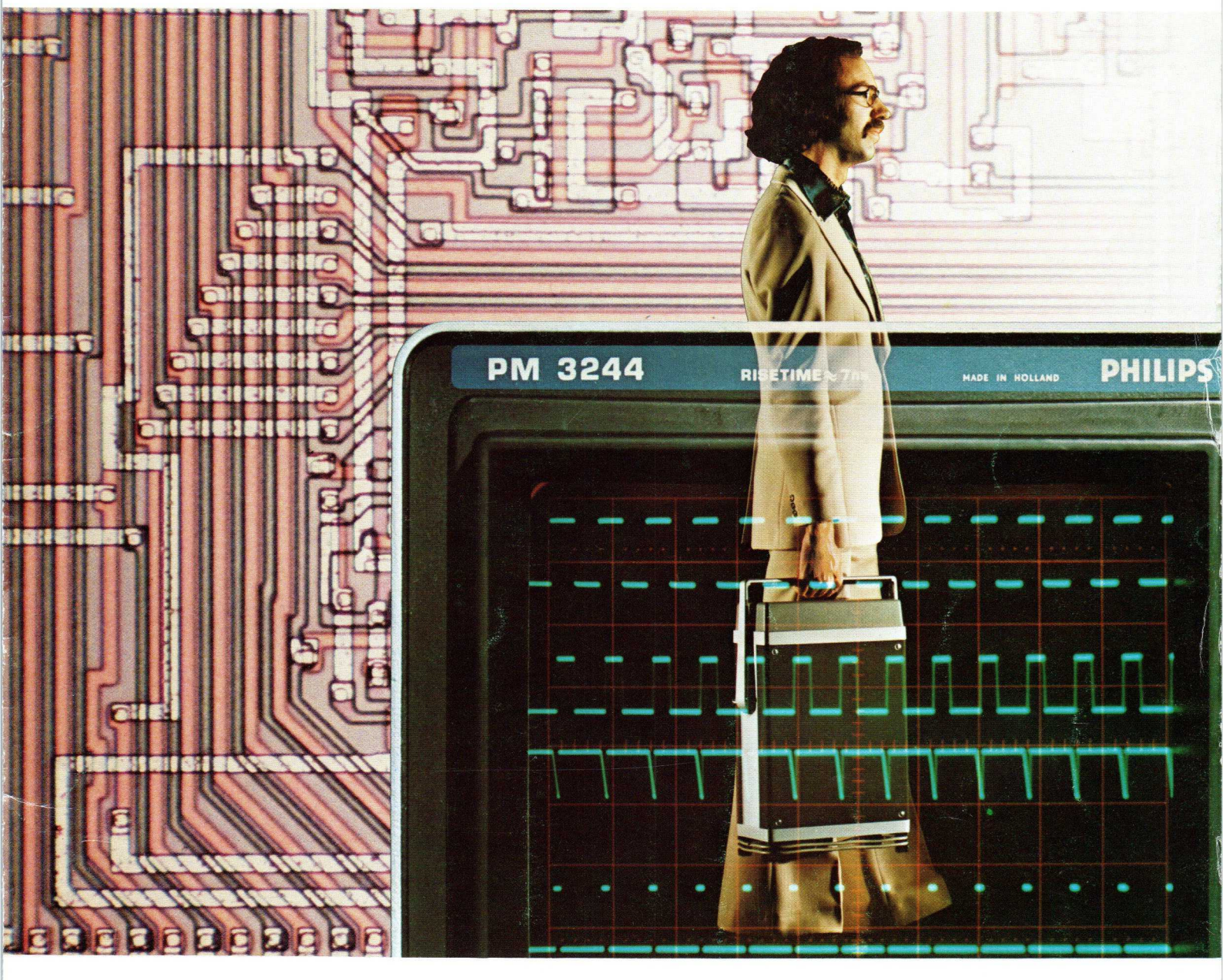
Four 50 MHz channels in compact 9.6 kg construction

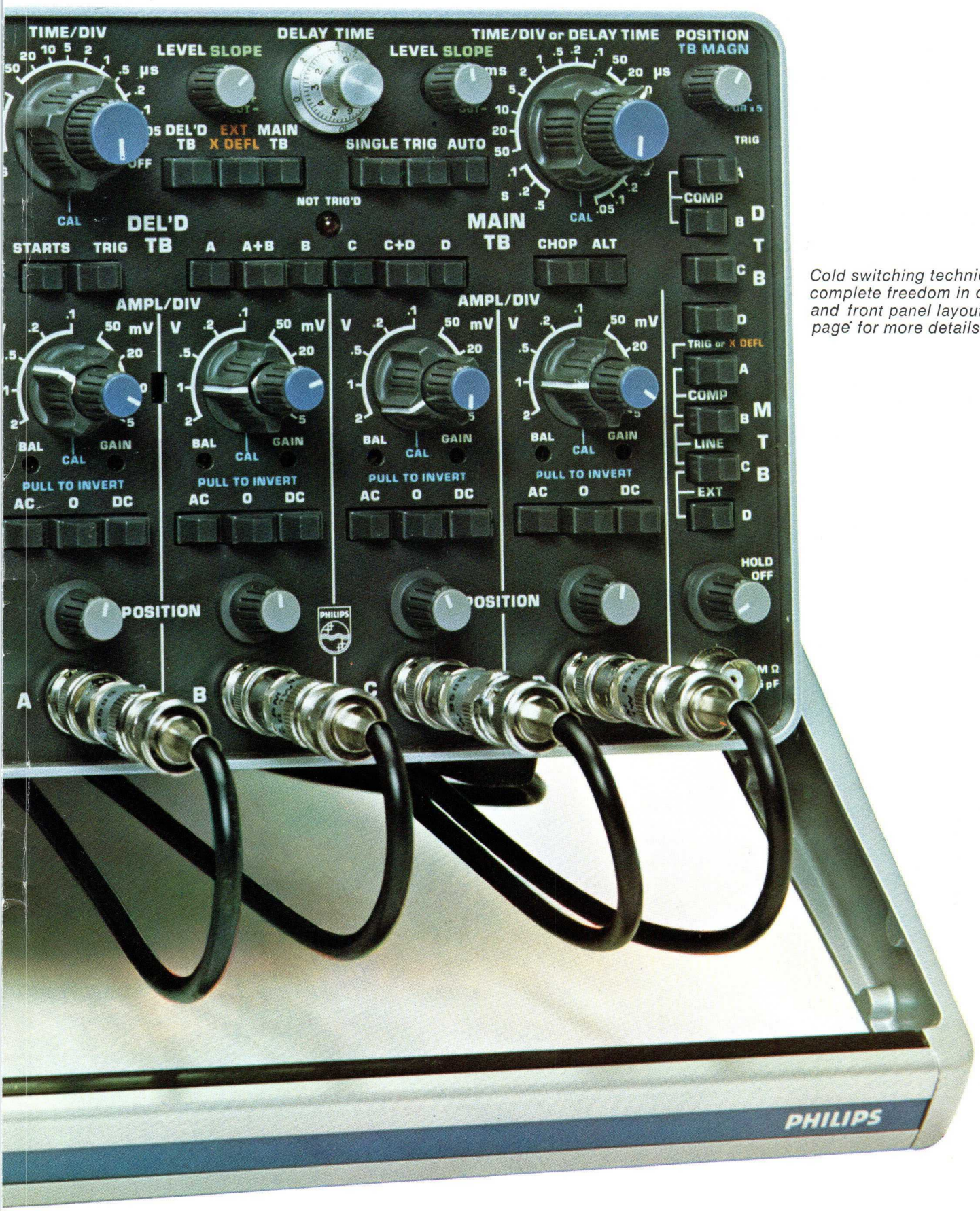


PHILIPS

PM 3244: 50 MHz/5 mV: Four channels

PM 3244 shown here life size.
Note well-defined 8 x 10 cm display.

Combined with logical front panel layout



Cold switching techniques give complete freedom in component and front panel layout. See rear page for more details.

And a specification worth studying in det

TECHNICAL SPECIFICATIONS

C.R.T.

Type
Philips D 14-125 rectangular meshtype tube with 10 kV acceleration potential and metal backed phosphor.

Screen type
P31 (GH) phosphor standard
P 7 (GM) phosphor optional.
Order number PM 3244G.

Useful screen area
8 x 10 div. of full centimeters.

Graticule
Internal graticule with centimeter divisions and 2 mm subdivisions along the central axes. 10 % and 90 % lines are indicated. Illumination continuously variable.

Y-AXES

Four identical vertical channels, each of which can be displayed individually, or in any combination up to four channels simultaneously, in alternate or chopped mode. Additionally the A + B and C + D signals can be displayed in any combination with the four channels. All channels can also be inverted.

Response
Freq. range DC :
0 Hz ... 50 MHz (−3 dB)
Freq. range AC :
10 Hz ... 50 MHz (−3 dB)
Risetime ~ 3 ns

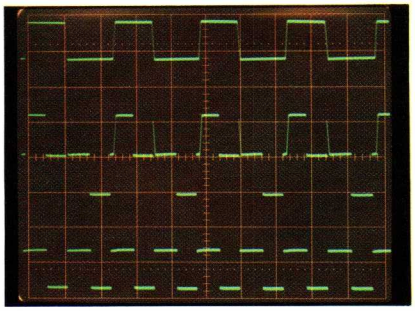
Deflection coefficients
5 mV/div ... 2 V/div, in 1-2-5 sequence. Uncalibrated continuous control between steps 1 : > 2.5

Accuracy
± 3 %

Input impedance
1 MΩ//15 pF
RC time AC coupled 22 ms
Coupling AC-0-DC

Display modes
Channel A only or
Channel B only or
Channel C only or
Channel D only or
Channels A + B added or
Channels C + D added or
any of these modes in any combination, chopped or alternate. Each channel can also be inverted. Chopping frequency approx. 1 MHz.

CMRR in A-B and C-D modes
100 : 1 at 1 MHz with 8 div. of common mode signal (after adjusting one vernier for optimum rejection of common mode).



Three traces illustrating differential display facilities. In this case a simultaneous display of channel A,-B and A-B. The identical facility exists for C and D channels.

Maximum input voltage
400 V (DC + AC peak)

Maximum deflection
Undistorted deflection up to 24 div. for sinewave signals with frequencies of up to 15 MHz. Shift range 16 div.

Signal delay
⩾ 20 ns

X-AXIS

Horizontal deflection can be obtained from either the main time base or the delayed time base, or a combination of the two, or from any of the signal sources selected for X-deflection. For X-Y displays Y_a, Y_b, Y_c or Y_d can be employed or the signal be applied to the external triggering input. The signal source for horizontal deflection can also be Line.

Display modes
Main time base
Main time base intensified by delayed time base
Delayed time base
Up to four trace X-Y displays using Y_a, Y_b, Y_c or Y_d for horizontal deflection or external or line.

Horizontal amplifier

Bandwidth
DC ... 1 MHz (−3 dB)

Deflection coefficient
⩽ 450 mV/div. using the Ext. connector. Vertical deflection coefficients apply when Y_a, Y_b, Y_c or Y_d is used for horizontal deflection.

Measuring accuracy
± 10 % using Y_a, Y_b, Y_c or Y_d input.

Phase error
< 3° at 100 kHz

Main time base

Time coefficients
0.5 s/div ... 50 ns/div in 1-2-5 sequence. Uncalibrated continuous control between steps 1 : > 2.5

Accuracy
± 3 %

Delayed time base
The delayed time base starts immediately after the selected delay or can be triggered after the delay time by any of the selected delay time base trigger sources.

Time coefficients
1 ms/div ... 50 ns/div in 1-2-5 sequence. Uncalibrated continuous control between steps 1 : > 2.5

Accuracy
± 3 %

Time base magnifier
Magnification : x 5
Highest effective sweep speed : 10 ns/div
Additional tolerance : ± 2 %

Main time base triggering

Trigger source
Internal, Y_a, Y_b, Y_c, Y_d, Composite, Line, External.

Coupling
DC ... 50 MHz

Modes
Auto : 10 Hz ... 50 MHz
Level : DC ... 50 MHz
Single : DC ... 50 MHz

Slope
+ or −

ail

Sensitivity
Internal : 0.5 div.
External : 150 mV.

Level range
24 div. for internal sources.
From − 5 to +5 V for external sources.

Input impedance
1 MΩ//15 pF

Maximum input voltage
400 V (DC + AC peak)

Delayed time base triggering

Trigger specifications are the same as those of the main time base with the following exception

Trigger source
Internal, Y_a, Y_b, Y_c, Y_d, Composite.

Sweep delay
In steps and continuously variable between 50 ns and 5 s after the start of the main time base sweep.

Incremental delay time accuracy
0.5 %

Delay time jitter
1 : > 20.000

CALIBRATION

Calibrated voltage
3 V_{p-p} ± 1 % square wave

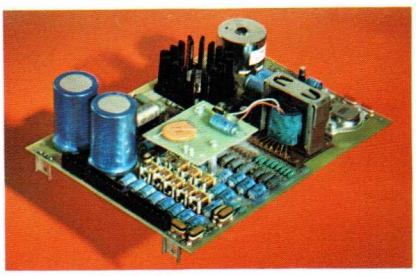
Calibrated current
6 mA_{p-p} ± 1 %

Frequency
2 kHz ± 2 %

POWER SUPPLY

Accepts any voltage between 90 and 270 V and any frequency between 46 and 440 Hz in one range without switching.

DC power source
Accepts any DC voltage between 100 V and 200 V.



Direct conversion power supply as used on PM 3244.

Power consumption
29 W

ENVIRONMENTAL CAPABILITIES

N.B. The following environmental data are only valid if the instrument is checked in accordance with the official procedures. Details of these procedures and failure criteria are available on request from your nearest Philips office or N.V. Philips Gloeilampenfabrieken, Test and Measuring Department, Eindhoven, Holland.

Ambient temperatures
+ 5°C ... + 40°C rated range of use
− 10°C ... + 55°C operating
− 40°C ... + 70°C storage and transport

Altitude
To 5.000 m operating
To 15.000 m not operating

Humidity
Meets IEC 68 dB requirements

Shock
1000 bumps of 10 g, 1/2 sine, 6 ms duration in each of 3 axes

Vibration
30 minutes in each of 3 axes at 10 ... 150 Hz, 0.7 mm_{p-p} and 5 g max. acceleration.

Electromagnetic interference
Meets VDE, Störgrad K

Recovery time
Operates within 15 minutes coming from − 10°C soak and going into 60 % relative humidity at +20°C room conditions.

DIMENSIONS AND WEIGHT

Height : 154 mm
Width : 316 mm
Depth : 410 mm
Weight : 9.6 kg (21 lb) approx.

INSTRUMENT OPTIONS

The following are available as service modifications. Contact your local Philips office for details.
- Main time base sweep output
- Main time base gate output
- Delayed time base sweep output
- Delayed time base gate output

INSTRUMENT VERSIONS

PM 3244 is the standard version
PM 3244G has the long persistence type phosphor (P7).

STANDARD ACCESSORIES

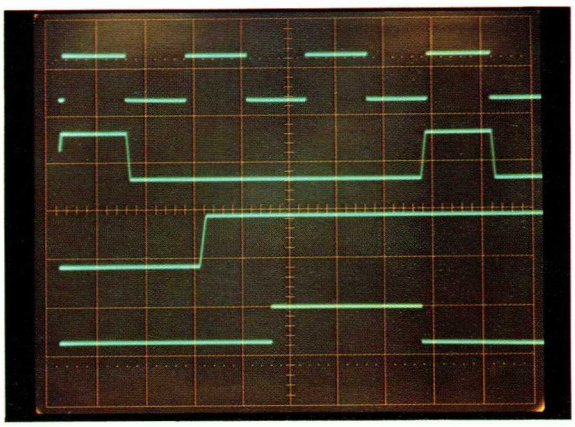
Contrast filter
Front cover
Collapsible viewing hood PM 9366
BNC-banana adaptor PM 9051
Cal. terminal to BNC adaptor
Operating and service manual

OPTIONAL ACCESSORIES

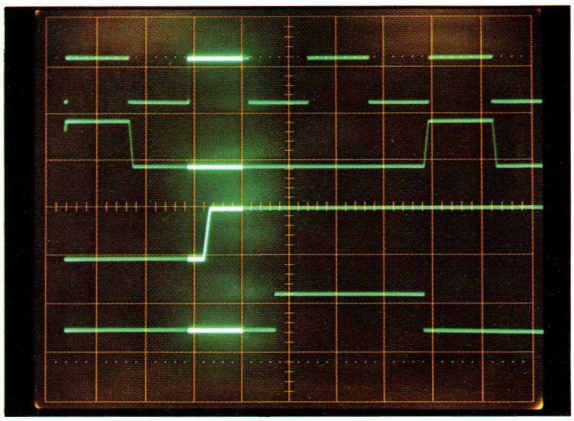
PM 9335	Passive probe set 1 : 1 (1.5 m)
PM 9335L	Passive probe set 1 : 1 (2.5 m)
PM 9350	Passive probe set 10 : 1 11 pF (1.5 m)
PM 9350L	Passive probe set 10 : 1 14 pF (2.5 m)
PM 9358	Passive probe set 100 : 1; max. voltage 5600 V; 2 pF (1.5 m)
PM 9333	Set of eagle clips (wire wrap etc.)
PM 9347	Active TV triggering probe 10 : 1 11 pF (1.5 m)
PM 9352	Micro miniature probe 10 : 1 6 pF (2.5 m)
PM 9353	Active FET probe 1 : 1; 10 : 1; 100 : 1, 3.5 pF (1.5 m)
PM 9355	Current probe; 1 mA/div. ... 1 A/div.; 12 Hz... 70 MHz
PM 9346	Power supply for active probes
PM 8960	19 inch rack mount adaptor
PM 8992	Accessory pouch
PM 9380	Oscilloscope camera
PM 8971	Adaptor for oscilloscope camera
PM 8910	Polaroid anti-glare filter
PM 8980	Long type viewing hood
PM 8901	Battery pack 24 V dc and 140 V dc
PM 8991	Oscilloscope trolley

Steinheil Oscillophot® system : Oscilloscope camera's M3, M4 and M5 can be mounted on oscilloscope using Steinheil adaptor 1820/50.

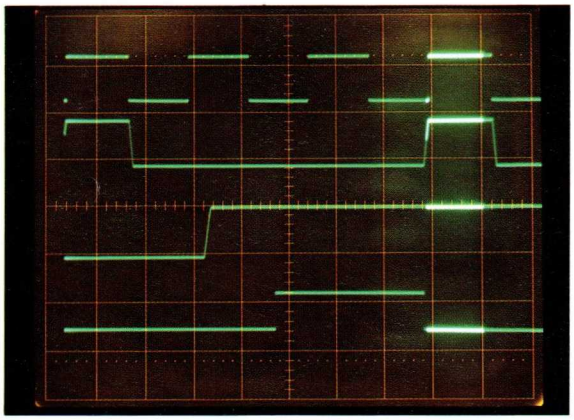
Plus widest display spectrum



As illustrated, triggering is fully independent and multi-sourced. Main and delayed time bases can be triggered from any of the four signals plus Composite. The main time base can also be triggered on External and Line.

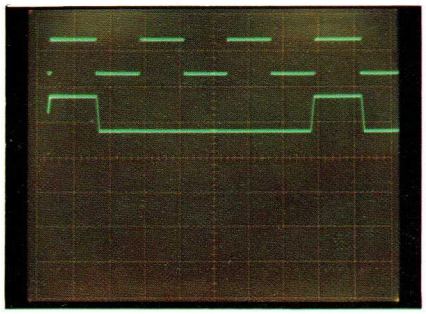


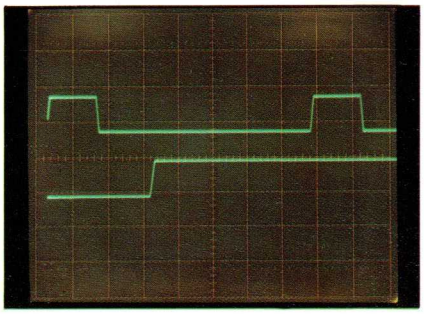
In this example the main time base is triggered on channel B and the delayed on channel A. It is therefore possible to magnify any delayed section of a signal in a stable manner even when it is not directly related to the main time reference.

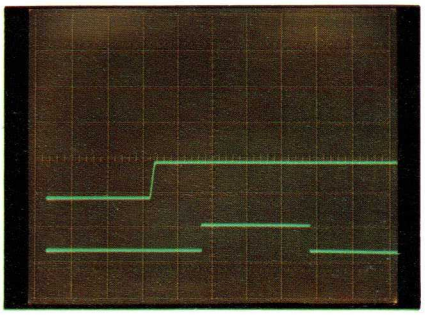


Here the main time base has been changed to channel B and the delayed to channel B. The two differentials can also be shown or displayed separately. Dual X-Y displays are yet another example of the PM 3244's remarkable display versatility.

Why four channels? Look no further

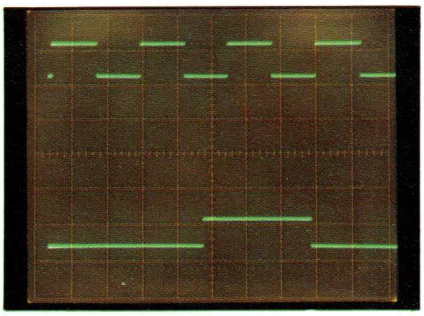






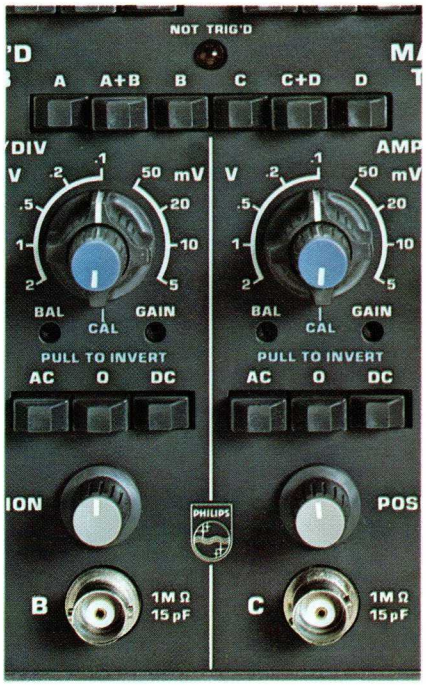
This simple example shows the limitations of using two trace instruments for applications involving sequential logic. Four displays need to be examined and noted before the time relationship between channel A and channel D can be determined. Moreover this procedure is time consuming, involving three changes of probes, and mistakes can be made all too easily.

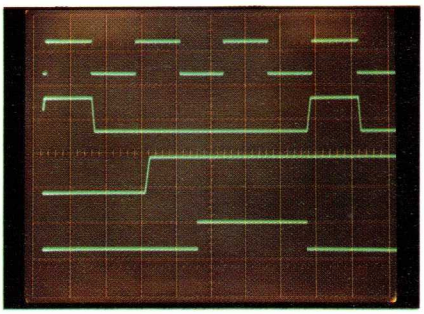
Seeing all four channels



simultaneously, however, gives the logic sequence at a glance and without error. It is also much more meaningful. The PM 3244 is thus ideal for a wide range of 'parallel' applications: coding and decoding systems, for example, where several inputs and one or more outputs need to be checked: the address, read, write and strobe signals in memories and for checking the data contents of several tracks of tape or disk memories.

PM 3244 makes logic measurements more meaningful and more convenient

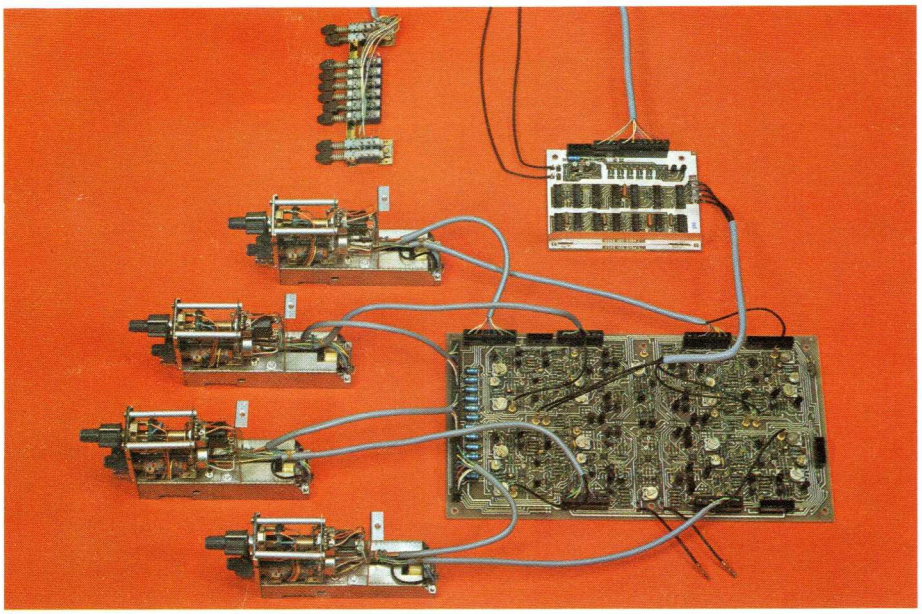




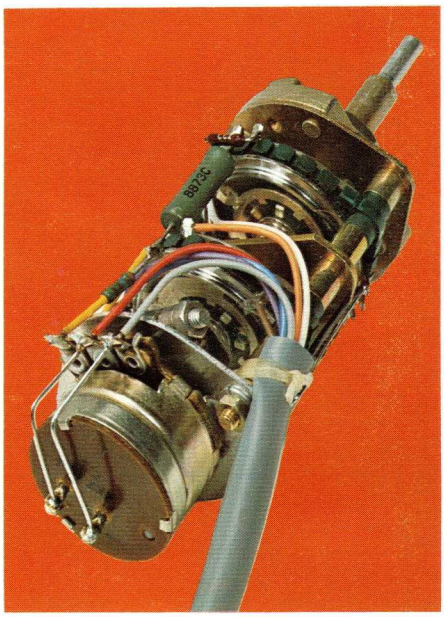
In the PM 3244 four channel convenience is also combined with remarkable multi-source triggering. For example, main and delayed time bases can be triggered from many different signal sources.

Additionally, it is possible to display two differential signals at the same time as the four inputs. Selection of display modes is simple - as illustrated - just one example of the high ergonomic standard that also extends to the case and cover that conveniently stores up to three probes.

Cold switching makes it possible



The main amplifier pannel of the PM 3244 is Electrically connected to front pannel controls and simple DC signals are used to change operating parameters.



A dramatic simplication of the main time base switch as a result of cold switching techniques.

Cold switching is the key to the PM 3244's remarkable versatility and logical front panel layout. As illustrated above, connections between front panel controls and PC boards are made electrically, not mechanically. The actual switching is performed on the boards with simple DC signals from the controls. This allows the controls to be placed anywhere on the front panel and an ergonomically ideal layout can therefore be achieved.

Eliminating mechanical connections also eliminates electronic design restraints, which in turn allows the PC boards to be designed for optimum layouts at all frequencies and for all facilities. Typically this means that all inputs are fed to one central amplifier board, as illustrated, while the display mode switching logic is gathered on a separate panel. High frequency signals can also be confined to the boards, thereby eliminating problems such as non-linearities and crosstalk.

Cold switching also improves reliability

Cold switching improves reliability in various ways. Since the controls need only handle low-current, low-voltage DC signals they can have a much simpler construction. It also means that they can have a low torque, positive 'click' action and be protected with simple dust covers. The dramatic effect of removing components from the switching is illustrated in the above photo of the PM 3244's main time base control, usually a highly complex multi-deck switch and therefore a potential reliability problem. Optimum component layout on the PC boards is another big reliability boost, as is the low 29 W power consumption of the instrument. This allows the PM 3244 to have a closed cabinet, which eliminates the need for ventilation holes and for cooling and the associated problems of dust and other pollution failures.

Low 29 W consumption permits battery operation

The low power consumption is the result of utilising another advanced technique, that of direct conversion power supply. The incoming line voltage, which can have a wide range of voltage frequency combinations including DC, is immediately rectified and the resulting raw DC voltage is stabilized using a highly-efficient switching regulator. The stabilized DC then feeds all the instrument power rails through a 20 kHz dc-to-dc converter, and this gives complete separation between line supply and instrument.

This 20 kHz transformer is much lighther and smaller than a conventional 50 or 60 Hz transformer and so the whole unit takes up little space and cuts the overall instrument weight. For battery operation an attractive unit is optionally available which gives five hours of continuous operation. The battery pack, type no. PM 8901, can be recharged overnight.

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