

60 Mc/s PLUG-IN OSCILLOSCOPE, TYPE PM 3330

6 cm vertical deflection at 60 Mc/s

Main frame amplifier risetime < 5 nano sec (> 70 Mc/s) without distributed amplifier

Internal, illuminated graticule

Special 50 Mc/s at $500 \mu\text{V}/\text{cm}$ plug-in amplifier, with a drift < 1 cm/week

Special H.F. probe system affords input capacitance of 5 pF and "tip" sensitivity of $20 \text{ mV}/\text{cm}$ at 50 Mc/s

Plug-in delaying time base; need not be bought until it is wanted

The PM 3330 is a plug-in instrument covering a wide range of applications with a small number of plug-ins. It is a "two aperture" instrument for use with "X" and "Y" plug-ins, but contains a built in main time base and a vertical amplifier output stage including the signal delay. In addition to the cathode ray tube and power supply unit, the main frame also incorporates the voltage and current calibration facilities and beam finder.

The present range of plug-ins covers measurements from low to high frequency with four vertical plug-ins and provides sweep delay with a time base plug-in. These plug-ins are listed below.

PM 3332 LOW DRIFT, HIGH SENSITIVITY WIDEBAND UNIT

DC ... 50 Mc/s $500 \mu\text{V}/\text{cm}$

Risetime 7 ns; drift 1 cm/week

PM 3333 WIDEBAND UNIT

DC ... 60 Mc/s $10 \text{ mV}/\text{cm}$

Uses a special low-capacitance probe

PM 3342 DUAL TRACE UNIT

DC ... 35 Mc/s $10 \text{ mV}/\text{cm}$

Can be used as a differential amplifier

PM 3351 LOW FREQUENCY, HIGH SENSITIVITY DIFFERENTIAL UNIT

DC ... 200 kc/s $100 \mu\text{V}/\text{cm}$

Common mode rejection 10,000 : 1 at 2 kc/s

Servo system for DC balance

PM 3347 SWEEP DELAY TIME BASE

Delay $2 \mu\text{s}$ to $5 \text{ s} \pm 3\%$

Jitter $< 1 : 20,000$ of full scale time

TV line and frame sync separator



PM 3330 MAIN FRAME

CATHODE RAY TUBE

Diameter 13 cm (5 in)

Acceleration voltage 10 kV

Graticule 6 x 10 cm, illuminated, internal

Type D 13 - 16 GH/1

Available phosphors GH, BE, GP

VERTICAL AMPLIFIER

Coupling DC

Risetime < 5 ns

Signal delay 150 ns

Visible delay 60 ns

CALIBRATION VOLTAGE

Amplitude 0.2 mV ... 80 V (2, 4, 8 series)

Tolerance 1 %

Frequency 2 kc/s square wave

CALIBRATION CURRENT

Amplitude 4 mA

Tolerance 1 %

Frequency 2 kc/s square wave

HORIZONTAL DEFLECTION

Deflection selector Time base A, single shot, mains supply (adjustable phase and amplitude), external 1:1 and 1:10 and X plug-in

HORIZONTAL INPUT

Bandwidth DC ... 1 Mc/s

Sensitivity 500 mV/cm and 5 V/cm

TIME BASE GENERATOR

Mode Free running or triggered

Sweep speed

Calibrated: 50 ns/cm to 1 s/cm (1, 2, 5 series), max. 10 ns using 5 x expansion
Uncalibrated: continuous adjustment between steps

Tolerance 3 % (in middle 8 cm)

Expansion 2 x and 5 x

Expansion tolerance 2 %

Time base outputs Sawtooth 90 V gate
35 V both pos. from zero level

TIME BASE TRIGGERING

Source

Internal (from channel A or B, or A + B

when the added mode is used with the dual trace unit)

External

Mains supply (with adjustable phase)

Slope Positive or negative

Mode

Automatic 10 c/s ... 1 Mc/s manual level and stability out of circuit
DC

LF frequencies over 3 c/s

(high-pass filter, RC time 56 ms)

HF frequencies over 2000 c/s

(high-pass filter, RC time 80 μ s)

TV frame } (manual level and stability

TV line } out of circuit)

Sensitivity

Internal: 3 mm up to 10 Mc/s, 1 cm up to 30 Mc/s, 1 cm in automatic mode 10 c/s - 1 Mc/s, 2 cm p-p video for TV (depending on the unit used)

External: 0.4 V up to 10 Mc/s 1 V

up to 100 Mc/s, 1 V in automatic 10 c/s - 1 Mc/s, 1 V positive video for TV

Input impedance 1 M Ω shunted by 55 pF (used with DC, LF, HF or Aut.)

Level

Internal: adjustable over 6 cm

External: adjustable over 6 V

Z-MODULATION

Sensitivity 15 V_{p-p} above 300 c/s

Input impedance 25 k Ω shunted by 35 pF

Source External, internal (from multitrace unit chopper) selected by a switch on rear panel

MAINS SUPPLY

Voltages 110, 125, 145, 200, 220 and 245 V

Frequency 40 ... 60 c/s (below 50 c/s the voltage must be no more than the nominal)

Voltage variations 10 % variation can be tolerated with negligible effect

Max. power consumption 600 VA

DIMENSIONS (OVERALL)

Height 46 cm (18 in)

Width 34.5 cm (13½ in)

Length 68 cm (26¾ in)

Weight (main frame only) 42 kg (92 lb)

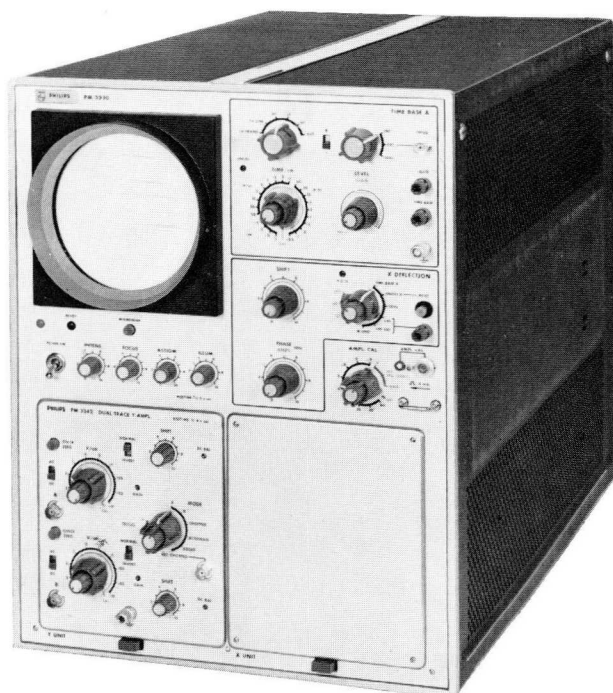
ACCESSORIES SUPPLIED

PM 9051 Adaptor BNC - 4 mm banana-plugs

4 dust filters

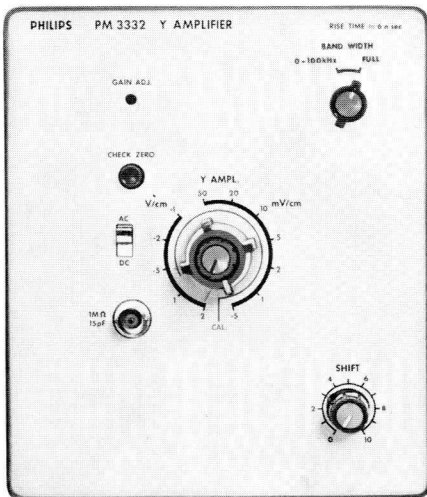
Mains lead

Manual



**PM 3332 LOW DRIFT,
HIGH SENSITIVITY,
WIDEBAND AMPLIFIER**

All data for this unit is valid when in combination with the main frame PM 3330



Bandwidth DC ... 50 Mc/s

Risetime 7 ns

Sensitivity 500 μ V/cm

The PM 3332 is an extremely low drift high sensitivity wideband amplifier employing a high level of DC feed-back, for stabilizing. Thus not only is the DC drift reduced to an extremely low figure but even the need for a DC balance control is eliminated. This instrument is therefore ideal for use in long-term drift measurements, and its combination of bandwidth and sensitivity brings low level HF measurements within the bounds of real-time instruments.

AMPLIFIER

Bandwidth

DC coupled: DC ... 50 Mc/s

AC coupled: 1.6 cs ... 50 Mc/s

Risetime 7 ns

Sensitivity 500 μ V/cm

Drift 1 cm/week, irrespective of switching on and off

Attenuator Calibrated 500 μ V/cm - 2 V/cm (1, 2, 5 series), continuous uncalibrated gain between steps

Tolerance 3 %

Overshoot < 2 % at max. sensitivity

Input impedance 1 M Ω shunted by 15 pF

Max. input voltage AC coupled 400 V DC

Max. deflection 18 cm mid-band (15 Mc/s) (6 cm window)

Shift range > 12 cm

DIMENSIONS AND WEIGHT

H x W x D: 17.5 x 15 x 27.5 cm (7 x 6 x 11 in)

Weight 2 kg (4 1/2 lbs)

ACCESSORIES AVAILABLE

PM 9331A/10 ATTENUATOR PROBE

Coupling DC

Probe bandwidth 0 ... 60 Mc/s

Attenuation 10 : 1

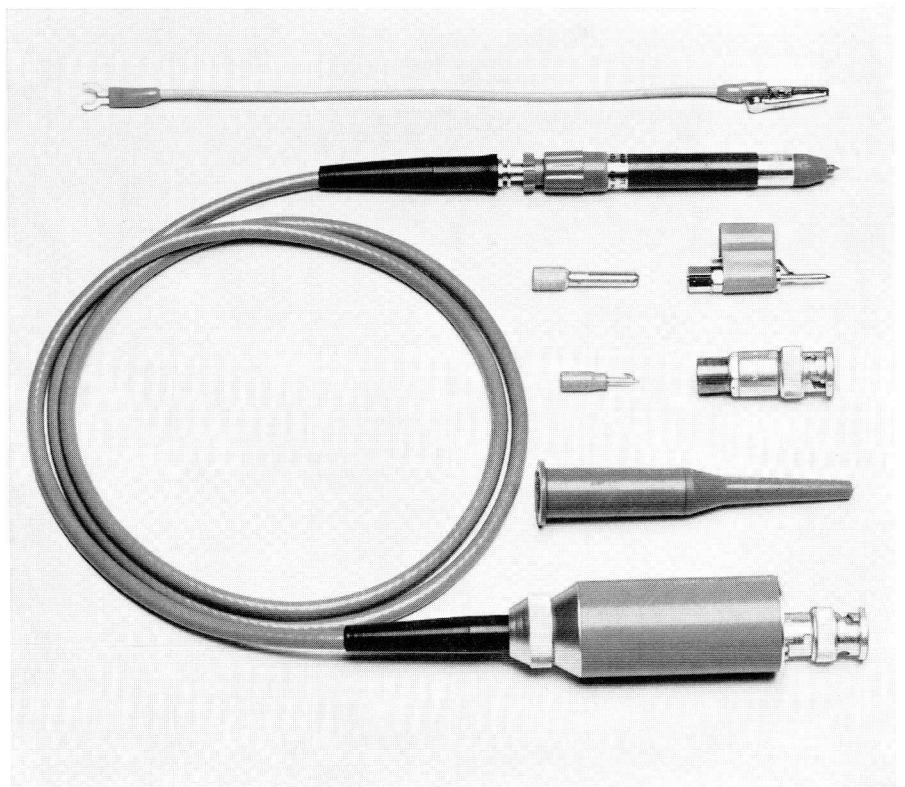
Tolerance 3 %

Input impedance 10 M Ω shunted by 8 pF

Max. input voltage DC coupled 1000 V, AC coupled 400 V DC

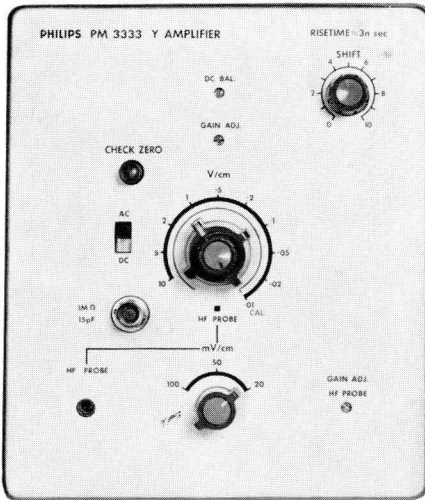
Cable length 110 cm

PM 9331 A/10 Passive probe



PM 3333 WIDEBAND VERTICAL AMPLIFIER

All data for this unit is valid when in combination with the main frame PM 3330



Bandwidth DC ... 60 Mc/s
(30 c/s ... 50 Mc/s input II)

Risetime < 6 ns

Sensitivity 10 mV/cm

The PM 3333 is a fast risetime vertical amplifier which makes full use of the main frame bandwidth, giving an overall risetime of 6 nano sec at full sensitivity. A special high sensitivity HF probe system is used which affords 100 kΩ shunted by 5 pF input impedance and 20 mV/cm at the probe tip, thus eliminating the need for the normal bulky cathode follower probe.

In addition, a conventional high impedance probe is supplied for normal work.

AMPLIFIER

Bandwidth

DC coupled: DC ... 60 Mc/s
AC coupled: 1.6 c/s ... 60 Mc/s

Risetime < 6 ns

Sensitivity 10 mV/cm

Attenuator

Normal input (input I): Calibrated 10 mV/cm to 10 V/cm (1, 2, 5 series), continuous uncalibrated gain between steps

HF probe (input II): 20, 50 and 100 mV (referred to probe tip), continuous uncalibrated gain between steps

Tolerance 3 %

Overshoot < 2 %

Input impedance (input I) 1 MΩ shunted by 15 pF

Maximum input voltage

AC coupled 400 V DC
(N.B. Input II can only be used with the HF probe)

Maximum deflection inputs I and II

6 cm over the full bandwidth
18 cm mid-band (20 Mc/s) window 6 cm)

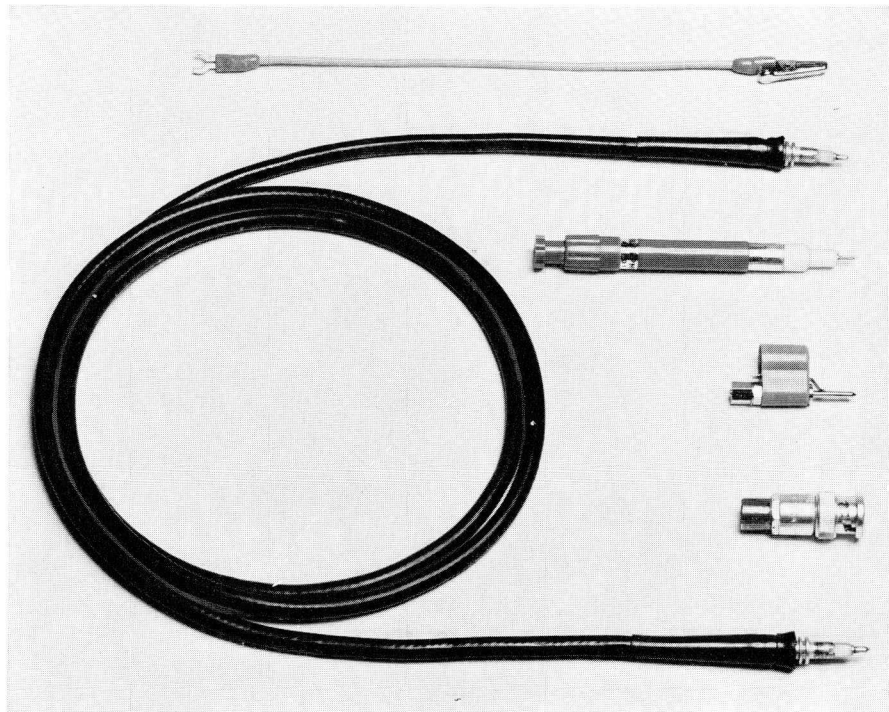
Shift range > 12 cm

DIMENSION AND WEIGHT

H x W x D 17.5 x 15 x 27.5 cm (7 x 6 x 11 in)

Weight 2 kg (4½ lbs)

PM 9332 HF probe



PM 9332 HF PROBE

(supplied with the unit, for use with input II only)

Coupling AC

Bandwidth 30 c/s ... 50 Mc/s

Attenuation 1 : 1

Maximum input voltage 400 V DC

Input impedance 100 kΩ shunted by 5 pF

Cable length 150 cm

ACCESSORIES AVAILABLE

PM 9331A/10 ATTENUATOR PROBE

Coupling DC

Probe bandwidth 0 ... 60 Mc/s

Attenuation 10 : 1

Tolerance 3 %

Input impedance 10 MΩ shunted by 8 pF

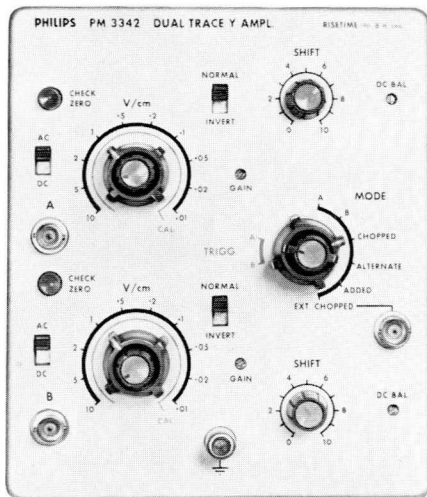
Maximum input voltage

DC coupled 1000 V, AC coupled 400 V DC

Cable length 110 cm

PM 3342 DUAL TRACE VERTICAL AMPLIFIER

All data for this unit is valid when in combination with the main frame PM 3330



Bandwidth DC ... 35 Mc/s

Risetime 10 ns

Sensitivity 10 mV/cm

The PM 3342 is a dual trace plug-in amplifier, with three main modes of operation. Thus either input can be displayed separately or they can be combined on a time sharing or added basis. Each input has its own attenuator and vertical shift-control, and internal triggering can be derived from either channel by a front panel selector. When used in the time-sharing mode, switching between input channels may be derived from the internal oscillator at 20 kc/s or 500 kc/s (chopped), the time base (alternate) or an external signal up to 100 kc/s.

In the added mode both attenuators are used, making it possible to combine signals of different levels. The trigger is derived from the combined signal, to avoid triggering on the common mode signal.

AMPLIFIER

Bandwidth

DC coupled: DC ... 35 Mc/s

AC coupled: 1.6 c/s ... 35 Mc/s

Risetime 10 ns

Sensitivity 10 mV/cm

Mode of operation

- 1) Channel \pm A only
- 2) Channel \pm B only
- 3) Alternate \pm A and \pm B
- 4) Chopped between \pm A and \pm B: at 20 kc/s, 500 kc/s or external up to 100 kc/s
- 5) Added \pm A \pm B

Attenuator

Calibrated 10 mV/cm to 10 V/cm (1, 2, 5 series), continuous uncalibrated gain between steps

Tolerance 3 %

Overshoot < 2 %

Input impedance 1 M Ω shunted by 15 pF

Max. input voltage AC coupled 400 V DC

Max. deflection 6 cm for the full bandwidth, 18 cm mid-band (10 Mc/s)

Shift range > 12 cm

Common mode rejection 100 : 1 at 1 Mc/s

Maximum common mode signal 0.1 V (at 10 mV/cm sensitivity)

Trigger signal selection Channel A or B; or A + B when the added mode is used

SIGNAL FOR EXTERNAL CHOPPING

Frequency Less than 100 kc/s

Risetime 1 to 100 ns for square waves

Amplitude 1 V to 20 V max. (symmetrical square wave)

DIMENSIONS AND WEIGHT

H x W x D 17.5 x 15 x 27.5 cm (7 x 6 x 11 in)

Weight 3 kg (7 lbs)

ACCESSORIES AVAILABLE PM 9331A/10 ATTENUATOR PROBE

Coupling DC

Probe bandwidth 0 ... 60 Mc/s

Attenuation 10 : 1

Tolerance 3 %

Input impedance 10 M Ω shunted by 8 pF

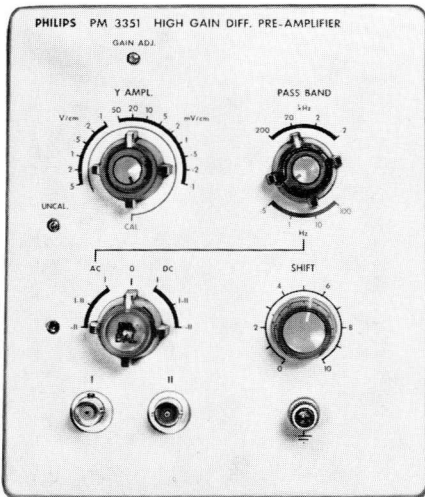
Maximum input voltage

DC coupled 1000 V, AC coupled 400 V

Cable length 110 cm

PM 3351 HIGH SENSITIVITY, LF DIFFERENTIAL AMPLIFIER

All data for this unit is valid when in combination with the main frame PM 3330



Bandwidth DC ... 200 kc/s

Sensitivity 100 μ V/cm

Common mode rejection factor 50,000 : 1

The PM 3351 is a high sensitivity, differential amplifier with extremely high common mode rejection, servo-operated DC balance and adjustable bandwidth. It is therefore suitable for direct observation of transducer outputs in the mechanical field in particular and for many other low frequency applications.

AMPLIFIER

Bandwidth

DC coupled: DC ... 200 kc/s

AC coupled: 0.5 c/s ... 200 kc/s

Filters

Low pass: 0.2, 2, 20 and 200 kc/s (3 dB)

High pass: 100, 10, 1 and 0.5 c/s (3 dB)

Sensitivity 100 μ V/cm

DC drift DC coupled < 500 μ V/h after first hour; AC coupled < 5 μ V/h after first hour

Attenuator

Calibrated 100 μ V/cm to 5 V/cm (1, 2, 5 series), continuous uncalibrated gain between steps

Tolerance 3 %

Common mode rejection

at 0.1 - 10 mV/cm: 50,000 : 1 for 50 c/s

at 0.1 - 10 mV/cm: 1,000 : 1 for 2 kc/s

at 20 mV/cm - 5 V/cm: 2,000 : 1 for 50 c/s

Maximum common mode signal 10 V at 0.1 - 10 mV/cm, 20 V at 20 mV/cm, 50 V at 50 mV/cm, etc. up to 500 V max.

Input impedance 1 M Ω shunted by 50 pF

Maximum input voltage

AC coupled 500 V DC

Max. vertical deflection 18 cm undistorted (6 cm window) mid-band (100 kc/s)

Shift range > 12 cm

Input selector

AC: channel I only, I—II, II only

"0"-amplifier input disconnected from input socket and connected to earth

DC: channel I only, I—II, II only

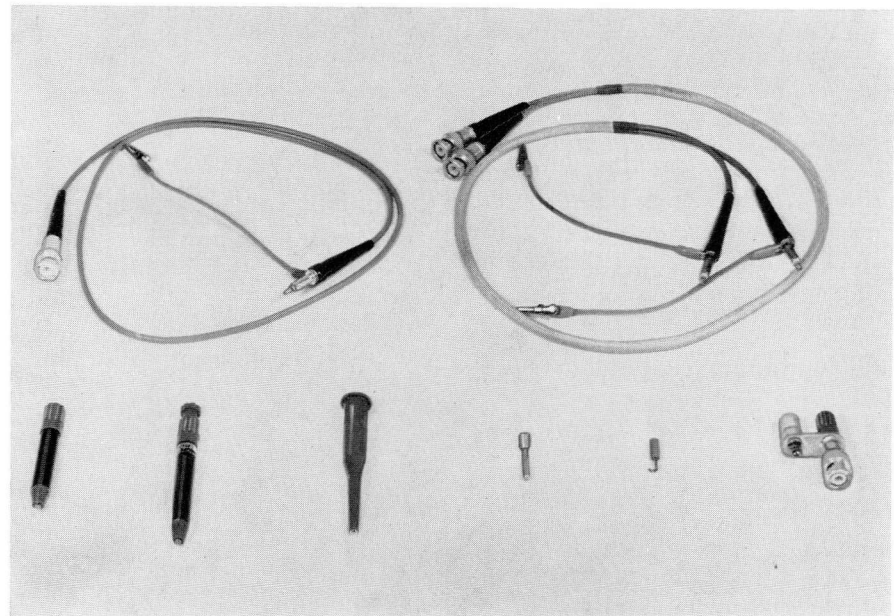
DC balance By servo system

DIMENSIONS AND WEIGHT

H x W x D 17.5 x 15 x 27.5 cm (7 x 6 x 11 in)

Weight 4 kg (9 lbs)

Passive probes and "siamesed" twin probe cable



ACCESSORIES

PM 9329 PASSIVE PROBE SET

The PM 9329 consists of 2 x PM 9324A/10, 2 x M 7 732 04, a "siamesed" twin probe cable and 2 x PM 9051

Type number PM 9324A/10 (blue)

Coupling DC

Attenuation 10 : 1

Tolerance 3 %

Input impedance 10 M Ω shunted by 12 pF

Max. input voltage DC coupled 1000 V, AC coupled 500 V DC

Cable length 95 cm

Type number M 7 732 04 (head only) (black)

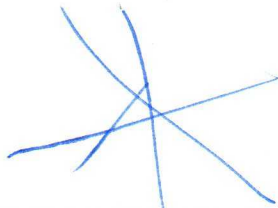
Coupling DC

Attenuation 1 : 1

The "siamesed" twin probe cable is made of low noise co-ax, so that maximum use can be made of the high sensitivity and the effect of stray hum pick-up is reduced to a minimum.

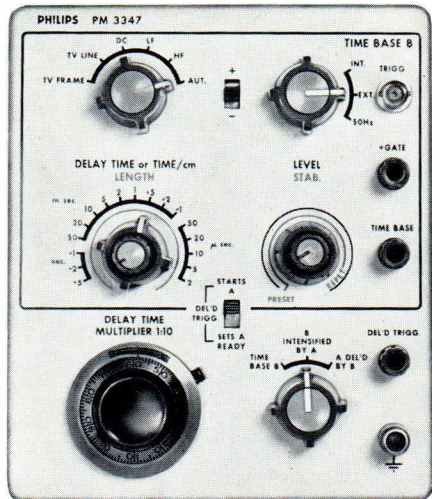
Cable length 110 cm

PM 9051 BNC to 4 mm plug adaptor



PM 3347 SWEEP DELAYING TIME BASE

All data for this unit is valid when in combination with the main frame PM 3330



The PM 3347 delaying time base (time base B) provides the means for triggering the main time base (time base A) at a predetermined calibrated time interval after the trigger pulse; this is the mode termed "Starts A".

In the alternative mode "Sets A ready" time base B prevents time base A from triggering until the delay time interval has elapsed after which time base A triggers on the next trigger pulse. Thus the delaying time base makes it possible to study a small part of a complex signal with respect to time, to make accurate time interval measurements and to study jitter.

The delaying time base is therefore particularly useful for work in the television and computer fields.

DISPLAY MODE

- 1) Time base B
- 2) B intensified by A
- 3) A delayed by B

TIME BASE B (AS A MAIN TIME BASE)

Mode Free-running or triggered

Sweep speed (calibrated only) 2 μ s/cm to 0.5 s/cm (1, 2, 5 series); tolerance 3 %

Expansion 2 or 5 times via main frame

Length 4 to 10 cm

Time base outputs Sawtooth + 90 V_{p-p} from zero level; gate + 35 V_{p-p} from zero level

Trigger source Internal, external or mains supply (adjustable in phase)

Trigger slope Positive or negative

Trigger mode

Automatic 10 c/s to 1 Mc/s (manual level and stability out of circuit) DC, LF from 3 c/s (high-pass filter RC time 56 ms), HF from 2000 c/s (high-pass filter RC time 80 μ s)

TV frame and line (manual level and stability out of circuit)

Trigger sensitivity

Internal: 3 mm up to 1 Mc/s, 1 cm Automatic, 2 cm p-p video for TV

External: 0.5 V_{p-p} up to 1 Mc/s, 1 V_{p-p} in automatic position, 1 V_{p-p} positive video or TV

Trigger level

Internal: adjustable over 6 cm

External: adjustable over 6 V

Trigger input impedance: 1 M Ω shunted by 55 pF (used with DC, LF, HF or AUT)

A DELAYED BY B (AS A DELAYING TIME BASE)

Delay range Calibrated 2 μ s to 5 s (1, 2, 5 series)

Tolerance 3 % + 200 ns

Intermediate adjustment Calibrated 10 turn helipot

Tolerance 0.2 % of full scale time

Jitter < 1 : 20,000 of the full scale time

Delayed trigger pulse output 3 V_{peak}

DIMENSIONS AND WEIGHT

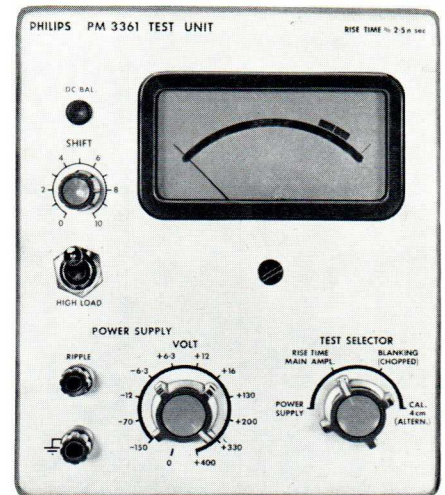
H x W x D 17.5 x 15 x 27.5 cm (7 x 6 x 11 in)

Weight 2 kg (4 1/2 lbs)

ACCESSORIES SUPPLIED

M 7 504 67 Measuring cable BNC - 4 mm plugs

PM 3361 PLUG-IN TEST UNIT



This plug-in facilitates testing of the main frame, output amplifier, power unit and blanking circuit. It provides:

I. A symmetrical square wave for testing the rise time of the vert. output amplifier. Amplitude: 1.2 V_{p-p} = 4 cm deflection Risetime: 2.5 ns

Frequency: 100 kc/s and 500 kc/s

Shift: Via front panel control

Zero level: A press button on the front panel connects the output amplifier input to the zero level reference voltage

II. An alternate display with two traces 4 cm apart for adjusting the output amplifier sensitivity and checking the performance of time base switching pulses as used by multitrace amplifiers. This display is obtained by driving the square wave oscillator from the time base, thus all data other than frequency is identical to I above.

III. A built-in voltmeter with a selector switch for input, and range for each supply rail, facilitates rapid testing of the power unit. The output voltage can be checked for normal load and maximum permitted load. At the same time ripple voltage can be measured by connecting an oscilloscope.

IV. Blanking pulses are available to check that the main frame blanking circuit, used in the chopped mode of the dual trace unit, is functioning satisfactorily.

ADDITIONAL ACCESSORIES

PM 3360 Dummy Unit
PM 9319 Trolley
PM 9316 Polarisation filter
PM 9314 Adaptor for American cameras
M 7 136 98 13 cm Rubber viewing hood

RECORDING CAMERAS AVAILABLE

PP 1021 RECORDING CAMERA



A unique, easy to operate film camera for recording of oscillograms having an extremely wide range of accurate film speeds. Single shots with automatic film transport as well as continuous running exposures can be made.

Film speeds 0.04 mm/s - 4 m/s, with optional drum cassette up to 50 m/s

Accuracy 1 %

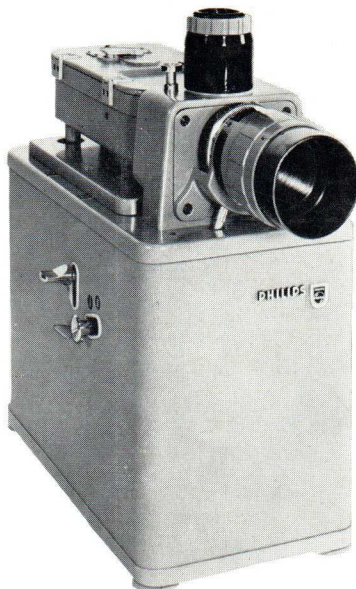
Lens Zeiss Sonnar 1 : 1.5

Focal distance 50 mm

Diaphragm 1 : 1.5 - 1 : 16

Recording material 35 mm perforated film or paper, length up to 50 m

PP 1014 RECORDING CAMERA



A film camera suitable for single shots and continuous-running exposures of oscillograms on CRT's with a diameter between 10 and 16 cm.

Film speeds 1.02 - 202 cm/s synchronously; 3.04 - 475 cm/s asynchronously

Accuracy $\pm 1 \%$

Lens Lytax-Acron 1 : 3.2

Focal distance 85 mm

Diaphragm 1 : 3.2 - 1 : 32

Recording material 35 mm perforated film or paper (up to 15 m)

PM 9300 MULTI-PURPOSE PHOTOGRAPHIC EQUIPMENT



A versatile and flexible camera kit for photographing oscillograms on Polaroid* or standard film (different sizes)

Basic camera Rolleicord** Vb

Lens Schneider Xenar 1 : 3.2

Focal distance 75 mm

Shutter Synchro-Compur 1/500 - 1 s, "T" and "B"

Diaphragm 1 : 3.5 - 1 : 22

* Registered trade mark of Polaroid Land Corporation, Cambridge, Mass. U.S.A.

** Registered trade mark of Rolleiwerke Franke und Heidecke, Braunschweig, Germany.