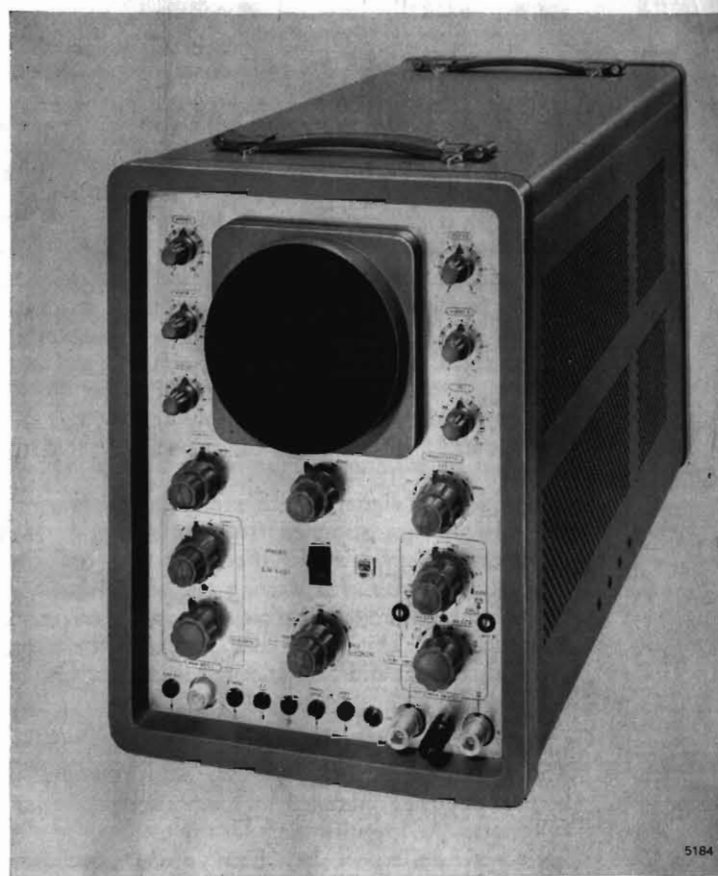


PHILIPS

High Frequency Oscilloscope with differential input Type GM 5603



5184

Features

D.C. coupled differential amplifier up to 14 Mc/s

Input sensitivity 50 mV/cm

Signal delay cables 0.3 μ sec

Calibrated sweep speeds 40 μ sec/cm and 1 sec/cm, in 21 ranges

Highly sensitive and stable triggering up to 2 Mc/s, synchronization up to 14 Mc/s
5" cathode-ray tube with spiral post-accelerating anode and 10 kV accelerating voltage

Two d.c. coupled cathode-follower probes and two attenuator probes are supplied with.

Industrial equipment division
Electronic measuring apparatus
H.F. Oscilloscope
Type GM 5603



Description

VERTICAL AMPLIFIER

The d.c. coupled push-pull amplifier is provided with two inputs which can be used either separately (asymmetrically) or in combination as a differential input; both d.c. coupling and a.c. coupling are possible. The amplifier consists of three stages preceded and separated by cathode followers. The two delay cables are symmetrically disposed immediately in front of the output stage. The sensitivity may be recalibrated with the aid of two screw-driver adjustments on the front panel, one for either input. To this end a calibration voltage is available which, in addition, can be used for readjusting the square-wave reproduction of the probes.

TIME BASE GENERATOR

The principle of the time base is the "three-pentode" circuit. Special provisions have been made to ensure a short starting time, thus enabling a maximum use of the signal delay line. The very short flyback time of the sawtooth voltage, together with the delayed resetting to the starting position of the driving multi-vibrator are a guarantee of a very stable, jitter-free, display.

The triggering signal, which can be taken from the vertical amplifier, supplied from the mains, or from an external source, is amplified and then converted into narrow pulses for driving the time base, with the aid of a Schmitt trigger circuit and a differentiating network. This circuit also comprises the trigger level adjustment and the polarity selector switch.

HORIZONTAL AMPLIFIER

The amplifier consists of a phase inverter and an output amplifier preceded and separated by cathode followers. A magnification of five times of the horizontal deflection has been made possible by special provisions in the horizontal shift adjustment.

CATHODE-RAY TUBE CIRCUIT

The voltage between cathode and anode of the cathode-ray tube has a value of approximately 1.5 kV. An additional voltage is applied to the P.D.A. electrode giving a total accelerating voltage of 10 kV. The bright-up during the forward scan is d.c. coupled. Modulation of the 'Z' axis can be achieved by means of externally applied signals.

MECHANICAL DESIGN

The instrument consists of a frame construction, from which the walls can be readily detached. For cooling purposes, a fan has been built in, together with a dust filter that can be washed out. The design of the graticule holders enables the contrast enhancing filters

to be easily exchanged; the use of supplementary photographic equipment and recording cameras also presents no difficulty. Four lamps have been employed, to ensure completely uniform distribution of light over the graticule.

Applications

Both the amplifier and the time base generator of the GM 5603 have been designed to make this oscilloscope especially suitable for measurements and observations in connection with pulse techniques. The d.c. coupled amplifier not only makes it possible to reproduce d.c. levels, but also prevents the amplifier from being blocked after overdrive. Hence it is possible to observe small signals immediately following large voltage variations without distortion. By making use of the differential input, signals applied in phase can be attenuated to a very great extent. This advantage becomes particularly apparent during measurements which have to be carried out free from earth.

The signal delay makes it possible to reproduce the whole leading edge of a pulse by means of which the time base is started.

When viewing complex signals, the very stable triggering with adjustable trigger level is of particular importance.

The use of a 10-kV accelerating voltage ensures sufficient brilliance to enable signals with fast rise-times to be observed at a low p.r.f.

The probes supplied with the oscilloscope serve to reduce the load on the test point. By making use of cathode-follower probes, measurements can be carried out with low input capacitance and full sensitivity.

The attenuator probes give an even greater input impedance at a sensitivity which is ten times lower. The inputs of the oscilloscope and the outputs of the probes are adjusted to the same impedance, in order that the probes may be interchanged.

Technical data

Cathode-ray tube

5 inch (13 cm) tube with spiral post-acceleration anode.

Accelerating voltage 10 kV

Type	Colour	After glow
DN 13-79 (standard)	green	medium
DB 13-79	blue	short
DP 13-79	yellow-green	long
DH 13-79	green	short

VERTICAL AMPLIFIER

Input selection

Input I asymmetrical, input II asymmetrical, or I-II

differential. In all positions d.c. or a.c. coupling is possible.

Frequency range

D.C. coupled 0 to 14 Mc/s
A.C. coupled 1 c/s to 14 Mc/s (3 dB \pm 1/2 dB)
Rise time 25 μ sec

Sensitivity

50 mV/cm if a cathode-follower probe is used

Attenuator

The sensitivity is adjustable in seven calibrated steps from 50 mV/cm to 5 V/cm.
The continuous attenuator has a range of control of 2.5 : 1 (uncalibrated).

Measuring accuracy

3 % absolute

Input impedance

1 M Ω in parallel with 22 pF

Input voltage

Maximum 20 V_{p-p} about earth level
The maximum d.c. component in the case of a.c. coupling is 300 V

Probes

See separate specification

Rejection factor

300 \times for frequencies up to 100 kc/s

Signal delay

A symmetrical delay line of 0.3 μ sec is included in the amplifier

Maximum deflection

The vertical deflection is undistorted for a picture height of 4 cm about the centre of the tube

Magnification

Every part of a picture magnified to 12 cm can be made visible on the screen

Calibrating voltage

For the adjustment of the sensitivity of the vertical amplifier and of the square wave reproduction of the probe a square-wave voltage is available

Amplitude

3 V_{p-p}, maximum error 1 %

Frequency

Approximately 2000 c/s

HORIZONTAL AMPLIFIER

Frequency range

D.C. coupled: 0 ... 1.8 Mc/s
A.C. coupled: 1 c/s ... 1.8 Mc/s (3 dB \pm 1/2 dB)

Sensitivity

Continuously adjustable between 1 V/cm and 5 V/cm

Input impedance

1 M Ω in parallel with 35 pF

Input voltage

Maximum 40 V_{p-p} about earth level
In the case of a.c. coupling the maximum d.c. component is 300 V

Magnification

Every part of a picture magnified up to 50 cm can be made visible on the screen

TIME BASE GENERATOR

Time scale

21 calibrated time scales between 0.2 μ sec/cm and 1 sec/cm (1 - 2 - 5 series). Continuous adjustment 2.5 : 1

Accuracy

3 % with the exception of the lowest and highest ranges, where the error may be maximum 6 %.

Magnification

Calibrated in steps 2 \times and 5 \times , or continuously, uncalibrated, up to maximum 5 \times . Maximum error 3 %, with the exception of the 0.2 and 0.4 μ sec range, where the error may be max. 6 %.
With maximum magnification the shortest time scale is 40 μ sec/cm.

Length of the time base

10 cm when not magnified

TRIGGERING AND SYNCHRONIZATION

The time base can be synchronized or triggered from positive or negative slopes; it may also function free-running. The trigger level and the synchronizing amplitude are adjustable.

Trigger-sync. possibilities

Internally from the vertical amplifier, internally with mains frequency or externally

Signal required for triggering

Internally 5 mm displayed signal, externally 0.5 V for frequencies from 5 c/s to 2 Mc/s

H.F. synchronization

Voltage required: internally 5 to 30 mm displayed signal, externally 1 to 2.5 V for frequencies up to 14 Mc/s.

Trigger-Sync. input

Input impedance: 300 k Ω in parallel with 35 pF

Starting time

The effective delay obtained with the aid of the delay line is approximately 100 μ sec

HORIZONTAL DEFLECTION WITH MAINS VOLTAGE

The horizontal amplifier can be switched to a sinusoidal voltage with mains frequency. The phase of this voltage can be adjusted over $2 \times 150^\circ$.

BEAM CONTROL

The bright-up during the forward scan of the time base is d.c. coupled

Brightness modulation

Voltage required: 15 V_{p-p} for frequencies between 5 c/s and 500 kc/s. Input impedance 1 M Ω in parallel with 120 pF

Brightness control and correction of astigmatism

Controls available on the front panel

MEASURING GRID

The measuring graticule has an illuminated scale of 10 \times 4 cm

The illumination is continuously variable

SUPPLY

Mains voltages

110 - 125 - 145 - 200 - 220 and 245 V

Mains frequency

40 ... 60 c/s (for frequencies < 50 c/s only at nominal mains voltage)

Power consumption

420 W

Power for the cathode follower probes is obtained from the oscilloscope

DIMENSIONS AND WEIGHT

Height 40 cm

Width 30 cm

Length 60 cm

Weight 35 kg

VALVES AND DIODES

DN 13-79

DY 87 (3 \times)

E 810 F (2 \times)

ECC 88 (2 \times)

PCL 84 (7 \times)

PL 36 (5 \times)

85A2

OA 70 (6 \times)

ECF 80 (3 \times)

EF 184 (4 \times)

EL 81

PCF 80 (14 \times)

OA 81

OA 202

OA 214 (13 \times)

ACCESSORIES

2 cathode-follower probes GM 4603D/00

2 attenuator probes GM 4601/10

2 adaptors to N-connector

2 measuring cables

Mains cable

Rubber viewing hood

Operating instructions

Cathode-follower probe GM 4603 D/00

The cathode-follower probe can be used either d.c. or a.c. coupled at option. For a.c. coupling two screw caps are supplied per probe; these caps contain coupling capacitors of different values. The small coupling capacitor offers the advantage of having a lower input capacitance; a large capacitor ensures a lower minimum of the band width. The probe is fed from the oscilloscope.

Technical data

Sensitivity

If used with the oscilloscope GM 5603: 50 mV/cm. (On delivery the sensitivity of the oscilloscope has been adjusted for the combination, error 3 % max.)

Band width

In combination with GM 5603

- D.C. to 14 Mc/s ($3 \text{ dB} \pm 1/2 \text{ dB}$).
- A.C. coupled with large blocking capacitor: 1 c/s to 14 Mc/s ($3 \text{ dB} \pm 1/2 \text{ dB}$).
- do— with small blocking capacitor: 100 c/s to 14 Mc/s ($3 \text{ dB} \pm 1/2 \text{ dB}$).

Input impedance

- Directly connected $0.5 \text{ M}\Omega$ in parallel with 5.5 pF
- With small coupling capacitor
 $0.5 \text{ M}\Omega$ in parallel with 7 pF
- With large coupling capacitor
 $0.5 \text{ M}\Omega$ in parallel with 10 pF

Maximum permissible voltage

20 V_{p-p} about earth level

The maximum permissible d.c. component on the blocking capacitors is 300 V



Cathode-follower probe GM 4603 D/00

Attenuator probe GM 4601 A/10

The pin of the probe has a diameter of 4 mm and is provided with a jaw construction which can be opened by pressing together the two flanges surrounding the casing. The square-wave reproduction of the attenuator can be adjusted by turning one of the flanges with respect to the body.

Technical data

Attenuation

10 : 1 (with respect to the sensitivity obtained when

the cathode-follower probe is used)

Accuracy

Maximum error 2 %

Input impedance

10 M Ω in parallel with 8 pF

Maximum input voltage

(Used with the oscilloscope GM 5603)
maximum 200 V_{p-p} about earth level



Attenuator probe GM 4601 A/10