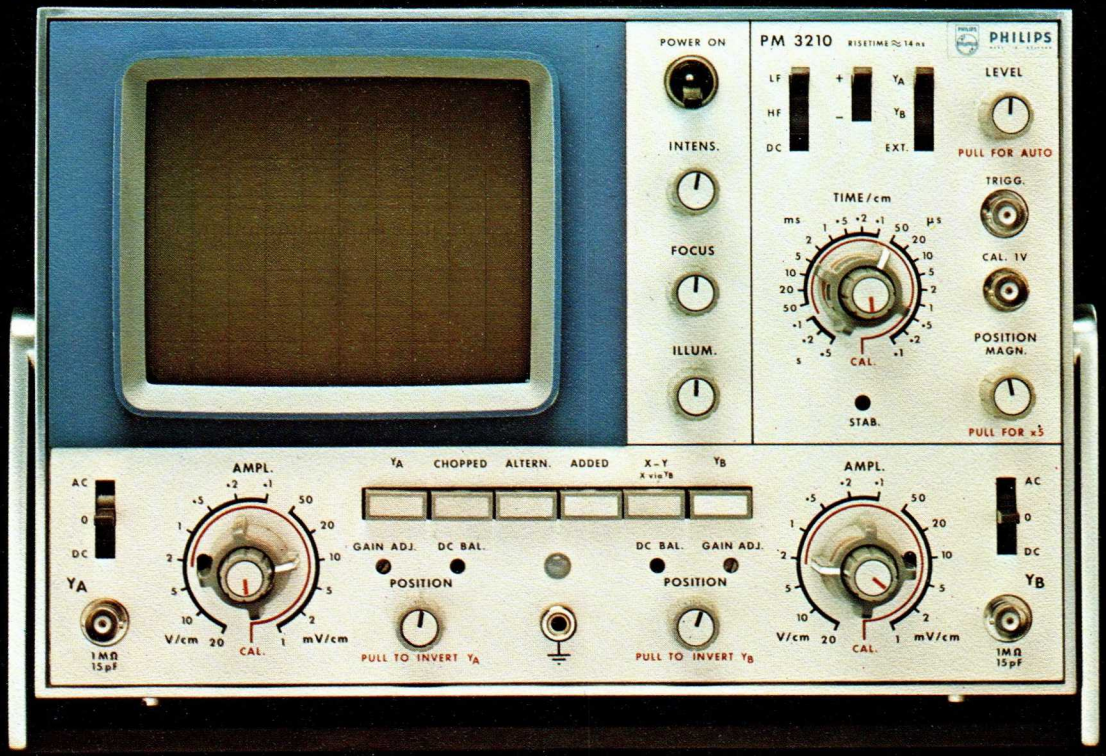
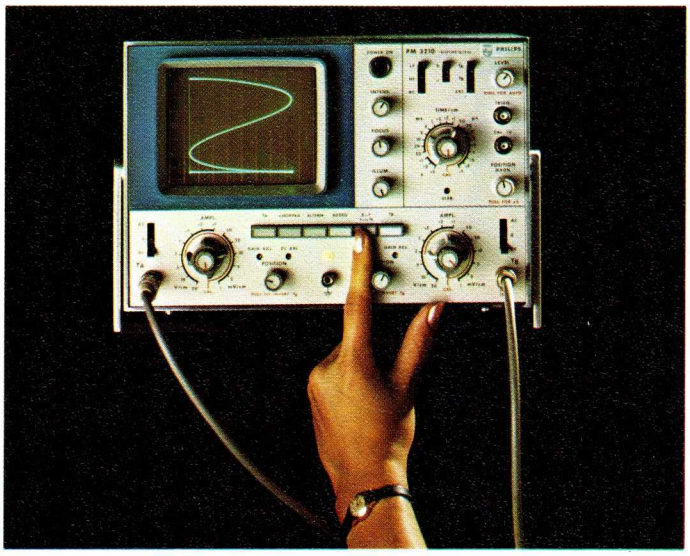
D14-120

PHILIPS

THE PORTABLE 25 MHz ALL-ROUNDER



The portable 25 MHz All-rounder, type PM 3210



Above photo illustrates the very high standard of ergonomic design. All main controls are prominent, easy to use and read. Operation mode is by push-button selection.

For accurate and versatile X-T, X-Y and HF pulse applications you need a 'scope with a lot of features. Like high sensitivity, low input capacitance, twin delay lines, negligible dc drift, unambiguous triggering, etc.
The new PM 3210 has all these features yet manages to be competitively priced. Without them you'll be limited in application and accuracy. But what is worse, you might not realise it.

Unbeatable 1 mV sensitivity all the way to 25 MHz

You may not think you need 1 mV/cm because you've got used to 5 or 10. But you'll find it very useful for examining waveform detail and indispensible for applications that need a probe.

Most passive probes attenuate by 10 : 1, and sensitivities of 50 or 100 mV are generally unacceptable, so FET probes were the only alternative. However FET probes are bulky, need to be supported and add noise to the measurement.

Now with the PM 3210 you can use a passive probe and stay with the kind of sensitivity you need at the probe tip: 10 mV.

Low 15 pF input capacitance eliminates leading edge distortion

Most general-purpose 'scopes are content with an input capacitance of 30 - 40 pF. For high-frequency applications, particularly in high impedance systems, this can produce serious distortion.

In the PM 3210 the input circuitry has a special "bootstrap" design that reduces the capacitance to 15 pF.

Delay lines in both channels give unique X - Y measurements

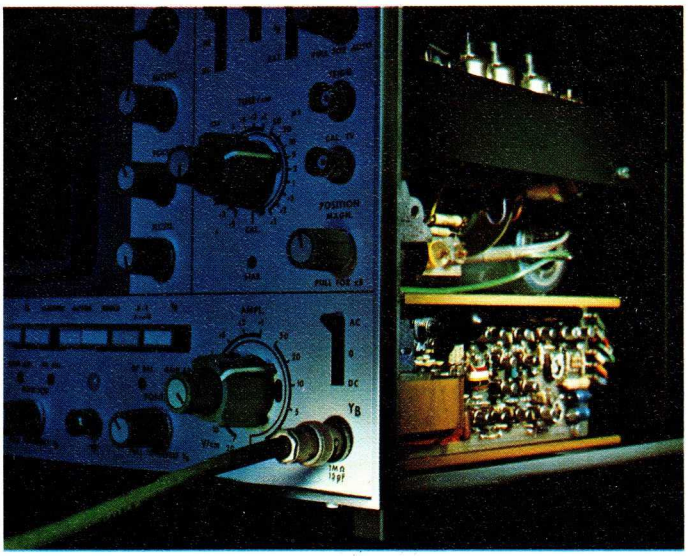
One delay line is common – you need it to see fast leading edges. But unless **both** channels have the **same** delay, it is obvious that for X - Y measurements the phase error will be considerable. Above a few kHz such displays are virtually meaningless, but unfortunately this is not always realized.

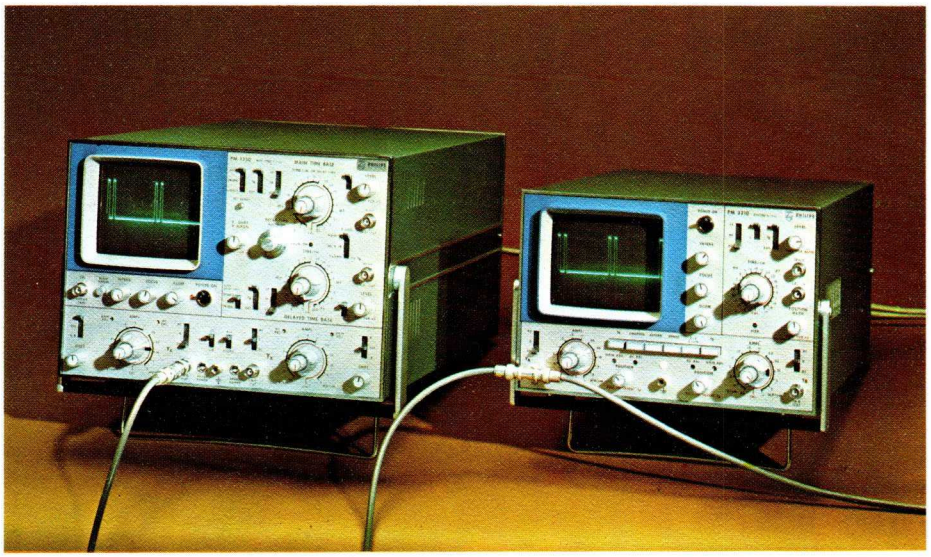
With the PM 3210 accurate X - Y measurements can be made up to 5 MHz with only 2° of phase shift error. We consider this simple but unique feature vital to any 'scope that claims to be general-purpose. And that coupled with the fact that it can employ interchangeable vector-display and phase-angle measurement graticules apart from its standard graticule, permits the PM 3210 to be used for vector display, X-Y plotting of semi-conductor curves, phase measurements etc.

More features too numerous to detail

The PM 3210 has many more necessary features that we can only mention. The high 1 mV sensitivity is combined with negligible dc drift (it needs to be). Balance correction problems on both the instrument's vertical channels are eliminated through use of drift-compensation circuits in the first stages of the pre-amplifiers. The display is on a large 8 × 10 cm screen but the actual 'scope is extremely compact. A high 500 kHz chopping rate is used, so there's less need to use the alternate mode.
Triggering is accurate and unambiguous (see diagram opposite for details).
And finally, the fast push-button selection of all 6 operating modes, that indicates the very high standard of ergonomic design that has gone into the genuine all-round performance oscilloscope.

Photo below shows the special "bootstrap" input circuitry that gives the low 15 pF input capacitance, instead of the normal 30 - 40 pF.



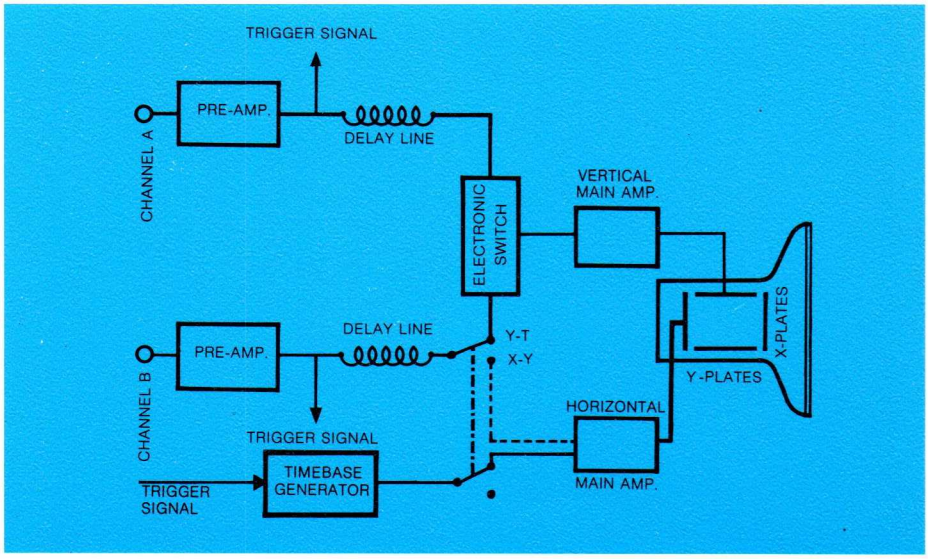


A very wide range of service applications – particularly for computers and electronic office machines – are covered by the combination of the 50 MHz/2 mV PM 3250 (left) and the 25 MHz/1 mV PM 3210.

More of the Philips range

Unit	Bandwidth	Sensitivity
PM 3221 *	10 MHz	10 mV/cm
PM 3200	10 MHz	2 mV/cm
PM 3230 [1])	10 MHz	20 mV/cm
PM 3231 [1]) *	15 MHz	10 mV/cm
PM 3250 [2]) *	50 MHz	2 mV/cm
PM 3370 [3]) *	150 MHz	1 mV/cm
PM 3400 [4]) *	1.7 GHz	1 mV/cm

[1]) real dual beam
[2]) double trace
[3]) plug-in
[4]) sampling
* with delay lines



The circuit of the PM 3210, with two delay lines and trigger pick-off before the switch and direct from either of the signals to be measured. This ensures the correct signal display. Note that in the X - Y position, indicated by the dotted lines, channels A and B have the same delay. In the conventional circuit only channel A has a delay line and thus accurate X - Y measurements cannot be made other than at very low frequencies, if at all.

Accessories

PM 9326, 10 : 1 Probe set
With 1.15 m cable.

PM 9327, 10 : 1 Probe set
With probe cable of 2 m

PM 9350 Passive probe 10 : 1

Rise time (probe only) < 2 ns

PM 9380 Oscilloscope camera

A quick and easy to operate Polaroid camera. The operator can simply hold the camera combination against the screen, press the trigger and remove.

PM 9373 Additional lens
For PM 9380 in use with PM 3210 oscilloscope.

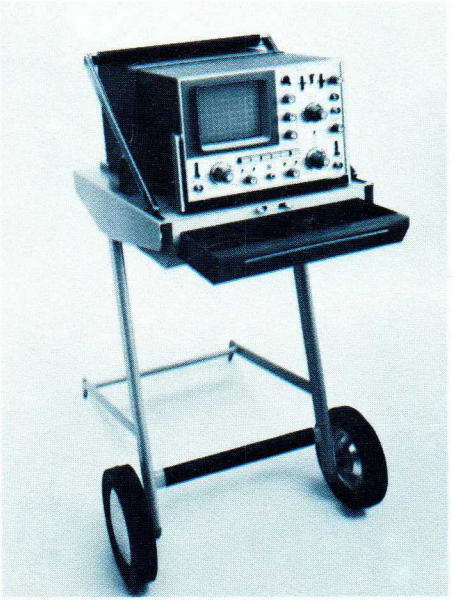
PM 9395 Collapsible trolley

The tray is adjustable in 20° steps over a wide arc, giving a total of 18 positions. Thus the screen of the oscilloscope can be viewed from almost any servicing angle. A drawer under the tray can be used to store probes and other small accessories.

PM 9361 Rackmount adaptor

PM 9378 Adapting flange
For PM 9380 when used with PM 3210 oscilloscope.

PM 9396 Carrying case



TECHNICAL DATA

Y-AXIS

Two identical amplifier channels A and B. The polarity of both channels can be inverted.

Bandwidth
DC: 0 Hz ... 25 MHz (—3 dB)
AC: 2 Hz ... 25 MHz (—3 dB)

Rise time 14 ns

Deflection coefficients 14 calibrated ranges from 1 mV/cm to 20 V/cm in 1-2-5 sequence. A vernier provides uncalibrated, continuous control between the ranges.

Measuring accuracy ± 3 %

Input impedance 1 MΩ//15 pF

Input RC time with AC coupling 100 ms

Maximum input voltage 500 V (AC + DC peak)
Maximum deflection for sine wave signals with frequencies up to 10 MHz, the vertical deflection is undistorted for a total ampli-

tude equivalent to 24 cm. With the aid of the shift controls, the peaks of such a signal can be displayed.

Signal delay delay time for each channel: 170 ns; visible delay: at least 20 ns.

DC shift at maximum sensitivity ½ cm/hour at a constant ambient temperature of 25 °C (77 °F)

Display modes
- channel A only
- channels A and B chopped the display time for each channel being 1 μs
- channels A and B alternate
- channels A and B algebraically added. Using the polarity inversion of both channels, the following displays are possible: (A + B, A — B, B — A, — A — B) common mode rejection factor: 100 (from 0 Hz to 1 MHz, after adjustment of GAIN ADJ)
  Maximum signal per channel: 24 × attenuator setting
- X—Y operation. Channel B forms the horizontal channel
  Bandwidth: O Hz ... 5 MHz with a phase difference of 2°
  at maximum between the channels.
  Maximum deflection in X direction: 6 cm for cine-wave signals with frequencies up to 5 MHz
- channel B only

Y signal output approximately 200 mV/cm. The output is protected against short circuits.

CALIBRATION

Calibrated voltage 1 V ± 1 %, square wave

Frequency approximately 2.5 kHz

TIME AXIS

Time coefficients 21 calibrated ranges from 100 ns/cm to 0.5 s/cm, in 1-2-5 sequence. A vernier provides uncalibrated, continuous control between the ranges.

Measuring accuracy ± 3 %

Magnifier 5 × (50 cm) Any 10 cm of the expanded sweep can be displayed. The maximum effective time coefficient is 20 ns/cm. The measuring accuracy with expanded sweep is ± 5 % (measured between 10 % and 90 % of the time base sweep).

Time base output 5 V, sawtooth voltage. The output is protected against short circuits.
Output resistance: 2 kΩ
Load: with an R_{load} 5 kΩ and a C_{load} 100 pF the deviation of the time coefficient is less than 10 %.

TRIGGERING

Trigger system The time base generator operates in the triggered mode when an input signal is applied. An auto circuit can be switched in to provide a time base line in the absence of an input signal
Trigger source channel A, channel B or external source

Trigger slope + or —

Trigger coupling
in position LEVEL

DC: 0 Hz ... 25 MHz
HF: 10 kHz ... 25 MHz

in position AUTO
DC: 10 Hz ... 25 MHz
HF: 10 kHz ... 25 MHz
LF: 10 Hz ... 10 kHz

Trigger sensitivity and bandwidth

	0 Hz - 10 MHz		10 Hz - 10 kHz		10 kHz - 5 MHz		5 MHz - 15 MHz		15 MHz - 25 MHz	
	INT.	EXT.	INT.	EXT.	INT.	EXT.	INT.	EXT.	INT.	EXT.
LF	—	—	0.5 cm	0.5 V	—	—	—	—	—	—
HF	—	—	—	—	0.5 cm	0.5 V	1 cm	0.5 V	3 cm	1 V
DC	0.5 cm	0.5 V	0.5 cm	0.5 V	0.5 cm	0.5 V	1 cm	0.5 V	3 cm	1 V

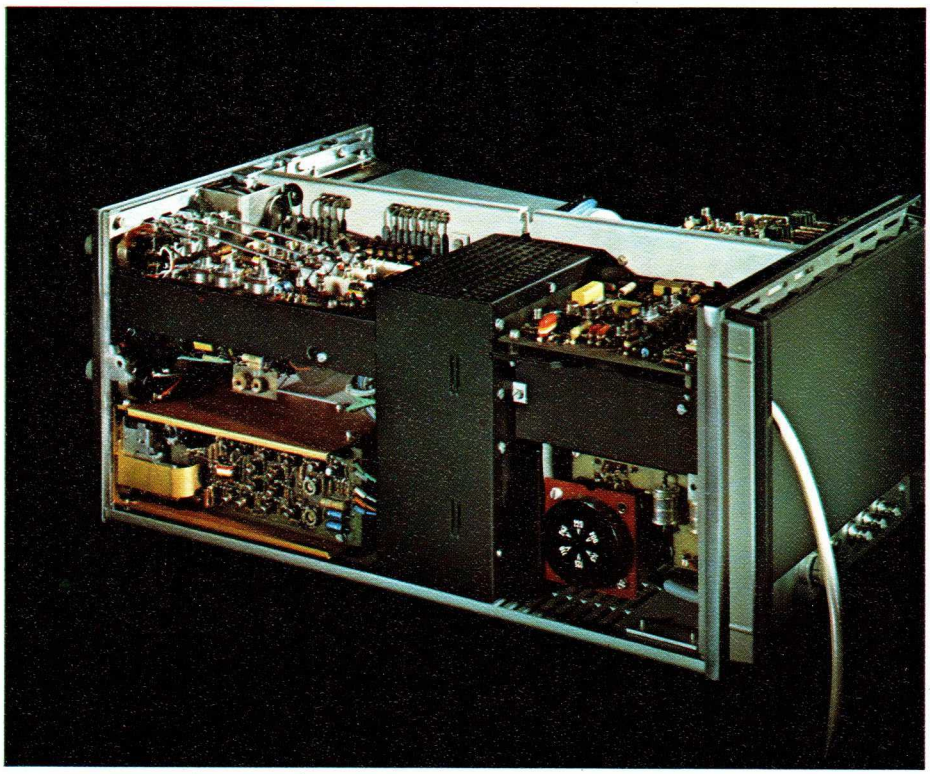
Input impedance of the external trigger input 1 MΩ//40 pF

Maximum input voltage 500 V/ (DC + AC peak)

Level range (measured with 10 kHz signal and continuous attenuator in position CAL.)
- internal level: more than 16 cm
- internal auto: approx. 3 cm
- external level: more than 10 V_{p-p}
- external auto: approx. 1.5 V_{p-p}

C.R.T.

Type D14-120 GH with medium short persistence phosphor * (P 31); 10 kV acc. Volt.
Useful screen area 8 cm × 10 cm
Graticule external, with cm-divisions and 10% and 90% dotted lines



Z-MODULATION

Internal unblanking by time-base generator. In position CHOPPED the beam is suppressed during switching

External DC coupled
Required voltage 5 V_{p-p}
(50 V_{p-p} at maximum)

Short term overload 500 V_{p-p} at maximum

Input impedance approx. 10 kΩ//20 pF

Bandwidth 0 Hz ... ...10 MHz

SUPPLY PART

Mains voltage 110 ... 245 V (± 10 %)

Mains frequency 46 - 400 Hz

Power consumption 95 W

ENVIRONMENTAL CONDITIONS

The instrument can be used in any position

Temperature range
Operating within specification: 0 ... +45 °C
Operating: —10 ... +55 °C
Storage: —40 ... +70 °C

OVERALL DIMENSIONS AND WEIGHT

Height 20 cm
Width 30 cm
Depth 43 cm
Weight 13 kg

* Instruments fitted with GM (P 7) long persistence phosphor are available under type number PM 3210G

Printed in The Netherlands -