N·O·T·E·B·O·O·K

200MHz SCOPE
PM3320

FAST 200 MHz DIGITAL SCOPE WITH 250 MS/s

FINAL PHILIPS DESIGN

Breaking the barriers in digital storage oscilloscope performance

PHILIPS

PHILIPS Test & Measurement

The design challenge: a new concept in digital storage oscilloscopes

__High-tech. specification:__ analog bandwidth 200 MHz, sampling rate 250 MS/s for 4 ns single-shot resolution and synchronous clocking for 2 channels, 10-bit vertical resolution;

__New, easier-to-use front panel__ using a combination of direct-action keys and softkeys for fast, clear and secure selection of over 150 functions;

__Semi-automatic measurements:__ a single measurement or a sequence of measurements must be repeatable without the need to reset the controls;

__Automatic measurements:__ the oscilloscope must be completely remote-controllable via IEEE-488 (IEC 625) bus, RS-232 interface and even over a long distance (by telephone). Programming must be simple and easy to understand.

__Make use of the full bandwidth:__ if the timebase speed requires a sampling frequency above that of the ADC, a good equivalent sample system is needed to store, analyze and measure signals at full bandwidth;

__Pre- and post-triggering:__ as well as post-triggering, pre-triggering must also be possible, for example when timebase speed requires equivalent sampling;

__Fast detail search at full resolution:__ a built-in system must be able to search for signal details quickly, after which these can be recorded at full bandwidth;

__Separate display areas for text and traces:__ the trace display area is kept free of text, except for channel identification. And the separate text display area is free of traces, for clear reading.

__Autoset:__ the Philips multi-parameter Autoset function makes conventional beamfinders look outdated and inadequate! Autoset sets timebase, amplitude and triggering, for instant and optimum display of input signals.

With the PM 3320, our design team started with a clean sheet. But also with a lot of experience in high-speed sampling techniques. The challenge? To create a new concept in digital storage oscilloscopes. In performance. In speed. In ease and security of operation.

250 MS/s sampling (4 ns); 10-bit vertical resolution

The result is a high-technology instrument that sets the new standard in leading-edge digital storage oscilloscopes. With a 200 MHz bandwidth, and a 250 MS/s sampling rate giving a 4 ns single-shot resolution, plus glitch-catcher circuitry to reveal 3 ns wide spikes if lower timebase speeds are required, PM 3320 is made-to-measure for the most demanding applications, like R&D and production-line quality control.

Choice of waveform displays

The central 8x10 cm area of the 10x12 cm screen is reserved for an uncluttered display of the waveforms. Channel identification is provided for each trace. The top two lines of the screen always show actual acquisition parameters, along with the measured results.

The softkeys in the right margin of the screen allow selection of traces from each of the four memories, or of their inverted displays. Also, the position controls can be assigned the function of influencing the entire display, or selected individual traces only.

In addition, the bottom two lines can either show additional actual acquisition parameters, or can present the full acquisition settings which were valid at the moment of recording.
This information is stored for all waveforms in each of the registers.

Autoset plus 8 x 10 cm dedicated signal area

It goes without saying that PM 3320 has Philips' established Autoset function for instant signal display. In addition, softkeys provide simple, direct access to over 150 functions from on-screen menus.

Those menus won't disturb the recorded waveform, since the 10 x 12 cm tube has a regular-size 8 x 10 cm signal display area and separate, dedicated information fields: softkey assignments at the right, settings, status and instant read-outs of cursor measurements at the top, and waveform-specific parameters at the bottom.

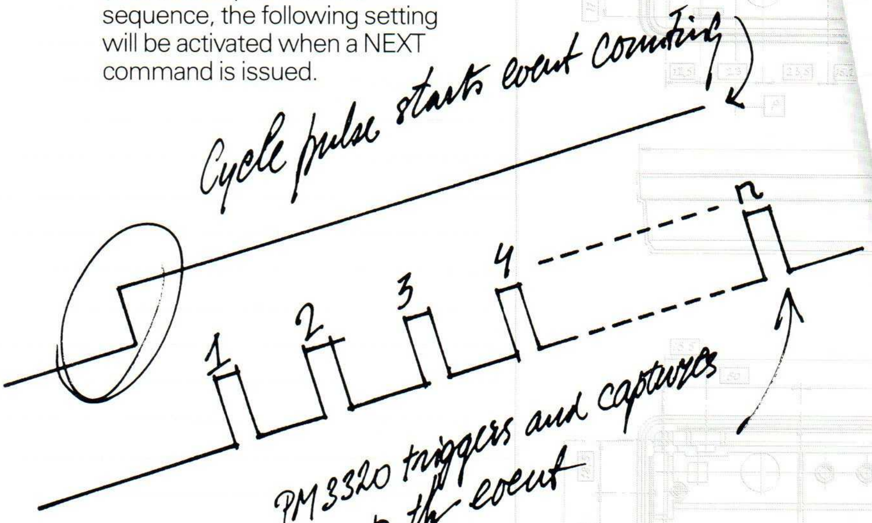
All without any loss of 'trace space', ensuring that signal information always has optimal legibility.

77 stored front-panel settings

No less than 77 combinations of front-panel settings can be stored under individual numbers.
The stored settings can be recalled instantly whenever they are needed, saving setting-up time and simplifying operation. The procedure for saving and recalling settings is clearly indicated by the softkey labels.

These front-panel settings can if required be combined, so that sequences of measurements can be carried out automatically. Within one sequence, the following setting will be activated when a NEXT command is issued.

FINAL PHILIPS DESIGN



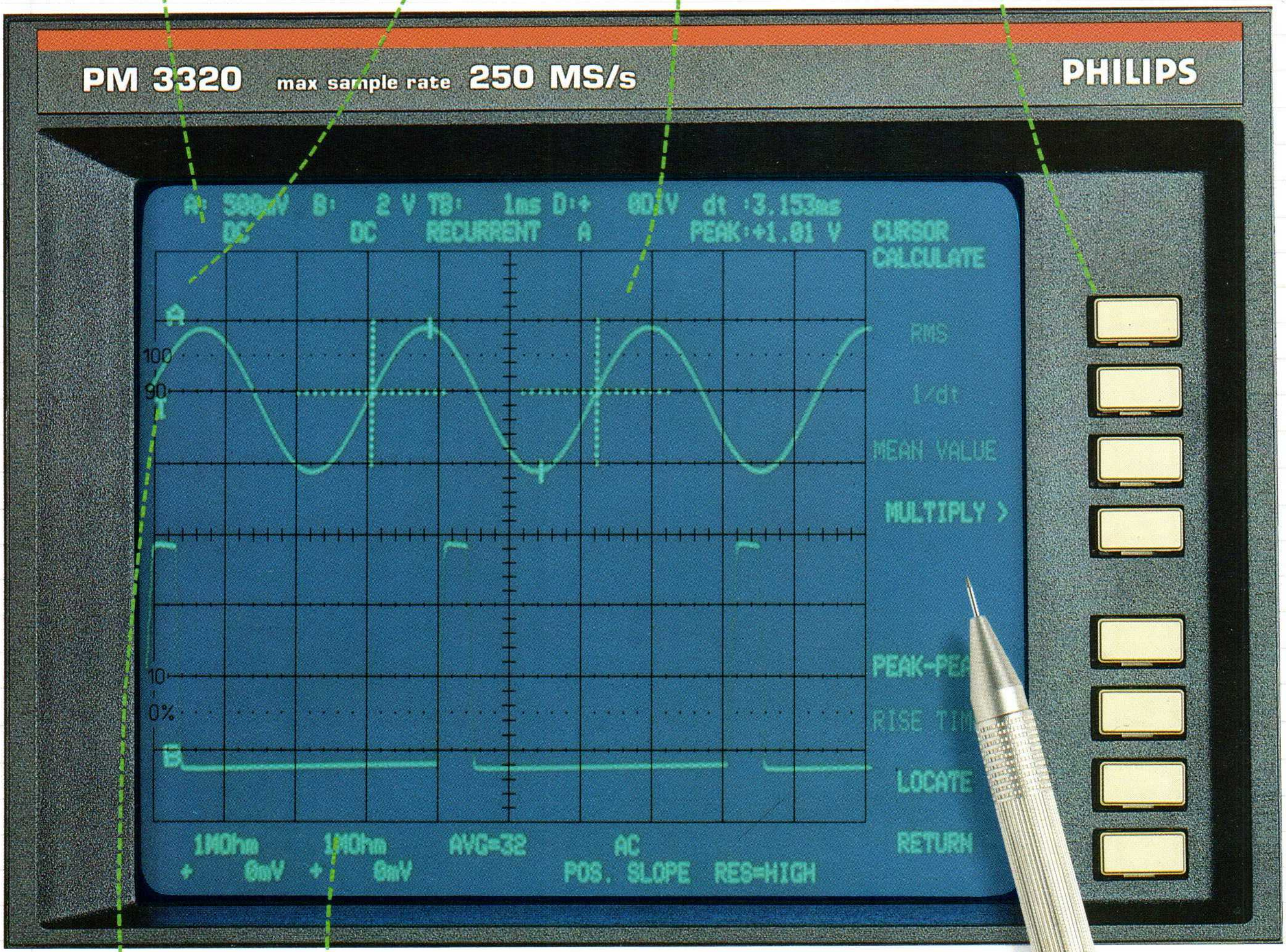
High-resolution signal capture and informative display presentation

Dedicated, switchable text display fields at top and bottom for at-a-glance information on 'scope status, settings and cursor measurement read-outs

Clear channel indications on the displayed signals themselves

On-screen cursors for signal measurements with direct on-screen read-outs of results

Eight softkeys with separate text display field for softkey labels at right of screen



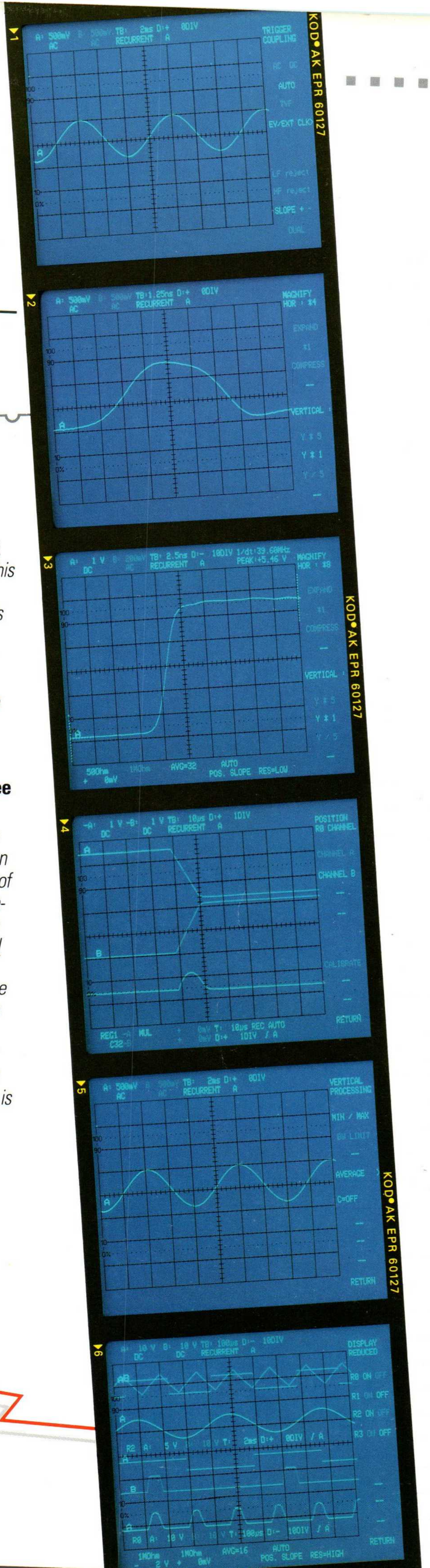
100mm

120mm

Trigger level indication. Shown here is I for Internal (other indications are E = Event, X = External, L = Line).

Large 10 x 12 cm screen CRT with separate 8 x 10 cm signal display area

Autoset
Another way in which Philips leads the way in oscilloscope ease and speed of operation: the Autoset function automatically sets timebase, amplitude and triggering to bring any input signal within range and onto the display instantly.



1,2 | See both the ns pulse and the ms carrier

A 3 ns glitch hidden in a lower-frequency signal can be detected with the MIN/MAX active. The low-frequency signal is recorded and the glitch is made visible. If a faster timebase setting is selected, the glitch can be captured with a 100 ps resolution, so that the pulse is built-up of 30 samples.

3 | Capture and store the 200 MHz (1.75 ns) signal

PM 3320's 200 MHz bandwidth and 1.7 ns risetime must be capable of being used in the required application. Above the timebase speed at which the maximum sampling rate is used (200 ns/div), the oscilloscope automatically makes use of a random sampling system. This means that the oscilloscope's own risetime can be stored, while even at these high speeds pre-triggering can still be performed.

4 | Measure and multiply the signals

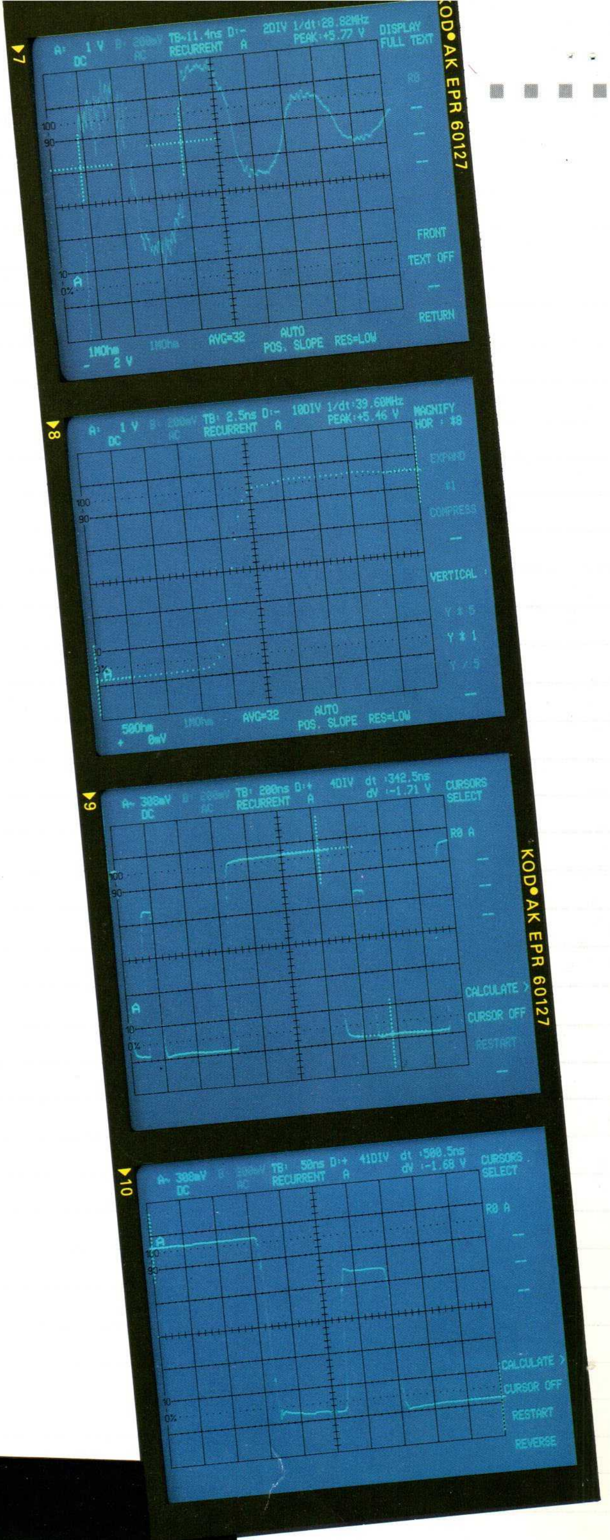
Measurements can be made on-screen and on-line. The time and voltage can be read-out directly from the screen, and the built-in data processing unit can calculate frequency, risetime, peak-peak, RMS and mean values, as well as carrying out ongoing multiplication, thereby allowing both the original signals and their products to be displayed.
Extra markers can indicate samples with which the maximum and minimum values, or the 10% and 90% values, of the risetime can be measured.

5 | 10-bit or 50 uV (0.1%) vertical resolution

The ADC has a 10-bit vertical resolution, allowing an absolute accuracy of 50 uV to be achieved. Normally, with oscilloscopes of this bandwidth the natural noise is relatively high, even if the input is properly matched to 50 ohm. However, the average mode can reduce this noise, allowing the available vertical resolution to be used optimally.

6 | Keep what you catch - and see what you keep!

PM 3320 has three extra, built-in memories. Signals that have been recorded can be copied into one of these memories. Cursor measurement can be performed on these stored waveforms. In addition, all parameters belonging to these waveforms are stored, and can be displayed. A choice can be made from a display of virtually all parameters from one register, or brief information from more than one register (or both - the choice is yours!).



7,8 | **The truth - and nothing but the truth!**

In many situations, it's reassuring to know that the trace displayed on PM 3320's screen looks like that of a conventional analogue oscilloscope.
For this reason, the dots are often interpolated; sometimes linearly, and sometimes with filtering. If too few measured samples are available in the memory, more dots are calculated and inserted between the measured dots. However, at any time it only takes a press of the DOTS button to suppress the interpolated dots and show only the real measured samples.

9 | *RESTART improves performance of the function referred to as delayed timebase (DTB): just set the cursors on the part of the trace to be examined in more detail, push the RESTART key...*

10 | *...and on the next trigger pulse, an extended-resolution recording of the selected part of the trace will be shown. This action can be repeated by zeroing the cursors and pressing RESTART again. Alternatively, you can go back to the previous setting by pushing REVERSE.*

Hard copies of displayed traces can be made simply and directly via the analog plot output. Or if the interface option is fitted, the digital plot output (IEEE or RS232) can be used.
During analog plotting, a moving dot at the bottom of the screen indicates the progress or plotting. Plotting speed is maximized under software control: if larger amplitude steps are plotted, the speed of plotting decreases, while if the vertical differences are small, the plotting speed will increase. Registers can be positioned individually across the screen, and it is even possible to position individual traces both horizontally and vertically before plotting is started.

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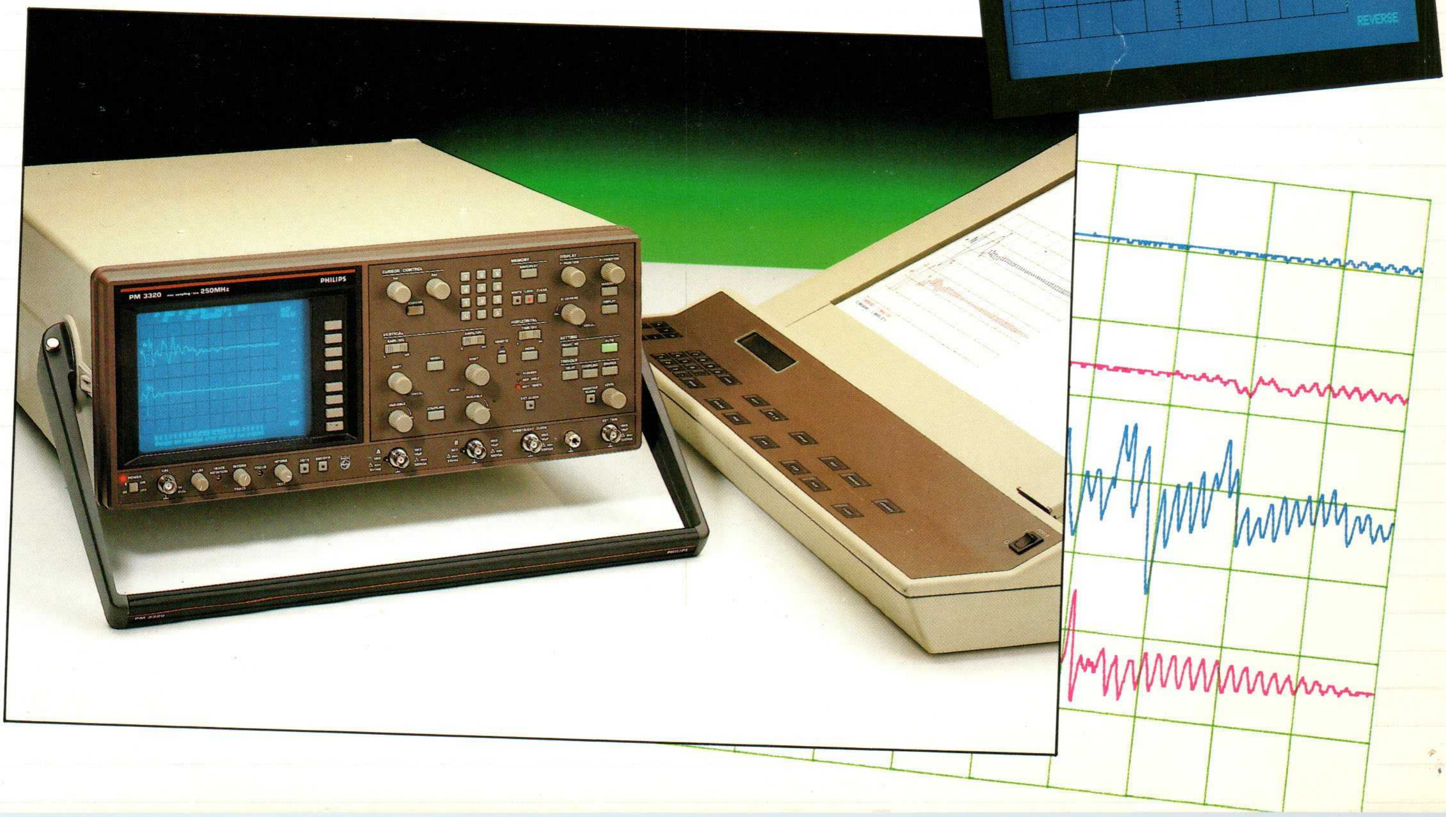
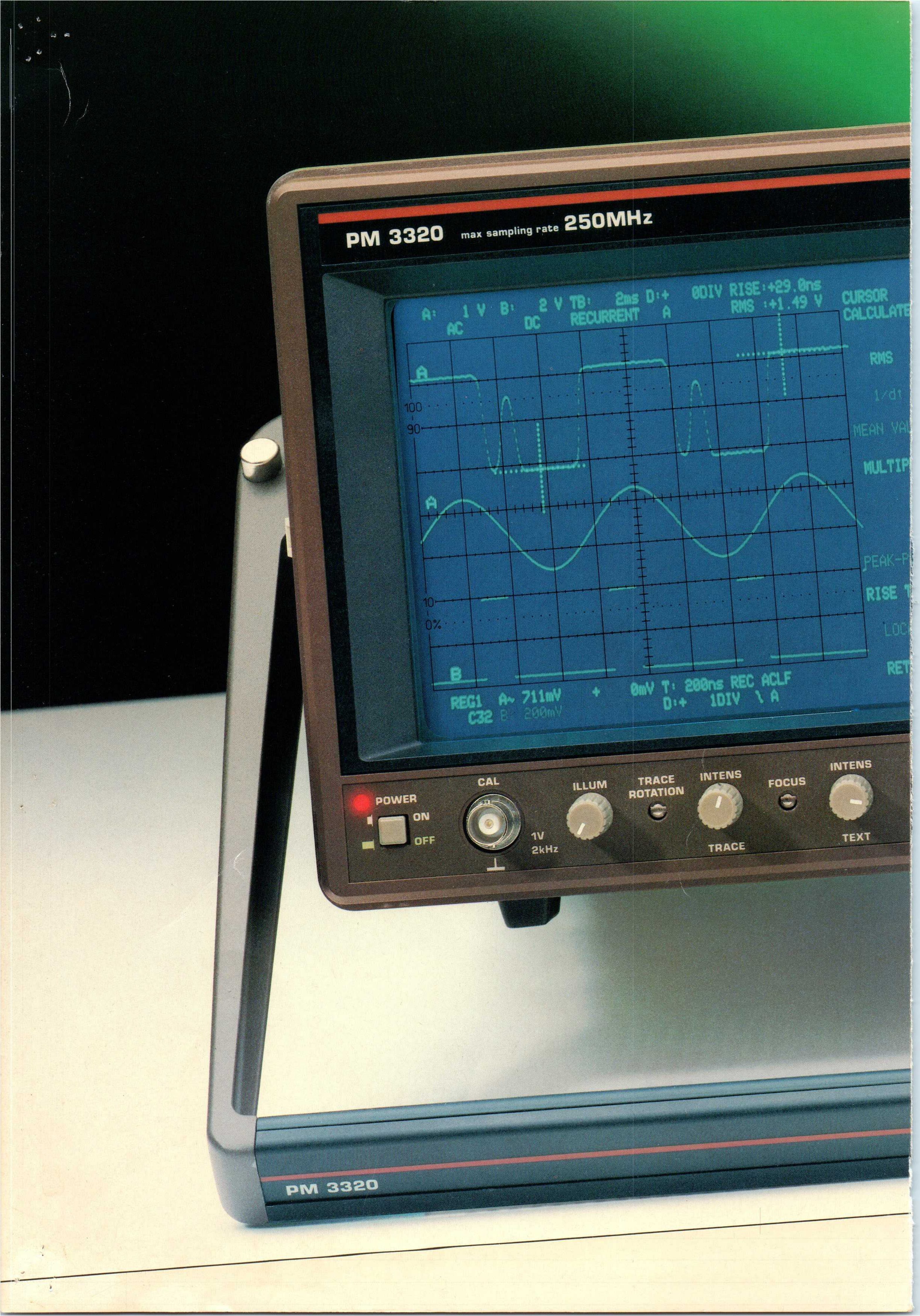
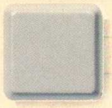



PM 3320
max sampling rate 250MHz
A: 1 V B: 2 V TB: 2ms D:+ 0DIV RISE:+29.0ns
AC DC RECURRENT A RMS :+1.49 V
CURSOR
RMS
100
90
10
0%
REG1 A~ 711mV + 0mV T: 200ns REC ACLF
C32 B: 200mV D:+ 1DIV \ A
POWER
ON
OFF
CAL
1V
2kHz
ILLUM
TRACE
ROTATION
INTENS
TRACE
FOCUS
INTENS
TEXT
PM 3320

- *Fully protected 50 ohm inputs*
- *DC offset variable up to 1000 div.*
- *Probe read-out indicates use of 1 Mohm, 50 ohm, passive or active probes*
- *Four separate memories; each of 4 K*
- *X-expansion around screen centre by up to 128x*
- *Selectable vertical expansion 0.2x or 5x*



A user request (URQ) button is provided to enable communication between PM 3320 and the computer; this function allows the computer to request operator input.

REAL SIZE

- *Logical, rational control hierarchy*
- *Softkeys with on-screen labels give direct access to menus*
- *Setting and status information constantly displayed on-screen*
- *Separate control areas for cursor, vertical and horizontal deflection, memory, display and triggering*
- *Numeric keypad for direct entry of values*

PM 3320 has a new front-panel look in digital storage 'scopes. A logical, functional look, based on a carefully developed control hierarchy that meets users' requirements in practical situations.

Continuously variable functions - vertical and horizontal deflection, cursors and display parameters - are controlled by rotary potentiometers in the familiar way. Functions linked to softkey selections are controlled by rectangular pushbuttons. The relevant on-screen labels appear automatically when a softkey-controllable function is selected. For manual settings, a numeric keypad is provided for direct entry of the desired values.

Memory controls are easily accessible on the front panel, with a lock control to safeguard existing stored signals against unintentional overwriting by new signals.

200MHz SCOPE PM3320

The new look in digital storage front panels

Versatile GPIB control with interface option

```
100 IEC PRINT #8,"FRO 0,VER A,ATT .20E-03"
110 IEC PRINT #8,"REG 0,MSC TRACE,BGN 0,
    END 999,CNT 1,DAT ALL,TRANSFER DECIMAL,
    DAT ?"
120 IEC INPUT #8,S$
```

This lines are required for setting attenuator to 20 milliseconds/div. (LINE 100) and asking 1000 data points from the oscilloscope (LINE 110). Oscilloscope will answer with "DAT 1000, xxx, xxx, etc". DAT 1000 indicates that 1000 data points will be transferred and than the decimal value of the points will be sent, separated by a programmable separator.

PM 3320's optional GPIB* interface provides direct, 2-way communication with a bus controller or personal computer. All functions of PM 3320 - including potentiometers, pushbuttons and softkeys - can be remotely controlled from the system controller.

This facility even makes it possible to download new softkey function assignments to the instrument fully automatically, for example at a particular time, or when a certain stage of a measuring process is reached.

The softkey text labels can also be programmed from the computer, allowing customized user menus to be created freely.

In the same way, messages can be sent automatically from the controller for display on the oscilloscope screen, providing a link between the control program and the operator. Up to 8 lines of text can be sent to the instrument in this way. This facility also makes it possible to transfer instrument warning and error messages - even those not normally displayed on the screen - to the computer.

These may later be valuable in tracing a sequence of measurements or other operations.

The interface allows measurement data to be transferred to the computer for storage.

Or alternatively, known data can be downloaded to the instrument, for example to serve as reference values. Parameters belonging to all 4 memories (a total of up to 8 traces) can be transferred between computer and oscilloscope in both directions.

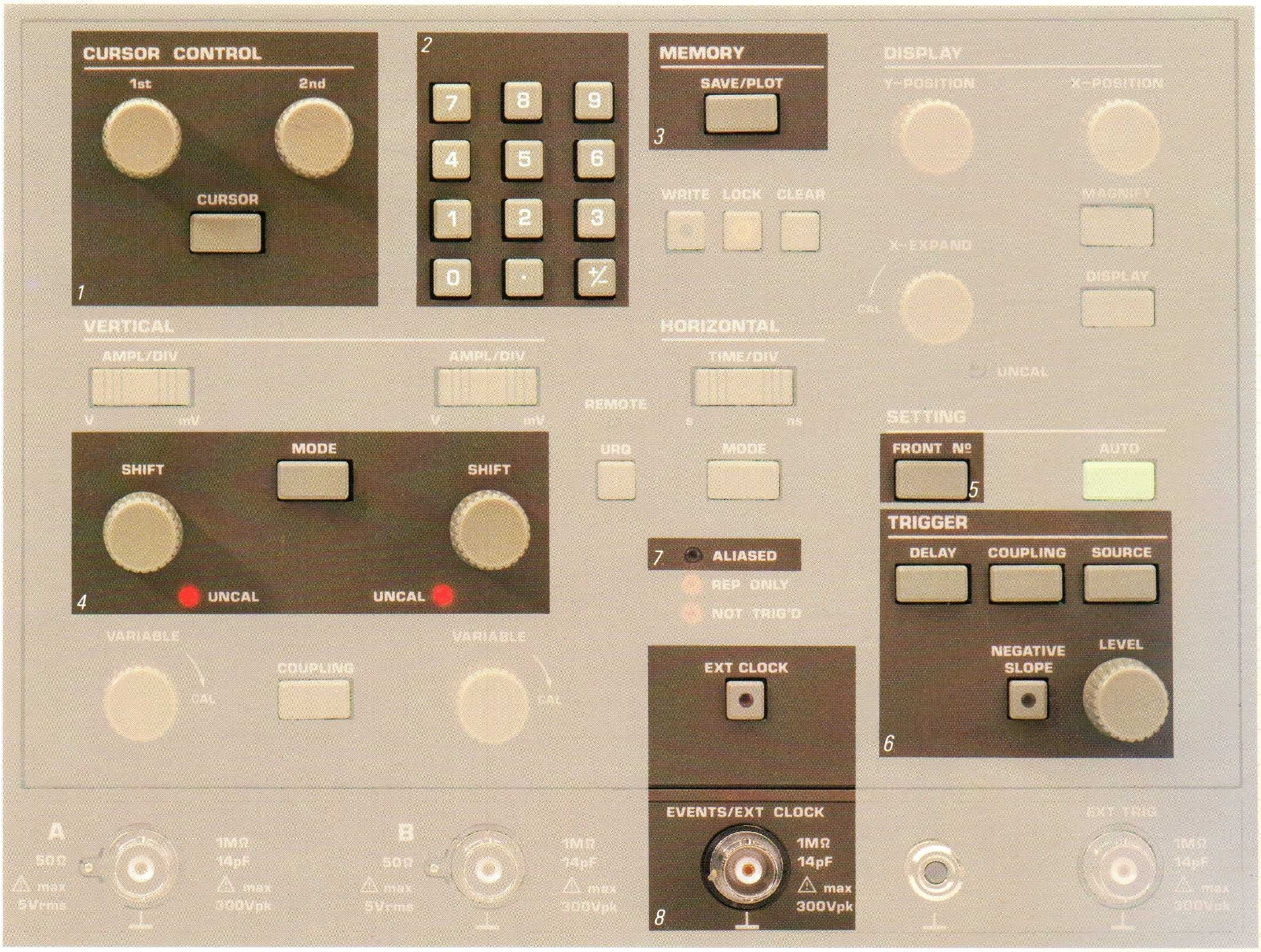
Data transfer between PM 3320 and the computer can be in either decimal or binary form, further increasing the instrument's versatility. Transfer rate is up to 50 KB/s (plus computer-dependent time). Programming of instrument functions is greatly simplified by the use of easy-to-learn commands in mnemonic form.

The bus interface also enables a hard-copy function; at the touch of a key, copies of the screen can be made on a digital plotter.

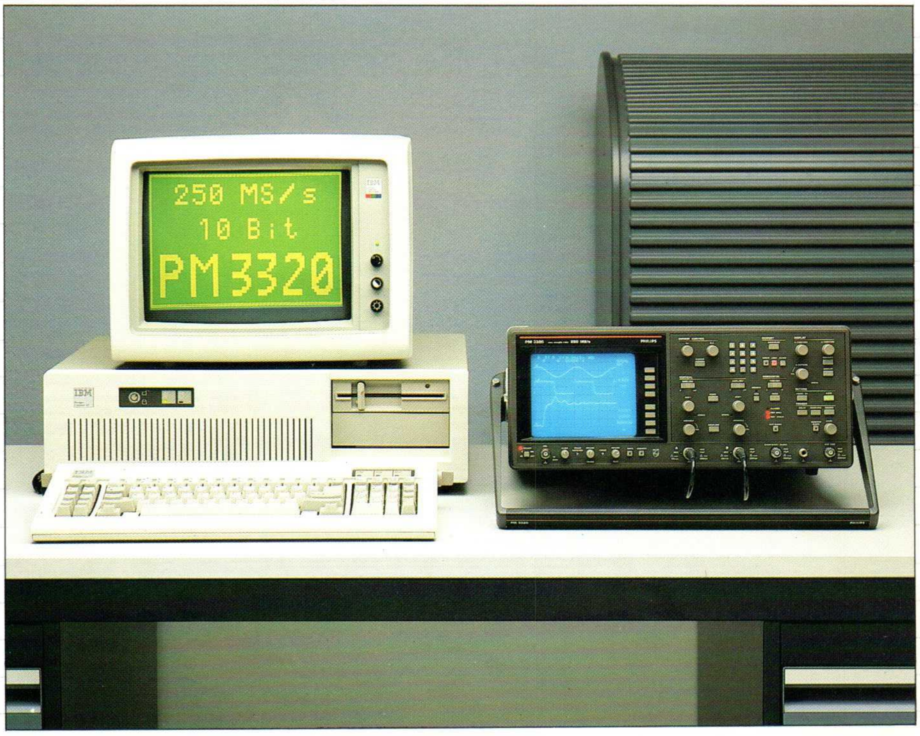
Before copying, the display can be optimized by horizontal and vertical positioning of traces and register contents.

In addition to data transfer via the GPIB, this interface option also includes an RS232 serial port. This opens-up additional communication possibilities; for example remote instrument operation via a telephone link and a modem.

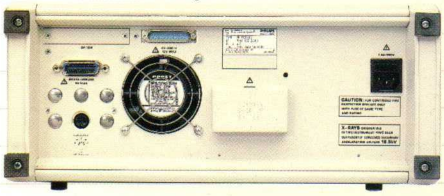
*** GPIB** = General Purpose Interface Bus; equivalent to IEC 625.1 and IEEE 488 standards. MATE-compatible interface version available on request.



1. Two controls, one for each cursor.
2. Direct input of numerical values.
3. Four memories.
4. Shift control for each trace.
5. 77 Front settings.
6. Full trigger control for source and delay.
7. Alias warning.
8. External clock input.



9. I/0 for IEEE-488/RS-232C
10. No voltage selection required and battery back up for memories and settings.



C.R.T.

Philips 180 mm rectangular tube with 16 kV acceleration potential and P31 phosphor (GH).
100 mm x 120 mm usefull screen area.
80 mm x 100 mm for traces.

Read-out
Three separate areas reserved for frontpanel setting information, register parameters en softkey menu's.

Graticule
Internal with % indications. Illumination continuously variable.

AUTOSET

Sets display, text, vertical mode, horizontal mode and triggercoupling in a predefined position. Other parameters depending on signal so that available signals are correctly recorded and displayed.

SIGNAL AQCUISITION

Sampling type
Real time 200 ns/div....360 s/div.
Equivalent time 5 ns/div....100 ns/div.

Maximum sample rate
Real time sampling 250 Megasamples/s.
Equivalent time 10 Gigasamples/s.
External clock 50 kilosamples/s.

Vertical resolution
10 bits or 0.1 % of full scale.
Voltage resolution: 50 microvolt.

Maximum horizontal resolution
Single channel (single shot).
200 ns/div...500 us/div: 512 samples/acquisition.
1 ms/div...360 s/div: 4096 samples/acquisition.

Single channel (repetitive or single scan).
5 ns/div...100 ns/div: 512 samples/acquisition.
200 ns/div...360 s/div: 4096 samples/acquisition.

Dual channel (single shot).
200 ns/div...500 us/div: 512 samples/acquisition.
1 ms/div...360 s/div: 2048 samples/acquisition.

Dual channel (repetitive or single scan).
5 ns/div...100 ns/div: 512 samples/acquisition.
200 ns/div...360 s/div: 2048 samples/acquisition.

Acquisition time
Real time 10.2 x time/division (exclusive delay time).
Equivalent time 2 s for 5 ns/div. (input signal dependant)
10 ms for 100 ns/div.
(99% probability of all samples being updated).

Sources
Channel A and channel B (both channels can be inverted before acquisition).

Modes
Channel A or channel B.
Channel A and channel B.
Channel A and channel B added.
Average mode and min/max mode possible in all three modes.

Sample difference between A and B
Both channels are sampled simultaneously ±200 ps.

CHANNELS A & B

Input impedance (High Z)
1 Mohm in parallel with 14 pF.

Input impedance (50 ohm)
V.S.W.R.
1.2 : 1 at 200 MHz.

Maximum input voltage (High Z)
300 V (AC + DC peak) at 1 MHz.

Maximum input voltage (50 ohm)
5 V DC and r.m.s.
50 V AC peak.
Protected against selection with unsafe voltage on input connector.

Deflection coefficients
5 mV/div... 5 V/div. in 1-2-5 sequence.
(Continuous control between steps).

Error limit (Variable calibrated)
Overall 2%.
Up to memory 1% (typical).

Dynamic range
10 divisions.

DC offset

	range	resolution
5 mV/div... 20 mV/div.	±5 V	5 mV
50 mV/div...200 mV/div.	±50 V	50 mV
500mV/div... 5 V/div.	±300 V	500 mV

Shift range
± 5 divisions.

Frequency response
DC...200 MHz (-3 dB).
AC coupled lower 3 dB point with 50 ohm input 10 Hz.
AC coupled lower 3 dB point with high Z input 1 Hz.

Bandwidth limiter reduces bandwith to 20 MHz.

Risetime (0.35/Bandwidth)
1.75 ns.

C.M.R.R.
120 : 1 at 1 MHz.
25 : 1 at 50 MHz.

Min/max function
Accuracy for pulse longer than 3 ns is 50%
Reset time 20 ns.

Average
Continuous average where:

$$\text{New value} = \text{Old value} + \frac{\text{New measured sample - Old value}}{\text{Constant}}$$

And constant is:
32 x in roll mode.
2 ... 64 x in other modes.

TIME BASE

Modes and Time Coefficients

Recurrent	5 ns/div... 5 s/div.
Single shot	200 ns/div... 5 s/div.
Single scan	5 ns/div... 5 s/div.
Multiple shot	200 ns/div... 5 s/div.
Multiple scan	5 ns/div... 5 s/div.
Roll	50 ms/div.. 360 s/div.

Error limit
In equivalent time mode ± 4%.
In real time mode ± 1%

TRIGGERING.

Sources
Channel A
Channel B
External
Line
External events.

Impedance
1 Mohm in parallel with 14 pF.

Coupling
Signal triggering AC, DC, LF rej., HF rej.,Autolevel or TVF.
Events triggering TTL, ECL or adjustable.v

Maximum input voltage
300 V (AC + DC peak) at 1 MHz.

Triggering sensitivity.

	up to 300MHz	up to 200MHz	up to 30 MHz
Channel A and B	3 div	1 div	0.5 div
External	0.3 V	0.1 V	0.05 V
External / 10	3 V	1 V	0.5 V

Slope
Positive, negative or dual slope.

Level range

Channel A and B	8 div.
External	± 0.8 V
External / 10	± 8 V
Any source in AUTO	related to peak-peak value.

Frequency range

Trigger coupling in DC	DC ... 300 MHz
Trigger coupling in AC	10 Hz ... 300 MHz.
Trigger coupling in LFrej	50 kHz ... 300 MHz.
Trigger coupling in HFrej	DC ... 50 kHz

Trigger delay
Range -10 ... 9999 divisions (200 ns/div... 360 s/div).
-10 ... 500 divisions (5 ns/div...100 ns/div).
1 .... 9999 events (max frequency 5 MHz).

MEMORY

4 memories of 4K x 10 bit-words each.

DISPLAY

Sources
Register R0, R1, R2 or R3 in any combination.

Expansion
Horizontal: In steps 1x ... 64x (8x in A vs B).
Continuously between 1x and 2x.
Vertical: 0.2x, 1x and 5x.

Display handling
Smoothed.
Dots only
Dot join.
All registers can be inverted.

Position
± 5 div horizontally and vertically from screen centre for each register and/or individual trace.

SETTING MEMORY

Memory size
77 front panel settings maximum. Option for more than 250 settings available.

Functions
SAVE, INSERT or DELETE for storage or erasure of settings.
RECALL, NEXT or PREVIOUS for recall of programmed settings.

Configuration.
Front panel settings can be grouped as main and sub settings in order to reach a number of closed sequences each with an own number of steps.

CALCULATION FACILITIES

RMS value
Mean value
Peak to peak value
Rise or fall time
Frequency (1/dT)
Multiplication of traces in a register.

CURSORS

Max horizontal resolution
Single channel mode 1 : 4096
Dual channel mode 1 : 2048

Vertical resolution
1 : 1024

Read out resolution
3 digits.

Error limit
± 2% of voltage.
± 0.2 % of time.

Range
Visible part of signal.

CALIBRATION OUTPUT

Square wave.
Internal impedance 50 ohm.
Output voltage 1 V.
Output current 20 mA.
Frequency 2 kHz.

INTERFACES (optional)

Interface board is available containing IEEE-488 or IEC-625 interface, RS-232C interface and a real time clock.

IEEE-488 (IEC-625)

* Busdriver *
E2 (Three-state).

* Interface function repertoire. *

Source handshake	SH1	Complete capable
Acceptor handshake	AH1	Complete capable
Talker	T5	Basic talker, Serial poll, Talk only and Unadress if MLA.
Listener	L3	Basic listener, Listen only and Unadress if MTA.
Service request	SR1	Complete capable.
Remote / local	RL2	No local lock out.
Parallel poll	PPØ	No parallel poll.
Device clear	DC1	Complete capable.
Device trigger	DT1	Complete capable.
Controller	CØ	No controller.
Default adress	8	

RS-232C

Connector	RFI/EMI
Busdrivers	Data circuits Spacing "0" > +3V Marking "1" < −3V (TxD and RxD lines) Control circuits ON > +3V OFF < −3V (RTS, CTS, DSR and DTR lines)
Current output	<10 mA
Impedance	Output 300 ohm. Input 3 kohm ... 7 kohm.
Voltage	Output −7 V ... +7V Input −25 V ... +25V

* Interface function repertoire. *

Baud-rate	75, 110, 150, 300, 600, 1200, 2400, 4800, 9600 or 19200 (input and output separatly selectable).
Stop-bits	1 or 2
Parity	odd, even or no.
Length	7 or 8.
Transmision	Asynchrone, full duplex.
Handshake	Software ENQ/ACK or XON/XOF Hardware DSR/DTR or CTS/DTR
Serial poll	ESC 7
Go to Remote	ESC 2
Go to Local	ESC 1
Device clear	ESC 4
Device trigger	ESC 8

ANALOG PLOT OUTPUT

Screen dump or register dump possible.
Output voltage 1V horizontal and vertical (± 3%).
Pen lift TTL compatible.
Plot time adjustable between 20 ms ... 2 sec per dot.

POWER SUPPLY

Nominal AC vVoltage range
100 ... 240 V

Nominal frequency
50 Hz ... 400 Hz.

Power consumption
With options 160 W nominal.

Memory backup for settings and traces
Two LR6 batteries are required.

MECHANICAL DATA

Heigth	176 mm (6.9 in.) 250 mm (9.8 in.) with feet and pouch. 4 E in 19 inch rackmount version.
Width	419 mm (16.5 in.) 465 mm (18.3 in.) with handle.
Depth	570 mm (22.5 in.) 670 mm (26.4 in.) with handle.
Mass	18 kg (39.6 lb) excl. accessoiries.

ENVIRONMENTAL CHARACTERISTICS

Meet environmental requirements of MIL-T-28800C Type III Class 5, Style D.

Temperature
Operating 1°C ... +50°C.
Storage −40°C ... +70°C.

Maximum humidity
95% relative humidity.

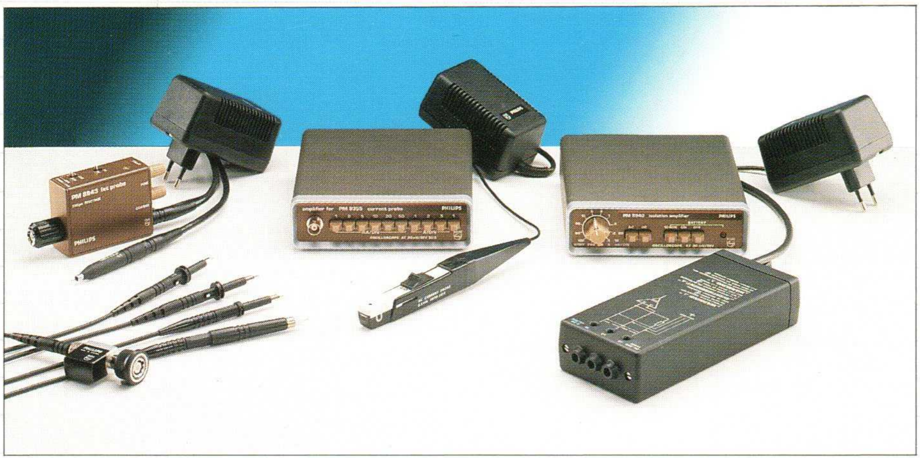
Maximum altitude
Operating 4.5 km (15 000 feet)
Non operating 12 km (40 000 feet)

Vibration
Frequency 5 Hz ... 55 Hz.
Max. acceleration 30 m/s^2.

Shock
6 shocks each axis, half sine wave, pulse duration 11 ms, peak acceleration 300 m/s^2.
Bench handling. (MIL-STD-810 methode 516, procedure V.)

EMI
MIL-STD-461 Class B.
VDE 0871 and VDE 0875.

Safety
The instrument meets the requirements of IEC 345 class I, VDE 0411 class I, UL 1244 and CSA 556B.



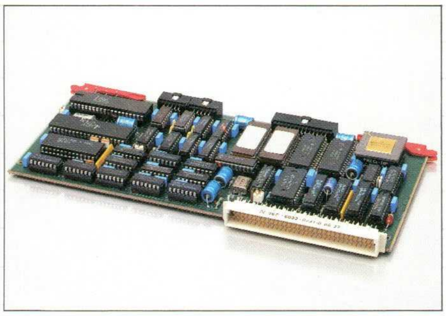
ACCESSORIES

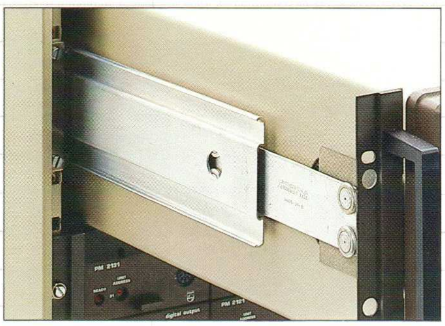
DELIVERED WITH THE INSTRUMENT

- Two 10 Mohm, 1:10 passive probe PM 8929/09 with scale read out. Length 1.5 m
- Blue contrast filter.
- Operating manual
- Front cover.

OPTIONAL AVAILABLE

PM 8911/09	Passive probe 1:10, 500 ohm, 1.5m with range indicator.
PM 8912/09	Passive probe 1:100, 5k ohm, 1.5m with range indicator.
PM 8924	Passive probe 1:1, 1 Mohm, 1.5m.
PM 8924/20	Passive probe 1:1, 1 Mohm, 2.5m.
PM 8929/19	Passive probe 1:10, 10 Mohm, 1m with range indicator.
PM 8929/29	Passive probe 1:10, 10 Mohm 2.5m with range indicator.
PM 8931/09	Passive probe 1:100, 20 Mohm, 1.5m.
PM 8940/09	H.V. isolation amplifier for floating measurements at 650 Vrms
PM 8943	FET probe 650 MHz 1:1 / 1:10 / 1:100
PM 9355/09	Current probe 12 Hz ... 70 MHz.
PM 8956	IEEE-488/IEC-625 interface
PM 8991/04	Oscilloscope trolley
PM 8992/80	Accessory pouch
PM 9051	BNC to 4mm banana binding posts.
PM 2296/50	IEEE-488 female to IEC-625 male adaptor
PM 2295/05	IEEE-488 cable (0.5m).
PM 2295/10	IEEE-488 cable (1m).
PM 2295/20	IEEE-488 cable (2m).
PM 9599/09	Set of attenuators. 10:1 50-50 ohm/ 100:1 50-50 Ohm/10:1 75-50 ohm
4822 872 00352	Operation manual
4822 872 05315	Service manual





ORDERING INFORMATION

PM 3320	200 MHz Digital storage oscilloscope.
INSTRUMENT OPTIONS.	
Option 30	19 in. rackmount version.
Option 40	IEEE-488/RS-232C interface bus installed.
Option 80	19 in. rackmount version and interface bus installed.

POWER OPTIONS

Philips oscilloscopes are normally delivered in accordance with local power requirements. If an alternative power option is required, the instrument can be supplied with a different power setting and power cord option. In such cases, purchase orders should specify one of the following options.

Option 001	Universal European 220 V/16 A, 50 Hz.
Option 003	Standard North American 120 V/15 A, 60 Hz.
Option 004	United Kingdom 240 V/13 A, 50 Hz
Option 005	Switzerland 220 V/10 A, 50 Hz
Option 008	Australia 240 V/10 A, 50 Hz.

TEST THE DIFFERENCE

Philips, the leading diversified electronics company in Europe and one of the largest in the world, is a major innovator, manufacturer and supplier of products, systems and services for domestic and professional applications the world over.

It has an international workforce of some 350,000 and a strong corporate presence in no less than 140 countries.

Annual sales exceed US$ 20-billion.

Philips' commitment to technological leadership is reflected in its annual R&D budget of 7% of turnover. And as the company is also a major user of its own technology, product quality and application suitability are assured.

Service is another Philips asset. Maintenance agreements can be tailored to customer requirements and supported by an international network of service centres.

It all adds up to product credibility. In technology. In quality. In service. That's the difference you get with T&M equipment from Philips.

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