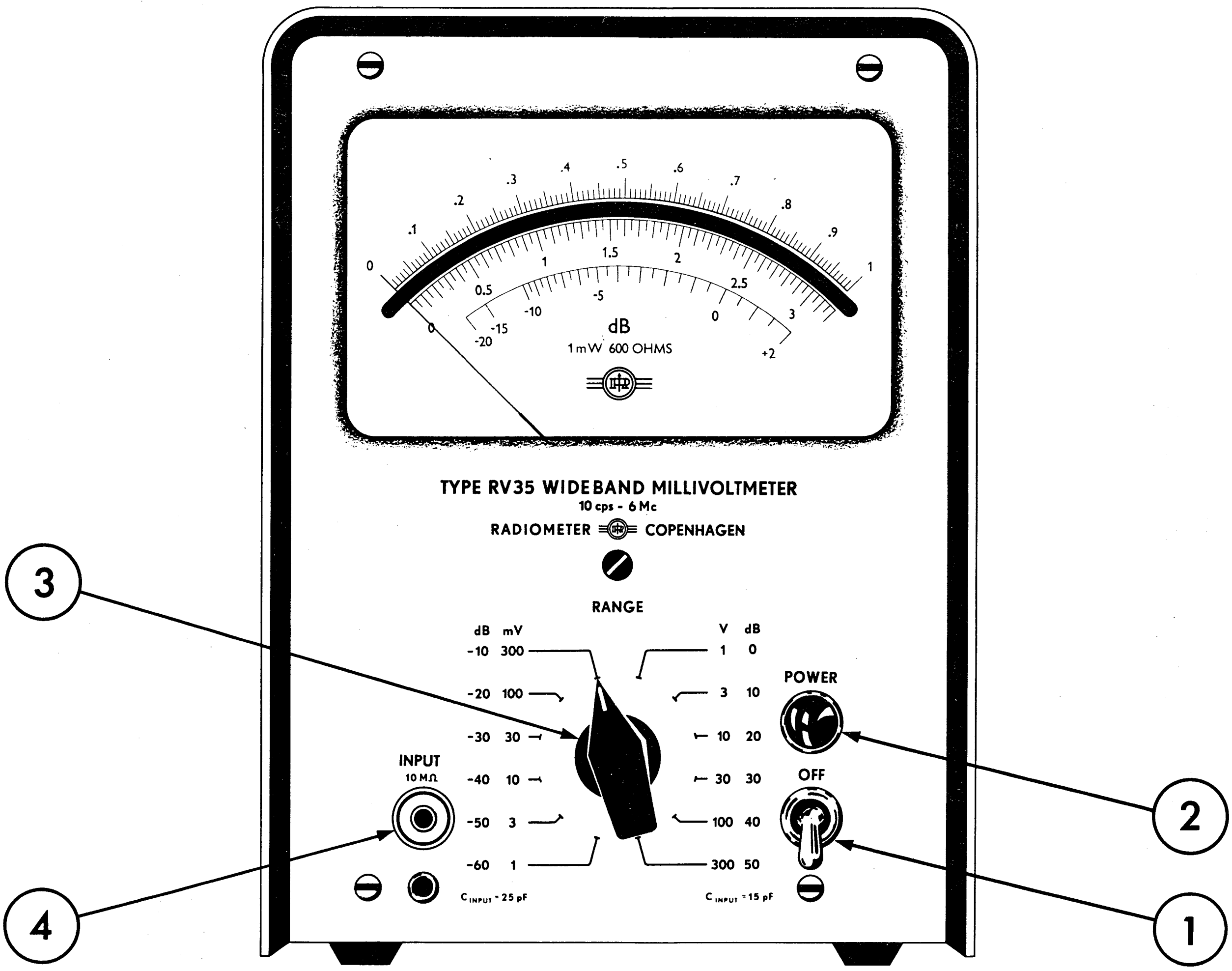


Fig. D2. The Front Plate of the Wideband Millivoltmeter, type RV35.

19 mm (3/4") below the centre of the coaxial socket is placed an uninsulated 4 mm banana jack which is connected to the VTVM chassis. The input socket will consequently accommodate a coaxial UHF-plug as well as a single or double banana plug.

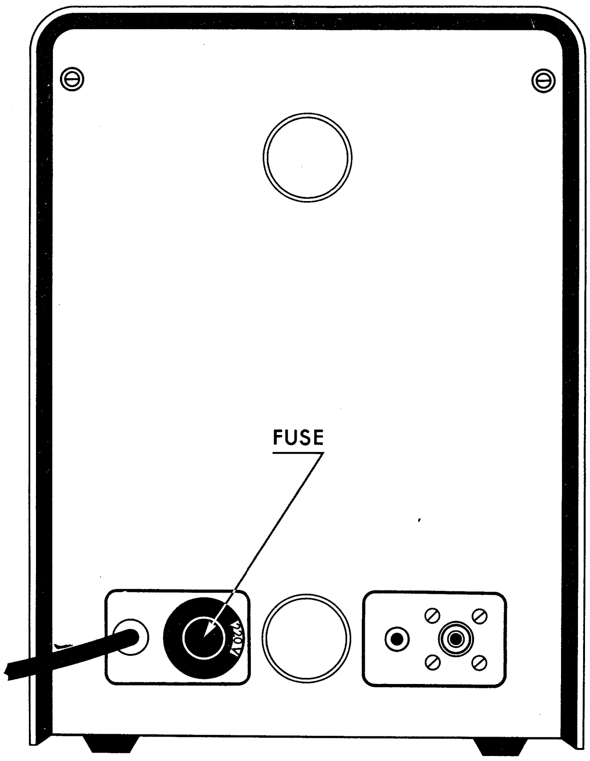


Fig.D3. Rear Plate of the Wideband Millivoltmeter, type RV35.

OUTPUT Terminal

The OUTPUT terminal is located on the rear of the instrument (see Fig.D3) and consists of a UHF coaxial connector, type SO 239.

19 mm (3/4") to the left of the connector is placed a 4 mm banana jack directly on the instrument chassis.

Meter

As can be seen on Fig.D4, the meter is equipped with a mirror-backed scale and a knife-edge pointer, providing for accurate reading, free from parallax.

It consists of two voltage scales which are located immediately above and below the mirror. The top scale (1) is graduated into 100 divisions, and is used in the ranges 1 - 10 - 100.

The lower scale (2) is graduated into 60 divisions, and is used in the ranges 3 - 30 - 300.

Furthermore, a dB scale (3), placed underneath the voltage scales, ranges from -20 dB to +2 dB with a division for every half dB. The reference-level of the dB range is 0.775 volt, corresponding to 1 milliwatt in 600 Ω.

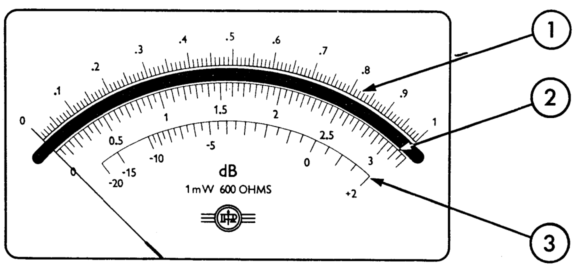


Fig.D4. The Indicating Meter of the Wideband Millivoltmeter, type RV35.

Line Voltage Selecting Switch and Fuse

The line voltage selecting switch is located on the rear of the instrument (see Fig.D3) and permits adaption of the VTVM to the line voltage to be used. It also includes the fuse. (See SECTION E.)

Power Cable

The power cable, protruding from the rear of the cabinet, is provided with a third conductor, connected to chassis. This conductor is utilized when a power-plug with a grounding terminal is used.

Section E. Operating Instructions

CONNECTING THE VTVM

1) Check that the VTVM is correctly switched to the line voltage to be used, as indicated by the line voltage selecting switch on the rear of the cabinet. Switching to another line voltage is accomplished by unscrewing the main fuse, taking off the contact ring, repositioning it according to the desired line voltage value, and screwing the fuse back in, as shown in Fig.E1.

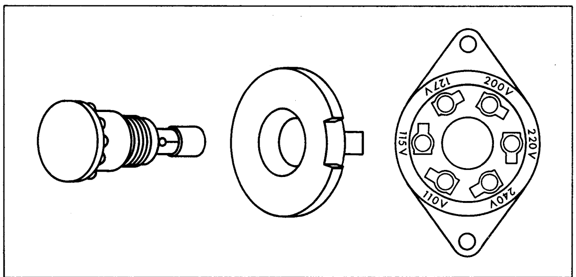


Fig.E1. View of the disassembled Fuse Holder and Voltage Selector.

2) Check that the fuse employed corresponds to the line voltage to which the VTVM is going to be connected. Use a 500 mA slow-blow fuse for operation on 200-220-240 volts and a 1 A slow-blow fuse for operation on 110-117-127 volts.

3) Switch on; the VTVM is ready for use after a few minutes warm-up time.

MEASURING

1) Connect the measuring object to the INPUT socket.

2) Set the RANGE switch to the desired measuring range. The range designation (on the front panel) indicates the maximum voltage measurable within the range selected.

3) The value of the voltage measured is then read on the appropriate voltage scale, viz. the scale on which the end-scale value is the first figure in the range-designation (1 or 3).

For instance, for a measured voltage of 250 mV, the 300 mV range and the lower volt scale are used. Readings can also be made in a higher voltage range, but with some loss of accuracy.

USING THE dB SCALE

The reference level of the dB range is 0.775 volt, corresponding to 1 milliwatt in 600 Ω.

The dB scale is valid in the 1 volt range without additions. In the other ranges, the level is found by adding the scale reading to the dB range indication (positive or negative sign being heeded).

For example, if the voltage measured is

9.75 millivolt, +2 dB will be read on the scale when the RANGE switch is in the 10 mV range which corresponds to a dB range indication of -40 dB. This gives: -38 dB.

SOURCES OF ERROR

Erratic Readings Caused by Hum

When the VTVM is warmed up, the meter will indicate about 1% of full scale. In the presence of hum fields at the input, and with the VTVM set to millivolt ranges, a somewhat larger deflection will be observed if the input is not short-circuited.

When measuring on high-ohmic circuits, hum may give rise to erratic measurements, as both load and input are high-ohmic. This deficiency will be eliminated if the measuring object is shielded, and a shielded input cable is used. The input cable's capacitive loading of the test object should then be taken into consideration.

When measuring at low voltage levels, hum currents may result in erratic readings if the VTVM is grounded. Smallest errors are obtained if the measuring setup is grounded only at the measuring object.

Measuring Signals Containing Harmonic Components

The Wideband Millivoltmeter responds to the average value of the applied voltage, but is calibrated in the rms value of a sinusoidal voltage.

A signal that is not sinusoidal may give a reading which deviates from the rms value of the signal. In table 1 is shown a comparison of rms values with the values read on the Wideband Millivoltmeter when the measured voltage has a fundamental frequency component of 100, and a 2nd or 3rd harmonic component of 10, 20 or 50.

USING THE WIDEBAND MILLIVOLTMETER AS AN AMPLIFIER

1) Connect the power cord to the appropriate line voltage, and turn on the VTVM. Allow the VTVM to warm up for a few minutes.

2) Connect the OUTPUT-socket on the rear of the cabinet to the circuitry (equipment) to which the amplified signal is to be fed. Unloaded, the output voltage is approx. 80 mV at full meter deflection (1.5 V for RV35S1). As the output impedance is approx. 75 Ω, this voltage will drop to approx. 40 mV for a 75 Ω load.

3) Feed the signal to be amplified to INPUT.

4) Select the desired amplification by means of the RANGE switch. Maximum

INPUT VOLTAGE % HARMONIC	TRUE RMS VALUE	RV35 INDICATION
0	100	100
10% 2' harmonic	100.5	100
20% 2' harmonic	102	100-102
50% 2' harmonic	112	100-110
10% 3' harmonic	100.5	96-104
20% 3' harmonic	102	94-108
50% 3' harmonic	112	90-116

Table 1

gain is obtained in the 1 mV range (approx. 80 times), and will decrease 10 dB for each consecutive step of the RANGE switch. The input signal must not exceed the double value of the range designation.

The meter reading above 2 MHz will to some extent depend on the load applied, when the numerical value of the load impedance is not much larger than 75 Ω. It must therefore be recommended to remove the load, if optimal measuring accuracy is desired.

Section F. Technical Description

INPUT ATTENUATOR

The input attenuator is placed between the input socket and the 1st cathode follower, V101. It consists of a resistive-capacitive divider, R2, R3 + R4 + R101, C3 and C4. The input attenuator is used in the volt ranges and provides for an attenuation of 60 dB. The attenuation is adjusted to correct value by means of ADJ4 and ADJ5.

The input resistance at low frequencies is in the main determined by R2. The input capacitance is the sum of the grid capacitance of V101 (10 pF), the capacitance of the input socket and divider, and the stray capacitances to chassis. When the cathode follower grid in the volt ranges is disconnected from the input, the input capacitances of the VTVM will be reduced by the 10 pF of the said grid to 15 pF.

5 x 10 dB ATTENUATOR

The load on the 1st cathode follower (V101) is an attenuator (R7-R12) with five 10 dB steps. In the 1 mV and 1 V ranges, the grid of the 2nd cathode follower V102 is connected to the cathode of V101. For each higher voltage range, this grid voltage is moved downwards by the divider until the 300 mV or 300 V range is reached.

At higher frequencies, capacitive adjustment of the attenuator is made with ADJ6 and ADJ7. The attenuator is followed by the 2nd cathode follower which has a negligible loading effect.

AMPLIFIER, RECTIFIER

The four pentode stages, V103 - V106, in combination with the meter circuit form a highly stable amplifier. The signal on the grid of the input stage (V103) is amplified and then rectified in the meter circuitry.

The negative feedback is 60 dB at medium frequencies. Towards higher and lower frequencies, the negative feedback is controlled by means of corrective networks between the individual tubes and in the anode circuits.

The voltage present across R145, which is proportional to the current through the rectifier, is the signal fed back. The voltage is stepped down via R118 and R119 to R117 (in the cathode of the amplifier's input stage). Over the greater part of the frequency range, calibration is accomplished by means of R119 (ADJ2). At the highest frequencies, however, calibration is carried out by adjusting ADJ3, which compensates for such changes in the phase shift as are caused by the tolerance of diverse components. Calibration at the lowest frequencies is made with ADJ1 and ADJ9.

Since the negative feedback voltage is obtained across R145 (in series with the meter circuit), the feedback will ensure a current through the rectifier proportional to the output voltage of the second stage. This coupling ensures a linear scale deflection, irrespective of the meter resistance and the resistivity of the diodes.

The meter rectifier is provided with extremely fast, low-capacitance, silicon diodes, which even at high temperatures have no influence on the meter reading.

The OUTPUT socket is connected to the cathode of the output tube (V106).

Regulated anode voltage is fed to all tubes in the measuring circuit, effectively to reduce hum and the effect of line voltage variations. Further to reduce the hum level, a dc filament voltage is fed to the first five tubes.

POWER SUPPLY

The regulated power supply provides 250 volts for tube anodes and screen grids.

The regulator contains three tubes, V201-V203. V201 is a pentode and functions as a series regulator tube. The control grid in the series tube is connected to the anode of the cascode amplifier, which consists of two triodes (V202). The regulator reference voltage is obtained across V203, which is placed in the cathode of the cascode and isolated by an LP-filter.

The input grid of the cascode is connected to the output of the power supply via a divider. A change in the output voltage will be amplified in the cascode amplifier and then fed to the grid of the series tube. The resistance of the series tube will then vary to oppose the change. The potentiometer, ADJ8, is used to set the output voltage at the correct value: 250 V.

The rectifier, CR202, supplies the tubes V101 - 105 with a filament current whose hum component is reduced by the capacitors C205 - C206.

The filament current for the remaining tubes is an ac current from the power transformer.

The primary windings of the power transformer are provided with outlets for 110 - 115 - 127 - 200 - 220 - 240 volts. By means of the line voltage selecting switch, the power line is connected to the desired outlet.

Section G. Maintenance

GENERAL

The Wideband Millivoltmeter is designed to withstand rough treatment, but careful handling and proper operation ensure long life and high reliability.

Necessary repairs should be carried out only by skilled personnel provided with the proper equipment to ensure that the repairs are correctly made.

REMOVING THE CABINET

Withdraw the power plug from the power outlet before removing the cabinet.

The cabinet consists of three sections: a front panel plate, a one-piece back and bottom, and a cover (top and sides).

Cover

The cover is attached to the chassis by means of 4 screws on the top, and is fastened on either side by 4 buttons at the bottom. When the 4 top screws are removed, the cover can be lifted off the chassis

One-Piece Back and Bottom

The bottom plate is fastened with 4 screws, while the back plate is secured by means of 2 screws near the upper edge.

Place the instrument upside down on a protective padding and remove the six screws mentioned. The one-piece back and bottom can now be removed if care is exercised to allow for the power cord to pass freely through the hole in the back plate.

Front Panel

The built-in meter is mounted on the instrument chassis, but is spring-loaded so as to press against the panel plate.

The panel is fastened to the chassis with 6 screws. Before loosening these screws, however, the pointer-knob must be removed. This is accomplished by unscrewing the knob screw with a 2 mm hexagonal wrench (Unbraco wrench), and then pulling the knob outwards.

Place the instrument with the front panel upwards on a protective padding, and first remove the two screws nearest the base. As the remaining four screws are loosened, the meter springs will press out the panel.

TUBE REPLACEMENT

Tubes should be replaced only when they are defective, since a tube replacement requires a subsequent adjustment (see below).

If attempts are made to locate a defective tube, only one tube at a time should be replaced. The tube should be returned to its former position if it does not prove to be the source of trouble. This procedure will simplify the subsequent adjustments.

Replacing tubes in the measuring circuit (V101 to V106) may cause deviations in calibration and frequency characteristic and replacing V201 to V203 may call for adjustment of the power supply (see below).

ADJUSTMENTS

Regulated Power Supply

The output voltage as measured between chassis and pin No.3 of V201 (marked "A" on the circuit diagram) is adjusted by means of the potentiometer, R203, ADJ8, to 250 V ±2%.

An indication of adequate regulation will be hum voltages between "A" and chassis not exceeding 0.2 mV, and variations in the dc voltage between "A" and chassis not exceeding 0.3 V for a 10% variation in line voltage with new tubes.

Amplifier

Whenever one of the tubes in the measuring circuit is replaced, it may be necessary to recalibrate the vacuum-tube voltmeter and adjust the frequency characteristic in the mV range.

1) Calibrating (1 kHz)

For this purpose use a generator capable of supplying 1 mV at 1000 Hz (400 Hz) with an accuracy better than 0.2%.

If the output voltage of the generator is not measured with an average value measuring instrument, the generator distortion must be taken into account.

a) Let the VTVM be switched on for 15 minutes after the cover has been removed.

b) Connect the generator to the VTVM input, using a shielded cable to avoid hum.

c) Set the RANGE switch to the 1 mV range. With 1 mV - 1000 Hz (400 Hz) fed to input, adjust ADJ2 to obtain full deflection on the meter.

ADJ2 is located on the right hand side of the VTVM, and is accessible through the second hole from the bottom in the amplifier shield.

2) Frequency Characteristic (HF)

To adjust the HF frequency characteristic, use a generator capable of generating approx. 1 mV with an accuracy better than 0.2% from 1 kHz to 3 MHz, and better than 0.3% up to 5 MHz, as measured with an average value measuring instrument.

a) Let the instrument be switched on for 15 minutes after the cover has been removed.

b) Connect the generator to the VTVM input by means of a terminated cable.

c) Set the RANGE switch to the 1 mV range and apply approx. 0.9 mV, 1 kHz. Take down reading.

d) Change the frequency of input signal to 5 MHz (amplitude as before), and adjust ADJ3 to reading at 1 kHz (bottom hole in amplifier shielding).

e) Switch to 2 MHz and measure the deviation as compared with 1 kHz (0.9 mV). A deviation larger than 0.4% will require a change of the value of C121 (C121 to be increased for positive deviations, decreased for negative deviations).

f) If the value of the capacitor is changed, steps (d) and (e) must be repeated.

3) Frequency Characteristic (LF)

To adjust the LF frequency characteristic, use a generator capable of generating approx. 1 mV with an accuracy better than 0.5% from 10 Hz to 1 kHz (measured on an average value measuring instrument).

a) Leave the VTVM turned on 15 minutes after the cover has been removed.

b) Connect the generator to the VTVM input, using a shielded cable.

c) Set the RANGE switch to the 1 mV range and apply approx. 0.9 mV, 1 kHz. Take down reading.

d) Change the frequency to 30 Hz and adjust ADJ9 (top hole in amplifier shielding) to reference level at 1 kHz. (If the VTVM does not have ADJ9, resistor R122 should be changed.)

e) Switch the frequency to 10 Hz and adjust ADJ1 (the hole in amplifier shielding nearest to the front panel) until reading is 1% below the reference level at 1 kHz.

f) Switch to 15 Hz and measure deviation as compared with 1 kHz. If the error exceeds 1%, split it between 10 and 15 Hz readings.

g) Shift to 30 Hz and reset reading with ADJ9 to reference level at 1 kHz, if required.

h) In case a correction has been necessary, steps e-f-g must be repeated.

Input Divider (60 dB)

1) Adjusting Input Divider (1 kHz - 10 kHz)

For this purpose, use a generator with a negligible frequency response error from 1 kHz to 10 kHz, and a precision divider (60 dB), providing attenuation from 1 V to 1 mV.

a) Leave the VTVM turned on 5 minutes after the cover has been removed.

b) Connect the generator to the VTVM input via the attenuator giving 60 dB attenuation.

c) Set the RANGE switch to the 1 mV range, and adjust reading to approx. 0.9 mV at 1 kHz. Take down reading.

d) Switch RANGE to 1 V range, and increase the signal by 60 dB, using the attenuator. Take down reading. Change to 10 kHz, and take down reading again.

e) Commence by adjusting at frequency where the error is most pronounced, and then adjust at other frequency. Repeat adjustments at 1 kHz and 10 kHz, until the readings match at either frequency.

The error at 10 kHz is corrected with ADJ5 (located on right side near front panel), whereas the error at 1 kHz is corrected with ADJ4.

2) HF Control of Input Divider

Use same generator as in "Amplifier 2)", in this instance, however, with an output voltage of 1 volt across the resistor terminating the cable.

a) Connect the generator to the VTVM input by means of a terminated cable.

b) Measure the deviation at 5 MHz as compared with 100 kHz. If the deviation exceeds 0.5%, the value of R6 must be changed.

c) If the deviation is positive, the value of R6 must be reduced.

d) It must be recommended to re-check as in "Input Divider (60 dB) 2)", if R6 has been changed.

5 x 10 dB Divider

By using a generator of the type required in "Amplifier 2)" - in this instance, however, capable of generating voltages between 1 mV and 300 mV, the frequency characteristic at the highest frequencies can be adjusted with ADJ6 and ADJ7.

1) Leave the VTVM turned on for 15 minutes after the cover has been removed.

2) Place the instrument in its usual operating position with the trimming holes at the front end of the bottom plate accessible to an insulated trimming tool.

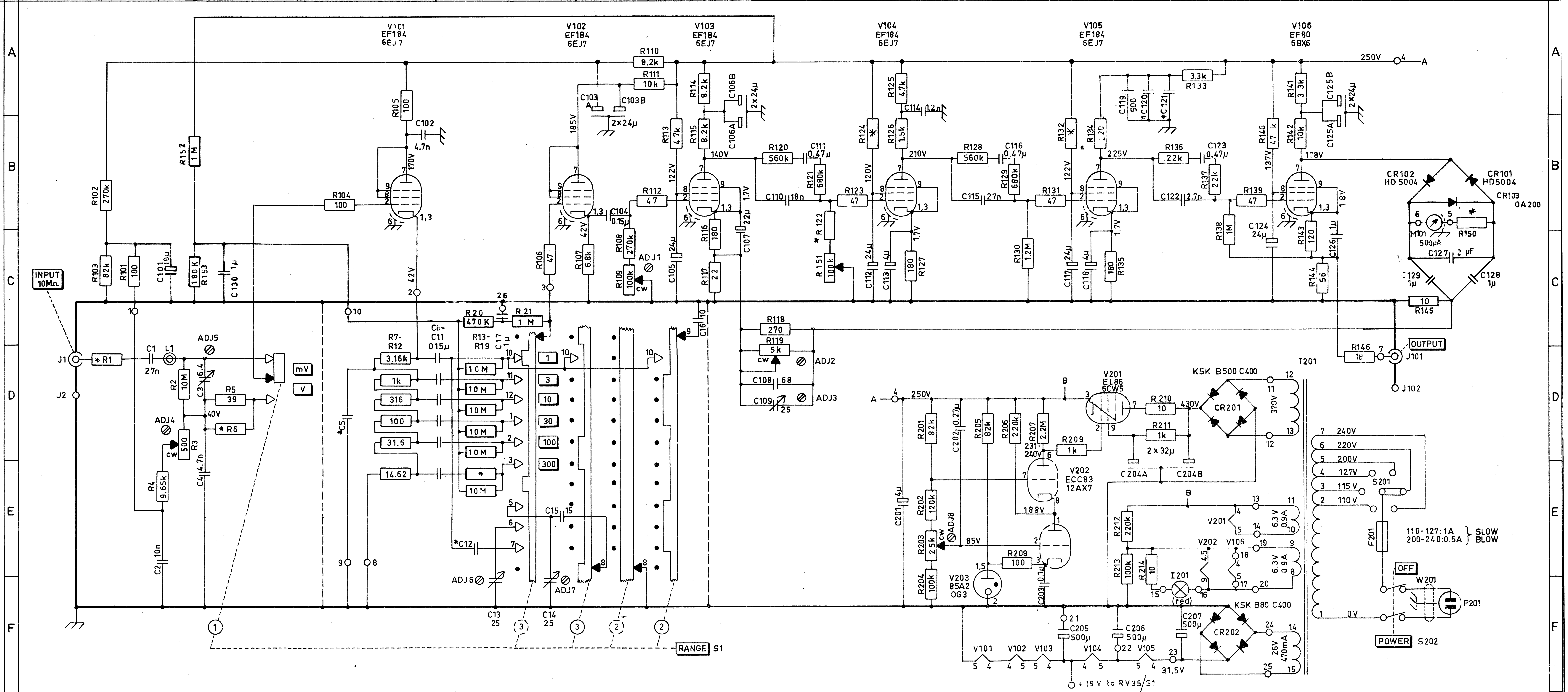
3) Set the RANGE switch to 3 mV range, and set input voltage to give nearly full scale deflection at 100 kHz. Take down reading.

4) Apply a 4 MHz voltage of equal amplitude to input of VTVM.

5) ADJUST ADJ7, through the front trimming hole in the bottom plate, to the reading obtained at 100 kHz.

6) The frequency characteristic in the 10 mV range is next adjusted in the same way by means of ADJ6 through the rear trimming hole in the bottom plate. However, the frequencies of the voltage applied have to be 100 kHz and 5 MHz.

Note: Some ways and means of adjusting the vacuum-tube voltmeter have been broadly outlined in the section above. The rigorous demands set up for the measuring equipment as well as the tolerances stipulated for the various adjustments are motivated by a wish to provide a simple and adequate adjusting procedure. The tolerances should not be interpreted as warranty data.



cw : CLOCKWISE POSITION

* : FINAL VALUES FACTORY ADJUSTED

VALUES IN Ω OR pF IF NOT OTHERWISE SPECIFIED

ALL d-c POTENTIAL MEASURED WITH RESPECT TO CHASSIS. VTVM INPUT RESISTANCE >60M

-O-: PRINT TERMINAL.

12

RADIOMETER COPENHAGEN

Rt.Nr.	Fra Fab. Nr.	Dato	Rt. af	Konf.	Norm.

RADIOMETER COPENHAGEN

72 EMDRUPVEJ NV

Malestok	Tegn.	NJ	15/6·66
~	Konf.	Ha	15/6·66
	Norm.		

WIDEBAND MILLIVOLTMETER

TYPE RV35 e

From no. 90852 to no.

Erstatter

1153– A1

Erstattes af