

INSTRUCTION MANUAL

Type OSG43
OSCILLOSCOPE



RADIOMETER

ELECTRONIC MEASURING INSTRUMENTS
FOR SCIENTIFIC AND INDUSTRIAL USE

INSTRUCTION AND OPERATING MANUAL
FOR

Type OSG43
OSCILLOSCOPE

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SECTION 1 GENERAL DESCRIPTION

1.1 INTRODUCTION

Type OSG43 Oscilloscope is particularly intended to be used with RADIOMETERS type TMS1 sweep-generator.

The principal components of the instrument are: a cathode-ray tube, two almost identical amplifiers, (one for vertical and the other for horizontal deflection), power supplies for the cathode-ray tubes and the amplifiers. The oscilloscope does not incorporate a sweep-generator because the horizontal deflecting voltage is fed to the X-amplifier from the TMS1 sweep-generator.

1.2 THE CATHODE-RAY TUBE

This tube is the DG 13-2 type with a screen diameter of 130 mm (5 inches) and medium persistence time. It has a post-deflection acceleration anode which gives it a very high brilliance and accurate focusing.

The tube is entirely enclosed in a magnetic shield of Mu-metal which protects it from the effects of stray magnetic fields.

1.3 THE DEFLECTION AMPLIFIERS

Both the amplifiers are of the push-pull type with a low distortion, even when the max. deflection is had on the cathode-ray tube.

1.31 The vertical amplifier (Y-amplifier)

The maximum Y-deflection sensitivity is approximately $\frac{15 \text{ mV}_{\text{dc}}}{\text{cm}}$ which corresponds to a maximum Y amplification of approximately 66 dB. The amplification can be reduced continuously by approximately 10 dB with a variable resistor (Y ATT. FINE). This is inserted across the cathodes of the input tubes. Furthermore, the amplification can be reduced by 54 dB in steps of 6 dB with a voltage divider inserted between the input jack and the grid of the input tube. As the voltage divider has no compensation for stray capacitances, the upper limiting frequency will depend to some degree on the position of the switch (Y ATT.)

The lowest limiting frequency (about 40 kc) is had in position "6dB". In position "0 dB" the upper limiting frequency is ap-

proximately 75 kilocycles.

When the switch "Y ATT." is at position ∞ , the grid of the input tube is short-circuited to chassis, while the input resistance of the Y amplifier remains unchanged at 1 M Ω .

The input impedance is 1 M Ω in parallel with 30 pF in position "0 dB", and 1 M Ω in parallel with 20 pF in the other position of Y ATT.

The vertical positioning of the spot is adjusted with the Y POSITION control which covers a range that corresponds to a displacement of approximately 10 times the diameter of the cathode-ray tube.

1.32 The horizontal amplifier (X-amplifier)

As mentioned before the X and Y amplifiers are almost identical. The X-amplification, however, is a little smaller than the Y-amplification. The continuous control of amplification covers a range of some 20 dB, while the input attenuator can only attenuate the signal at the input by 40 dB in steps of 20 dB.

The maximum sensitivity will only be about 30 mV_{dc}/cm because the X-sensitivity of the cathode-ray tube is some 10% lower than the Y-sensitivity, and the X amplification is about 6 dB lower than the Y amplification.

For the same reasons the X POSITION control covers only a range that corresponds to 5 times the diameter of the screen.

1.4 THE POWER SUPPLY

1.41 The low voltage

The d-c voltages of 400, 160 and -90 volts for the amplifiers are supplied from 3 bridge-coupled rectifiers which work in conjunction with an electronic voltage stabilizer for 160 volts and a voltage stabilizer ~~and~~ tube (type 90-C1) for -90 volts.

1.42 The high voltage

± 1800 volts for the cathode-ray tube is supplied by a 50 kc generator whose output voltage is stepped up by a transformer and

rectified. Through a high ohmic voltage divider the high voltage (-1800 volts) is compared with the electronically stabilized voltage of 160 volts in a two-tube d-c amplifier. The output voltage of this controls the screen-grid voltage of the oscillator in such a way that variation in the high voltage due to changes in the line voltages and the power consumption are counteracted.

1.5 INTENSITY MODULATION

The intensity can be modulated with an externally supplied a-c voltage. A 5-15 volt peak voltage depending on the setting of the intensity is sufficient to blank the spot altogether. For instance it is possible to use the difference marker voltage from TMS1 for intensity modulation. In doing so, two dark spots 5.5 Mc apart appear in the beam. It is important that the grid voltage of the cathode-ray tube never grows positive referred to the cathode, as this will destroy the tube. The best result is obtained when the peaks of the modulation voltage are flat during the positive half periods. In this way the intensity will be constant during the entire sweep.

The input impedance at the jack INTENSITY MODULATION is about $0.1 \text{ M}\Omega \neq 40 \text{ pF}$.

SECTION 2 OPERATING INSTRUCTIONS

2.1 CONNECTING THE INSTRUMENT TO THE A-C LINE

The line transformer has two 110 volt primary windings which are connected in series when the instrument leaves the factory, so that the instrument operates on 220 volts.

If the instrument is to operate on 110 volts, connect the two windings in parallel and replace the fuse marked "power line fuse" (0.63 amp) with a 1.25 amp (slow blow) fuse.

2.2 ADJUSTING THE BRILLIANCE AND FOCUSING

Never let the spot remain in the same position on the screen. Otherwise, it will rapidly burn a hole in the coating of the screen.

- (1) Supply an adequate a-c voltage (> 50 mV) to the X INPUT jack (for example the TMS1) before turning on the INTENSITY.
- (2) Set the INTENSITY control so that the beam has sufficient brilliance.
- (3) Next set the knob FOCUS so that the beam is as sharp as possible.

2.3 BALANCING THE AMPLIFIERS

After a warm-up period of 5 to 10 minutes balance the Y amplifier as follows:

- (1) Connect an a-c voltage (> 50 mV) to the X INPUT jack and adjust the length of the beam (with the X ATTENUATOR) to approx. 100 mm.
- (2) Set the Y ATTENUATOR to position ∞ .
- (3) Turn the Y ATT. FINE to the extreme right.
- (4) Set the Y-POSITION so that the horizontal line is positioned in the middle of the screen.
- (5) Next turn Y ATT. FINE to the extreme left. This will probably make the line on the screen move up or down.
- (6) Now set the Y-BALANCE so that the line passes through the center of the screen. The Y BALANCE control can be set with a screwdriver when the round plug button below the label Y BALANCE has been removed.

Balance the X amplifier in exactly the same way as described above, only interchange Y with X.

The instrument is ready for use when the amplifiers have been balanced, and INTENSITY and FOCUS have been set.

2.4 APPLYING VOLTAGE TO X AND Y AMPLIFIERS

The voltage source is connected to the Y amplifier through the coaxial jacks on the left-hand side of the instrument. The terminals for the X input are located on the right-hand side of the oscilloscope.

The jacks marked DC have a d-c connection to the grids of the input tubes, while the jacks marked AC are connected to the DC jacks via 0.1 μ F capacitors.

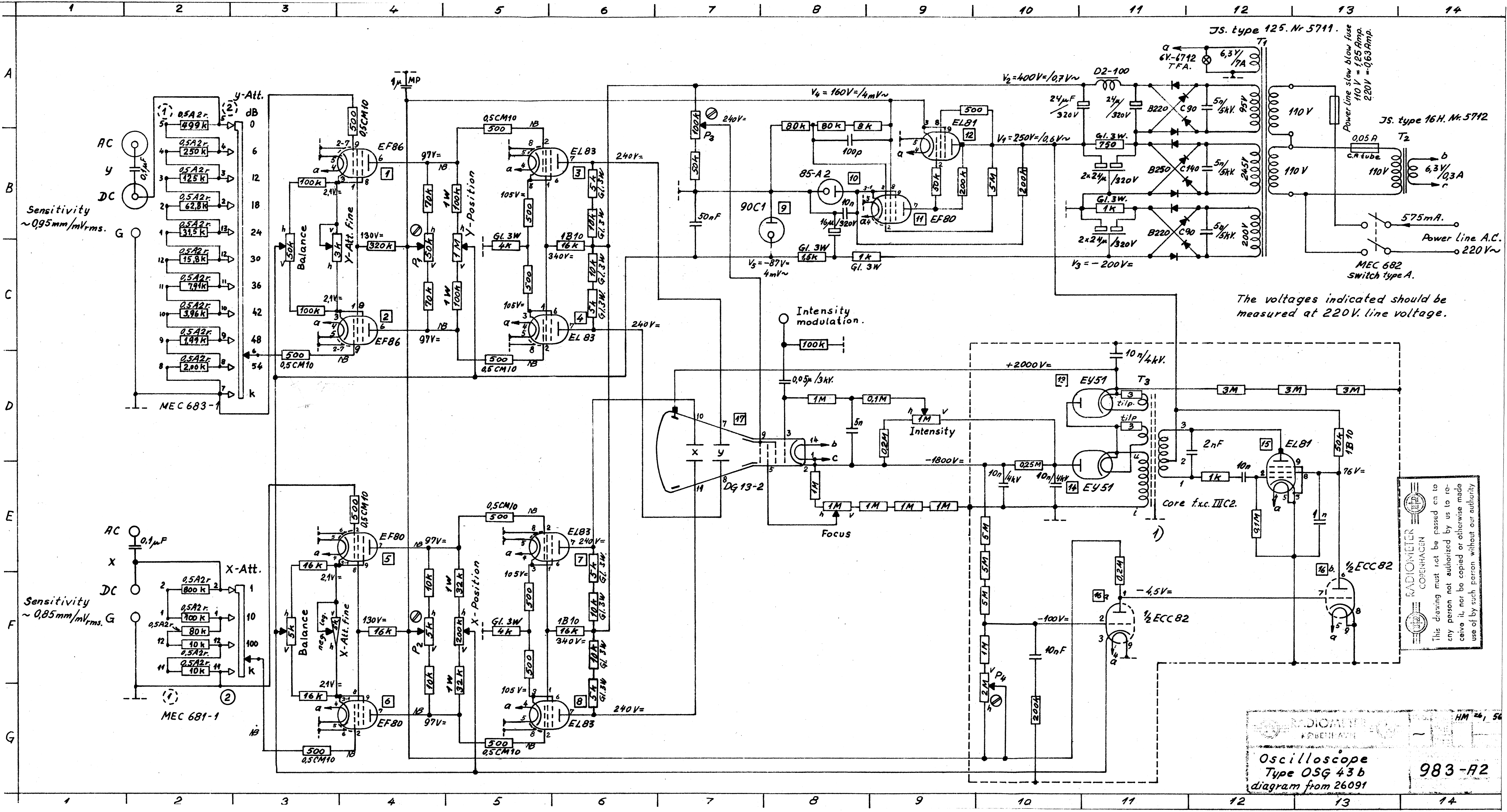
The peak value of the input voltage must not exceed 500 volts.

SECTION 3
SPECIFICATIONS

CR TUBE:	Screen diameter:	130 mm
	Accelerating voltage:	3.7 kV
	Sensitivity:	30 V _{dc} /cm
Y AMPLIFIER:	Max. sensitivity:	15 mV _{dc} /cm
	Frequency range:	dc - 40 kc approx.
	Input Impedance:	1 MΩ, 30 pF
	Attenuator:	6 dB steps, 0-54 dB and continuous 0-10 dB.
X AMPLIFIER:	Max. sensitivity:	30 mV _{dc} /cm
	Frequency range:	dc - 80 kc approx.
	Input Impedance:	1 MΩ, 30 pF
	Attenuator:	20 dB steps, 0-40 dB and continuous 0-20 dB.

No sweep generator.

Intensity modulation (Z-modulation)
requires 15 volts - peak to peak.



The voltages indicated should be measured at 220V. line voltage.

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Oscilloscope
Type OSG 43b
diagram from 26091
983-A2
HM 26, 50