

PHILIPS*Service*

15152

ONTW. KONSTR. EMA
STAF. TECHN. AFD.

15-10-1967	PM3419AB/01	Cd 538
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**Information
PIT-EMA**

Already published: Cd 524

Re: : Modifications in PM 3419 A/01 and PM 3419 B/01

Some improvements have been applied during the manufacture of the /01 series of sampling plug-in units PM 3419 A and PM 3419 B.

We recommend to apply these modifications also in the instruments that are offered for repair.

1. PM 3419 A: To protect the supply voltage of +70 V (PROBE POWER) at a short-circuit in the basic instrument PM 3410, the type of zenerdiode Z 153 (SZ 30C) was changed into BZY 95/C30. Further, a resistor of 33 ohm (5.5W, 10%) has been applied in series with this diode. The units in which this modification is carried out, are marked with code letter C behind the serial number.
2. PM 3419 B: To obtain a less critic adjustment of RV 103 (trigger-circuit) the value of resistor R 119 (100 ohm) has been reduced to 47 ohm.

Finally, we point out to you that an excessive noise in the instruments PM 3419 A is often caused by a bad contact of sampling diodes Z 101 and Z 102 (Z 401 and Z 402) with their holders. This can be improved by slightly pinching up the contacts of the diode holders.

Déjà publié: Cd 524

Concerne : Modifications dans PM 3419 A/01 et PM 3419 B/01

Lors de la fabrication de la série /01 des "sampling plug-in units"

PM 3419 A et PM 3419 B quelques améliorations ont été appliquées.

Nous vous conseillons de modifier conformément les appareils qui sont présentés pour réparation.

1. PM 3419 A: Pour protéger la tension d'alimentation de +70 V (PROBE POWER) à un court-circuit dans l'appareil de base PM 3410, le type de la diode zener Z 153 (SZ 30C) a été modifié à BZY95/C30. De plus, on a appliqué une résistance de 33 ohm (5,5W, 10%) en série avec cette diode. Les unités, dans lesquelles cette modification a été effectuée, sont reconnaissables à la lettre de code C derrière la no. de série.
2. PM 3419 B: Pour obtenir un réglage moins critique de RV 103 (triggercircuit) la valeur de la résistance R119 (100 ohm) a été réduite à 47 ohm.

Finalement, nous vous faisons remarquer qu'un bruit excessif dans les appareils PM 3419 A est souvent causé par un mauvais contact des "sampling diodes" Z 101 et Z 102 (Z 401 et Z 402) avec les supports. En pinçant quelque peu les contacts des supports de diode, on peut améliorer ceci.

Bereits veröffentlicht: Cd 524

Betrifft : Aenderungen im PM 3419 A/01 und PM 3419 B/01
Während der Herstellung der /01 Serie der "sampling plug-in units"
PM 3419 A und PM 3419 B wurden einige Verbesserungen angebracht.
Wir empfehlen Ihnen die Geräte, die zur Reparatur angeboten werden,
diesbezüglich zu ändern.

1. PM 3419 A: Um bei einem Kurzschluss im Basisgerät PM 3410 die
Speisespannung von +70 V (PROBE POWER) zu schützen
wurde die Zenerdiode Z 153 (SZ30C) in BZY95/C30
geändert. Ebenfalls wurde, in Reihenschaltung mit
dieser Diode, ein Widerstand von 33 ohm (5,5W,10%)
angebracht.
Die Einheiten in denen diese Aenderung durchgeführt
wurde, sind mit Kodeletter C hinter der Fabrikations-
nummer vermerkt.
2. PM 3419 B: Um eine weniger kritische Einstellung von RV 103
(triggercircuit) zu erwerben, ist der Wert von Wider-
stand R119 (100 ohm) auf 47 ohm herabgesetzt.

Schliesslich machen wir Sie noch darauf aufmerksam, dass ein über-
mässiges Rauschen in den Geräten PM 3419 A oft durch einen schlechten
Kontakt der "sampling diodes" Z 101 und Z 102 (Z 401 und Z 402) mit
ihren Haltern verursacht wird. Dies lässt sich verbessern durch die
Kontakte der Diodenhalter ein wenig zuzukneifen.



1-2-1968	PM 3419 AB/01	Cd 556
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Information PIT-EMA

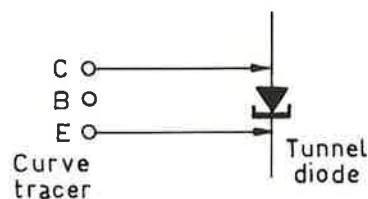
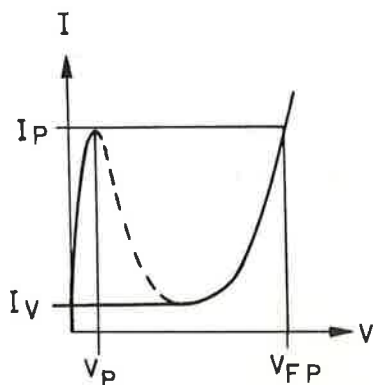
Already issued: Cd 524 and Cd 538

Re: Tunnel diodes

We have found that the characteristics of some tunnel diodes (especially type MS 1705) change with the time. As a result the oscilloscope will not function properly.

The tunnel diodes can be checked by means of a curve tracer (e.g. PM 6507), while they are still fitted in the oscilloscope. The table and figure below show the proper settings of the curve tracer, the acceptable limits and the connection of the diodes.

Settings of curve tracer	Z113 Z120 MS 1705	Z103 TD253A	Z105 TD253A	Z210 IN 3716 TD716
Vertical collector mA/div	2	1	1	0.5
Horizontal collector V/div	0.1	0.05	0.05	0.05
Dissipation				
Limiter resistor	500	500	500	500
Peak Volts approx.	12.5	8	8	4
Acceptable limits				
I_P mA	18 - 22	9 - 11		4.2 - 5.2
I_V mA	< 2.5	< 1.5	< 2.5	< 1.3
V_P mV	< 200	< 110	< 130	< 80
V_{FP} mV	> 1000	> 500	> 500	> 450



Connection

PEM 4225

Bereits veröffentlicht: Cd 524 und Cd 538

Betrifft: Tunneldioden

Es hat sich herausgestellt, dass sich die Kennlinien einiger Tunneldioden (speziell Typ MS 1705) im Laufe der Zeit ändern, wodurch der Oszillograf schlecht funktioniert.

Es besteht die Möglichkeit, die Tunneldioden mit Hilfe eines Kurvenschreibers (z. B. PM 6507) zu kontrollieren, während sie sich noch im Oszillografen befinden.

In nachstehender Tabelle und Abbildung sind die passenden Einstellungen des Kurvenschreibers, die erlaubten Grenzwerte sowie der Anschluss der Dioden erwähnt.

Publications antérieures: Cd 524 et Cd 538

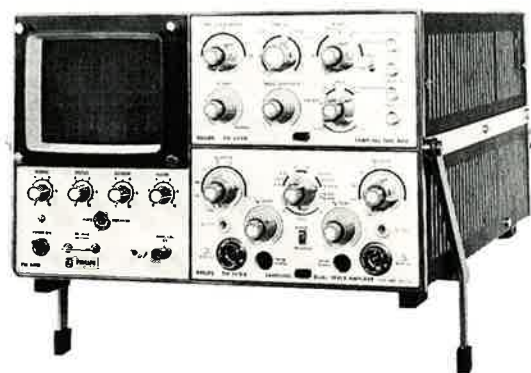
Objet: Diodes tunnel

On a trouvé que les caractéristiques de certaines diodes tunnel (spécialement le type MS 1705) changent avec le temps. Ceci affecté le bon fonctionnement de l'oscilloscope.

Il est possible de contrôler les diodes à l'aide d'un traceur de courbes (p. ex. PM 6507), tout en les laissant dans l'oscilloscope.

Le table et la figure ci-dessus montrent les réglages appropriés du traceur, ainsi que les valeurs limites admissibles et la connexion des diodes.

PHILIPS



Operating manual

15152

ONTW.-KONSTR. EMA
STAF. TECHN. AFD.

PM 3419A + PM 3419B — Sampling plug-in units

IMPORTANT:

In correspondence concerning these instruments, please quote the type number and the serial number as given on the type plate on the rear of the instruments.

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General

I

The sampling system consists of two plug-in units i.e. the sampling dual trace amplifier PM 3419 A and the sampling time base unit PM 3419 B. The amplifier unit should be plugged into the lower and the time base unit into the upper opening of the basic instrument.

The technical data and the directions for use will be given in this operating manual, while the information for service purposes is given, for each unit separately, in the PM 3419 A and PM 3419 B service manuals.

Technical data

II

Tolerances quoted, in the following data are guaranteed by the factory for a nominal mains voltage. Values without tolerances serve only for information

purposes and indicate the properties of an average instrument.

A. PM3419 A, SAMPLING AMPLIFIER

Mode of operation

1. Channel A only
2. Channel B only
3. Channel A and channel B
4. Channel A and inverted channel B
5. Channel A plus channel B
6. Channel A minus channel B
7. Channel A vertical and channel B horizontal.

Rise time

0.35 ns or less, with less than 3% overshoot and undershoot.

Frequency response

Equivalent to DC–1000 MHz

Sensitivity

8 calibrated ranges, 1 mV/cm to 200 mV/cm in 1–2–5 sequence. A variable control permits uncalibrated, continuous adjustment between ranges.

Attenuator tolerance

$\pm 3\%$

Noise

Less than 2 mV with NORMAL-SMOOTHED switch in NORMAL position and less than 1 mV in SMOOTHED position. Automatic smoothing in the 1 and 2 mV/cm positions.
(Noise measured as $3 \times$ rms, or as observed signal excluding 10% of random dots).

Isolation between channels

More than 40 dB up to 1000 MHz.

Input impedance

50 ohms. Input connectors are GR 874 (locking type).

Signal delay

35 ns delay time for each channel permits viewing leading edge of input waveform.

Dynamic range

1.6 volts. (= Full scale reading). Small signals on top of DC-levels up to ± 1.6 volts can be viewed at any sensitivity.

Maximum input voltage

± 5 volts DC. (Higher with reduced duty factor and pulse slope of less than 3 volts/ns).

Internal trigger

Triggering can be selected from either channel. The trigger take-offs deliver approximately 1/9 of the input signal amplitude to the timing unit.

Recorder output (Y OUT)

Channel A and channel B. Output amplitude is 0.5 V/cm through 1 k Ω . 4 mm banana plug socket.

Probe power	Connectors on both channels for cathode follower probe.
Dimensions	Height: 10.5 cm (4") Width: 19 cm (7 1/2") Depth: 32 cm (12 1/2")
Weight	5 kg (11 lb)

B. PM3419 B, SAMPLING TIME BASE UNIT

Sweep speed	13 calibrated ranges, 1 ns/cm to 10 μ s/cm in 1-2-5 sequence. Tolerance is $\pm 3\%$.
Magnification	7 calibrated ranges, $\times 1$ to $\times 100$ in 1-2-5 sequence. A variable control permits uncalibrated, continuous adjustment between ranges. Intensity and sample density remain constant when display is magnified. Tolerance within $\pm 5\%$ at all magnifier settings.
X Shift	Coarse and fine controls provide horizontal shift of one unmagnified screen width.
X Deflection	<ol style="list-style-type: none"> 1. Repetitive with 10, 100 or 1000 samples/cm. 2. Manual scan, using front panel control. 3. External scan by external voltage via continuous attenuator with 10 kΩ input impedance. Min. 5 V is needed for 10 cm deflection. 4. Single adj. with repetitive internal slow ramp with sweep time adjustable from 1 to 60 s per sweep. 5. Single with internal slow ramp with sweep time adjustable from 1 to 60 s per sweep. (The sweep time set in "Single adj." mode will be operative in "Single" mode).
Recorder output (X OUT)	0.5 V/cm deflection on the screen through 1 k Ω . BNC-connector.
TRIGGERING	
Trigger modes	Free run, internal —, internal +, external — and external +. Triggering or synchronizing.
Amplitude range	5 mV to 250 mV peak to peak for external trigger. Nine times more internal trigger amplitude is required. Safe overload ± 5 V peak.
Pulse width	More than 1 ns at minimum amplitude.
Frequency range	Up to 1000 MHz.
Jitter	Less than 30 ps or 2 mm with sweep magnified 100 times, which ever is greater. This is for fast rise signals and 50 mV or more amplitude on the external input.
Trigger output	Pulse amplitude: Approximately + 2 volts into 50 k Ω . Pulse rise time: Less than 4 ns. Pulse width: Approximately 100 ns.
Dimensions	Height: 10.5 cm (4") Width: 19 cm (7 1/2") Depth: 32 cm (12 1/2")
Weight	1.6 kg (3 1/2 lb)

Optional accessories

III

Note: For spare parts see chapter VI.C

A. PM 9340 (See Fig. 8)

Cathode follower probe

1. Introduction

The PM 9340 HF cathode follower measuring probe should only be used in conjunction with the PM 9341 set of slip-on accessories.

2. Electrical data of the cathode follower probe and the slip-on attenuators.

a. The slip-on attenuators allow the following attenuations to be obtained.

$\times 10$, $\times 20$, $\times 50$, $\times 100$, $\times 200$, $\times 500$ and $\times 1000$, according to table I.

The permissible voltage at higher frequencies is lower where continuous wave is used. See table II.

b. Cathode follower measuring probes are fed from PM 3419 A amplifier unit.

6.3 V - 180 mA

70 V - 12 mA

c. Valve and semi-conductor

Triode: EC 1000

Diode: BAY 38

TABLE I

Attenuation	Input resistance $\pm 2\%$	Input capacitance $\pm 10\%$	Rise time	Equivalent characteristic bandwidth	Max. permissible voltage
$\times 10$	10 M Ω	3.6 pF	0.4 nsec	0-850 MHz	1.5 V
$\times 20$	10 M Ω	2.6 pF	0.4 nsec	0-850 MHz	3 V
$\times 50$	10 M Ω	1.8 pF	0.4 nsec	0-850 MHz	7.5 V
$\times 100$	10 M Ω	1.5 pF	0.4 nsec	0-850 MHz	15 V
$\times 200$	10 M Ω	1.4 pF	0.4 nsec	0-850 MHz	30 V
$\times 500$	10 M Ω	1.3 pF	0.4 nsec	9-850 MHz	75 V
$\times 1000$	10 M Ω	1.3 pF	0.4 nsec	0-850 MHz	150 V

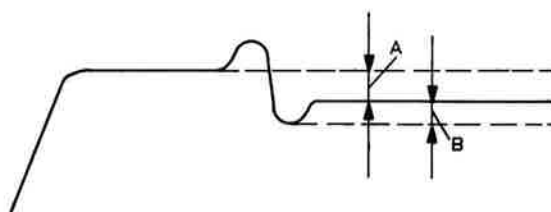
TABLE II

Attenuation	Max. permissible voltage			
	500 MHz	750 MHz	1000 MHz	1250 MHz
$\times 500$	150 V _{p-p}	150 V _{p-p}	150 V _{p-p}	125 V _{p-p}
$\times 1000$	300 V _{p-p}	200 V _{p-p}	150 V _{p-p}	125 V _{p-p}

B. PM 9341 (See Fig. 10)

Slip-on accessories for the cathode follower probe consisting of:

- | | | |
|------------------------------------|--------|---|
| a. slip on attenuators (Fig. 10-5) | × 10 | } The attenuation of the cathode follower probe is included |
| | × 20 | |
| | × 50 | |
| | × 100 | |
| | × 200 | |
| | × 500 | |
| | × 1000 | |
- b. slip-on coupling capacitor, max. 400 Vp. (Fig. 10-4)
- c. earth clip (short) (Fig. 10-1)
- d. earth clip (long) (Fig. 10-3)
- e. terminal spring (Fig. 10-2)
- f. box for storing items *a* to *e* as well as two PM 9340 cathode follower probes.



PEM 3252

Fig. 1. Pulse reflection

A = real component

B = imaginary component

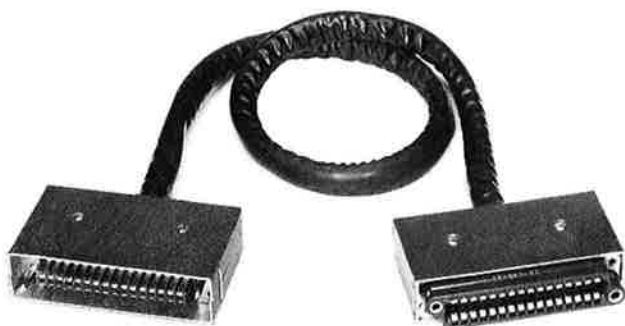


Fig. 2. Extension cable



Fig. 3. Extension plug

C. PM 9342 (See Fig. 11)

1 : 10 attenuator consisting of:

- a. attenuator probe with cable and General Radio 874 type connector
- b. earthing lead
- c. BNC to measuring pin adapter

d. five earthing terminals

e. box for storing items *a* to *d* together with a PM 9344 T-piece.

This passive measuring probe is intended for use in sampling oscilloscopes with an input impedance of 50 Ω .

Electrical data

- | | |
|---|---|
| 1. attenuation | 10 \times |
| 2. input resistance (at d.c.) | 500 $\Omega \pm 1.5\%$ |
| 3. input capacitance (from 0 to 10 MHz) | 0.7 pF |
| 4. input impedance (at 1 GHz) | $\approx 300 \Omega$ |
| 5. rise time | ≤ 100 psec |
| 6. equivalent bandwidth | 0 – 3.5 GHz (–3 dB) |
| 7. max. input voltage | d.c.: 16 V
a.c.: 45 V _{p-p} up to 800 MHz |
| 8. max. power to be applied | 0.5 W |

D. PM 9343 (See Fig. 11)

1 : 100 attenuator, consisting of *a* to *e* as in C above.
This passive measuring probe is intended for use in

sampling oscilloscopes with an input impedance of 50 Ω .

Electrical data

- | | |
|---|--|
| 1. attenuation | 100 \times |
| 2. input resistance (at d.c.) | 5000 $\Omega \pm 1.5\%$ |
| 3. input-capacitance (from 0 to 10 MHz) | 0.6 pF |
| 4. input impedance (at 1 GHz) | $\approx 1500 \Omega$ |
| 5. rise time | ≤ 200 psec. |
| 6. equivalent bandwidth | 0–1.7 GHz (–3 dB) |
| 7. max. input voltage | d.c.: 50 V
a.c.: 140 V _{p-p} up to 500 MHz |
| 8. max. power to be applied | 0.5 W |

E. PM 9344 (See Fig. 14)

T-piece with General Radio 874 type connectors for making measurements with a PM 9341 or PM 9342 attenuator probe in 50 Ω coaxial cables.

Electrical data

- | | |
|----------------------------------|---|
| 1. frequency range | 0 – 2 GHz |
| 2. impedance | 50 Ω |
| 3. pulse reflection (see fig. 1) | without measuring probe: less than 5%
with PM 9342 measuring probe (10 \times):
A = 10%, B = 5%
with PM 9343 measuring probe (100 \times):
A = 2%, B = 5% |

F. EXTENSION CABLE, see Fig. 2

When this cable is used, measurements may be made on the plug-in units while they are actually in use. The cable is also used in checking and adjusting the plug-in units.

* Code number: 4822 159 00558

G. EXTENSION PLUG, see Fig. 3

* Code number: 4822 159 00559

* These components may be ordered from the Central Service Department. The extension cable and plug are the same as those used with the PM 3330 plug-in oscilloscope.

Controls, input and output connectors

A. SAMPLING AMPLIFIER PM 3419 A

Control or connector	Location	Designation	Purpose
S1	front panel	"TRIGG A-B"	Selection of trigger signal to the Sampling Time Base Unit from either the A-channel or the B-channel of the Dual Trace Amplifier PM 3419 A.
S2	front panel	"Y _A mV/cm"	Attenuator for the vertical signal in the A-channel.
S3	front panel	"Y _B mV/cm"	Attenuation of the vertical signal in the B-channel.
S4	front panel	"NORMAL-SMOOTHED"	Smoothing of the random noise on both A- and B-channels.
S5	front panel	"Added A+B A-B, A, B, alternate A and B, alternate A and -B, A VERT. B HOR."	Mode switch for the selection of A- and/or B-channels in different combinations. It is also possible to use the A-channel for vertical deflection and the B-channel for horizontal deflection
RV1	front panel	"Y _A SHIFT"	Coarse adjustment of the vertical position of the A trace.
RV2	front panel	"Y _A SHIFT"	Fine adjustment of the vertical position of the A trace.
RV3	front panel	"Y _B SHIFT"	Coarse adjustment of the vertical position of the B trace.
RV4	front panel	"Y _B SHIFT"	Fine adjustment of the vertical position of the B trace.
RV5	front panel	"Y _A mV/cm CAL."	Fine adjustment of the attenuation of the Y _A signal.
RV6	front panel	"Y _B mV/cm CAL."	Fine adjustment of the attenuation of the Y _B signal.
P1	front panel	"Y _A 50 Ω max. 2 V"	Input connector of the A-channel.
P2	front panel	"Y _B 50 Ω max. 2 V"	Input connector of the B-channel.
P3	front panel	"PROBE POWER"	Power output connector intended for a measuring probe of the A-channel.
P4	front panel	"PROBE POWER"	Power output connector intended for a measuring probe of the B-channel.
P5	front panel	"Y _A OUT"	Output connector for the signal from the A-channel.
P6	front panel	"Y _B OUT"	Output connector for the signal from the B-channel.
P11	rear panel	—	Internal connector between the Sampling Dual Trace Amplifier and the Basic Oscilloscope.

A mechanical push-button under the switch S4 ("NORMAL-SMOOTHED") is to be pushed to release the unit from the basic oscilloscope.

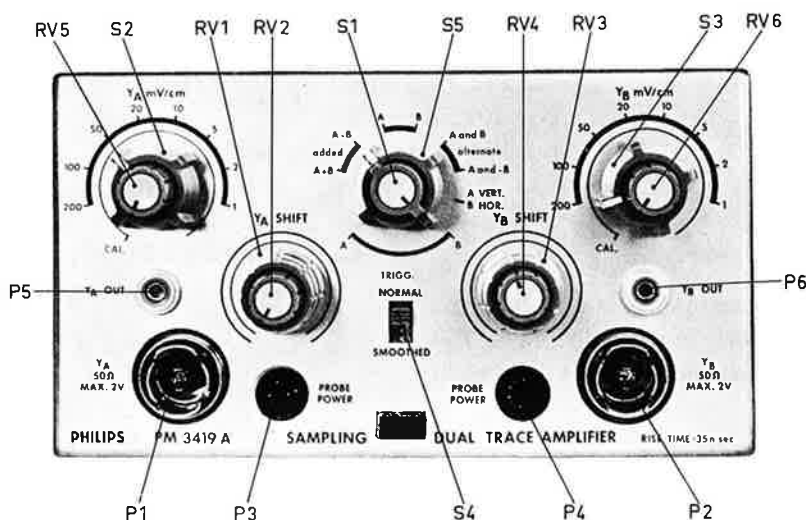


Fig. 4. Front view PM 3419A

B. SAMPLING TIME BASE UNIT PM 3419 B

Control or connector	Location	Designation	Purpose
S1	front panel	"TRIGG."	Selection of internal or external triggering (pos. or neg.) or free running.
S2	front panel	"TRIGG.-SYNC."	Selection of triggering or synchronizing mode.
S3	front panel	"TIME/cm"	Selection of the sweep speed between 1 ns and 10 μ s.
S4	front panel	"TIME SCALE MAGN."	To increase the sweep speed up to 100 times.
S5	front panel	"X DEFL."	Selection of the type of deflection. – Number of samples/cm. – Manual deflection. – Deflection from an external source. – Repeated sweeps where the sweep speed of the single deflection can be adjusted. – Single deflection (with the aid of the push-button S6). Push-button for starting the single sweep when S5 is in position "Single."
S6	front panel	"START"	The sweep starts when the push-button is depressed, but if the push-button is kept depressed the sweep does not return, which can be used in connection with X-Y recorders.
RV1, RV2	front panel	"TRIGG. SENSITIVITY"	Sensitivity control of the triggering or synchronizing.
RV3	front panel	"X SHIFT"	Coarse adjustment of the X position of the signal.
RV4	front panel	"X SHIFT"	Fine adjustment of the X position of the signal.
RV6	front panel	"TIME SCALE MAGN."	Fine adjustment of the magnification.

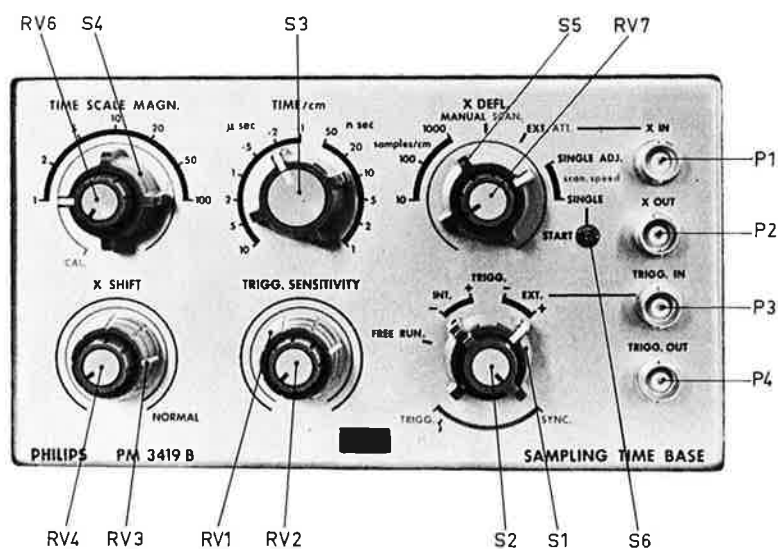


Fig. 5. Front view PM 3419B

<i>Control or connector</i>	<i>Location</i>	<i>Designation</i>	<i>Purpose</i>
RV7	front panel	"SCAN." "ATT." "scan speed"	Depending on the position of the X deflection switch S5. S5 in pos. 10, 100 and 1000 samples/cm: RV7 no function. S5 in pos. "MANUAL": Manual scanning. The horizontal position of the spot is directly governed by the potentiometer. S5 in pos. "EXT.": Attenuation of applied external deflection voltage. S5 in pos. "SINGLE ADJ" and "SINGLE": Control of horizontal speed of the spot between 1 and 60 sec. (without affecting the calibrated time/cm).
P1	front panel	"X IN"	In put connector for external deflection voltage, when S5 is set in position "EXT."
P2	front panel	"X OUT"	Output connector for the X deflection voltage from the time base unit.
P3	front panel	"TRIGG. IN."	Input connector for trigger signals when external triggering is used.
P4	front panel	"TRIGG. OUT"	Output connector of trigger signals for external use.
P12	rear panel	—	Internal connector between the Sampling Time Base Unit and the Basic Oscilloscope.

A mechanical push-button under the control RV1 ("SENSITIVITY") is to be pushed to release the unit from the basic oscilloscope.

Operation

V

A. PRELIMINARY ADJUSTMENT

1. Displaying signals

Apply the signal(s) to be tested to the input socket(s) Y_A and/or Y_B and set the controls of the units as follows.

Amplifier unit:

MODE S5	"A" or "B" resp.
TRIGG. S1	"A" or "B" resp.
Y-SHIFT	mid-position
NORMAL-SMOOTHED	NORMAL

Time base unit:

TIME/cm	2 ns
TIME SCALE MAGN.	1
X-DEFL.	100 samples/cm
X-SHIFT	NORMAL
TRIGG. SENSITIVITY	anti-clockwise
TRIGG. S1	FREE RUN.
TRIGG.-SYNC.	TRIGG.

When a number of widely spread-out dots as well as a line are visible on the screen, there is an input signal capable of effecting triggering. Proceed as follows:

- Set TRIGG. to position INT. + or —
- Turn TRIGG. SENSITIVITY to the right until a stable picture is obtained.

Note: The input signal must be at least 45 mV_{p-p}. If it is weaker than this, an external trigger signal of at least 5 mV_{p-p} must be applied to socket P3, TRIGG. IN. In such an instance, switch TRIGG. is set to position EXT. + or —.

- Adjust the desired image height using switches Y_A mV/cm and/or Y_B mV/cm.
- Set the required time coefficient using TIME/cm.
- Set the image in the centre of the screen with the aid of the Y SHIFT and X SHIFT controls.

2. Measuring accessories

For the technical data on the accessories available, see chapter III.

a. PM 9340 cathode follower probe

- Attach an adjusted $\times 10$ attenuator from the PM 9341 set of slip-on accessories to the measuring head.
- Connect the measuring probe to the correctly set sampling system.
- Apply a square-wave voltage of 1 V_{p-p} with a frequency of 1 to 10 kHz to the measuring probe.
- Check to see whether the attenuation is, in fact, $10 \times$. If necessary, adjust by means of the potentiometer fitted to the printed circuit board in the measuring probe.

The measuring probe can be taken apart once the securing screw at the side has been unscrewed.

b. PM 9341 set of slip-on accessories

- Attach the appropriate attenuator to a correctly set PM 9340 cathode follower measuring probe.
- Connect the measuring probe, loaded with 50 Ω , to an oscilloscope.
- Apply a square-wave voltage with a frequency of 1 to 10 kHz to the measuring probe, as given in the table below.
- Adjust the trimmer at the side of the slip-on attenuator until a satisfactory square-wave shape is obtained.

Attenuator	Voltage to be applied	Oscilloscope setting
$\times 10$	400 m V _{p-p}	10 mV/cm
$\times 20$	800 m V _{p-p}	10 mV/cm
$\times 50$	2 V _{p-p}	10 mV/cm
$\times 100$	4 V _{p-p}	10 mV/cm
$\times 200$	8 V _{p-p}	10 mV/cm
$\times 500$	40 V _{p-p}	10 mV/cm
$\times 1000$	80 V _{p-p}	10 mV/cm

c. PM 9342 and PM 9343 1 : 10 and 1 : 100 attenuator probe

- Connect the measuring probe to the sampling system.
- Check the attenuation of the probe.
- Next set the sensitivity of the oscilloscope to 20 mV/cm.
- Apply a square-wave voltage of 0.8 V_{p-p}, 100 kHz, < 100 ns (for the PM 9342) or of 8 V_{p-p}, 100 kHz, < 100 ns (for the PM 9343) to the measuring probe.
- Adjust until a satisfactory square-wave shape is obtained.

To this end, remove the grommet from the measuring probe and, after releasing the retaining screw, rotate the forward section of the probe in relation to the rear section.

B. X SHIFT

The X SHIFT adjustment is in principle a delay control with a coarse and a fine adjustment. The sweep always starts at the left-hand side of the screen (this can only be adjusted by an internal preset potentiometer).

When both controls are in the fully clockwise position the delay is minimum. In this position it should always be possible to see the triggering edge, provided that the time scale switch is in position 2 ns/cm, unmagnified. The triggering edge moves to the left when the X SHIFT control is turned to the left.

If the time scale is to be magnified, first place the significant part of the display in the middle of the screen. The magnifier operates in such a manner that the part of the display which is in the middle of the screen stays there during magnification.

C. TIME COEFFICIENT

The time coefficient is selected with the TIME/cm switch, while the time scale can be enlarged up to $100\times$ by means of the TIME SCALE MAGN.

The time coefficient is always equal to the quotient of the adjustment of the TIME/cm switch and the setting of the TIME SCALE MAGNIFIER.

The time coefficient can be continuously varied by means of the fine adjustment knob of the TIME SCALE MAGNIFIER. The time coefficients are calibrated only in the CAL. position of this fine adjustment knob. It should be noted that the apparent speed of the beam across the screen of the c.r.t. is not equal to the actual time coefficient in sec/cm.

Note: Before switching over to magnification using the TIME SCALE MAGN. switch, first adjust with the TIME/cm switch to as short a time as possible and then bring the part to be magnified to the centre of the screen with the aid of the X-SHIFT control.

D. MODE S5 (AMPLIFIER)

Any one of seven methods of operation may be chosen using the mode selector S5.

- "A" Only the input signal of channel A is displayed
- "B" Only the input signal of channel B is displayed
- "A and B" Both input signals are given at the same alternate time
- "A and —B" Both input signals are given at the same alternate time, the polarity of signal B being reversed.
- "A + B" The signals from A and B are added together.
- "A —B" The signals from channels A and B are added together, the polarity of signal B being reversed.
- "A vert., B hor." The input signal from channel B is used for horizontal deflection.
Switch "Y_B mV/cm" now determines the horizontal sensitivity while the image can be shifted horizontally by knob Y_B-SHIFT.

E. TRIGGERING

A choice may be made between internal and external triggering by means of the trigger mode selector S1 (time base generator). With internal triggering, the trigger signal is derived from the input signal to be tested, which must, in this case, be at least 45 mV_{p-p}. With external triggering a trigger signal of at least 5 mV_{p-p} is applied to socket P3, TRIGG. IN. Both the

positive and negative going flanks of the input or trigger signal may be used for triggering.

With internal triggering, the TRIGG. switch (S1, amplifier unit) is used to select a trigger signal originating from channel A or B.

F. TRIGG. SENSITIVITY

The trigger sensitivity control has a double knob. In most cases the adjustment should be possible by means of the larger knob.

The smaller knob is effective only in the trigger mode and only when the input signal has the same frequency or is a multiple of the sampling frequency (approx. 100 kHz).

In such cases it is possible to change the sampling frequency slightly by the smaller knob to obtain a stable display.

G. HORIZONTAL DEFLECTION, "X DEFL."

1. 10 - 100 - 1000 samples/cm

The 100 samples/cm method of operation will be the one generally used. The distortion, which in some cases occurs in the reproduction of fast voltage steps is usually sufficiently slight with this method, while generally a sufficiently high writing speed is obtained. The cause of the distortion that occurs, lies in the fact that in some cases (highest sensitivities; smoothed mode) a number of samples is required in the sampling technique before the unit step movement at the input is followed, with a given accuracy, by the vertical displacement of the electron beam.

Example:

Let us assume that five samples are needed to display the unit step on the screen with an amplitude accuracy of 1% (see fig. 6).

At 10 samples/cm, the unit step would be inscribed within 5/10 cm, or 5 mm horizontal shift.

With 100 samples/cm, the horizontal shift in this case would be about ten times as small, and with 1000

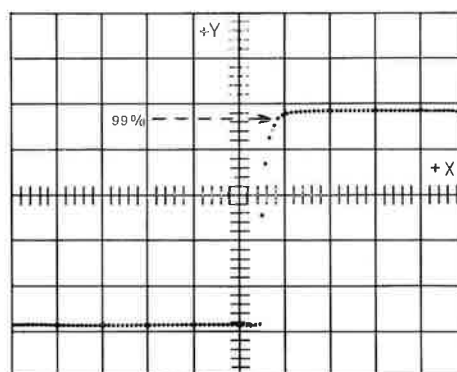


Fig. 6. Screen display

samples/cm even about a hundred times as small. The latter method is, however, used, only if the "smoothed" mode is applied. See also section H, "NORMAL SMOOTHED".

At low repetition frequencies of the input signal, the electron beam will move over the screen relatively slowly, so that the eye no longer sees a continuous image. In such a case, it may be helpful to use the 10 samples/cm method.

This however may increase the degree of rounding-off of steep flanks.

2. Manual scan

In this position of the X-DEFL. switch, the horizontal deflection of the electron beam is dependent on the position of potentiometer RV7. This method is used in recording oscillograms on recorders and when making accurate amplitude measurements (detail measurements).

3. EXT.

In this position of the X-DEFL. switch, the electron beam is deflected horizontally by means of an external voltage applied to socket P1, X-IN. This voltage can, for instance, be derived from the horizontal deflection system of an X-Y recorder.

4. SINGLE ADJ. and SINGLE

The single shot method is used in photographing screen images and in recording oscillograms on recorders. In the "SINGLE ADJ." position the image is repeatedly inscribed. The speed of inscription can be adjusted by means of potentiometer RV7.

In the SINGLE position, the image is inscribed once at the inscription speed set by RV7 as soon as the START button is pressed. A special feature here is that the electron beam does not fly back if the START button is held down. In some cases this may be used to prevent damage to the stylus of a recorder caused by the fast flyback.

It should be noted that the above single shot mode differs from the single shot mode of non-sampling

systems because of the repetitive input signal to be applied.

H. NORMAL SMOOTHED

A fairly broad band of points making reading of the oscillogram difficult may be produced on the screen as a result of inequality between subsequent periods of a periodic signal and of amplitude variations in quick succession, e.g. noise, particularly when measurements are made at high sensitivity. The noise band can be greatly reduced by using the "SMOOTHED" method. Here the rough average of a quickly varying input voltage (noise voltage) is reproduced. In this method, therefore, the unit step, as mentioned in section G.1, will require a much larger number of samples in order to obtain a given amplitude accurately on the screen. When the "smoothed" method is used, therefore, it is desirable to switch to 1000 samples/cm to reduce the rounding-off of fast steps.

Fig. 7 shows a display with a sampling density of 10 and 1000 samples/cm when smoothing is used.

The number of samples required to obtain a given amplitude accuracy depends not only on the selection of NORMAL or SMOOTHED, but also on the position of the vertical attenuator. The circuit is arranged in such a way that some smoothing automatically occurs in positions 2 and 1 mV/cm.

J. INPUT CIRCUIT

The input impedance of the vertical deflection system of the sampling unit is $50\ \Omega$ and the maximum input voltage is $2\ V_{p-p}$.

If the input voltage is higher than $2\ V_{p-p}$ any commercially available coaxial attenuators with a characteristic impedance of $50\ \Omega$ may be used.

If a higher input impedance is required, an attenuator measuring probe (PHILIPS PM 9342 or PM 9343) or a cathode follower measuring probe (PHILIPS PM 9340) can be used. The latter should be combined with a slip-on coupling capacitor and/or one of the available slip on attenuators (PHILIPS PM 9341). Power for the cathode follower measuring probes is supplied from socket P3 or P4, PROBE POWER.

The cathode follower measuring probe allows an input impedance of $10\ M\Omega$ to be obtained at a low input capacitance (about 1.3 to 3.6 pF).

K. RECORDER OUTPUT

A recorder for recording oscillograms may be connected to output sockets $Y_A\ OUT$ and $Y_B\ OUT$. The output impedance of the recorder outputs is $1\ k\Omega$. The sensitivity is 0.5 V per cm deflection on the screen.

If a compensation recorder is used in the MANUAL SCAN and SINGLE or SINGLE ADJ. methods, carrying out or setting slow scanning allows of a high input resistance of the compensation recorder to be maintained.

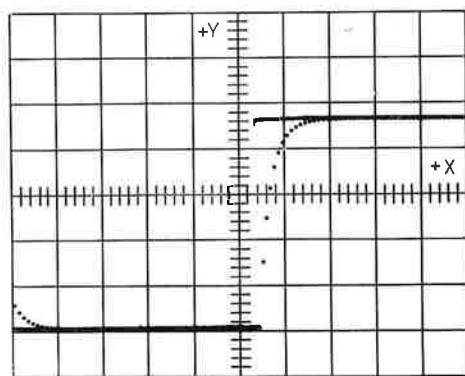


Fig. 7. Effect of sampling density on step response when smoothing is used

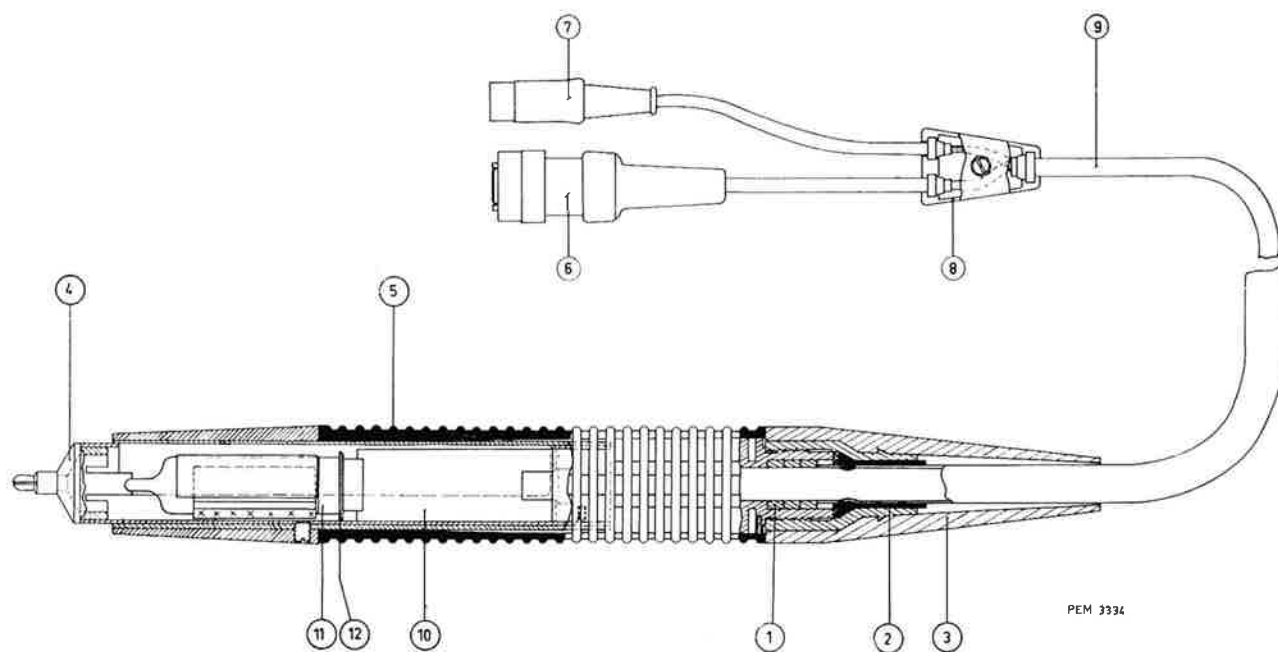


Fig. 8. Cathode follower probe PM9340

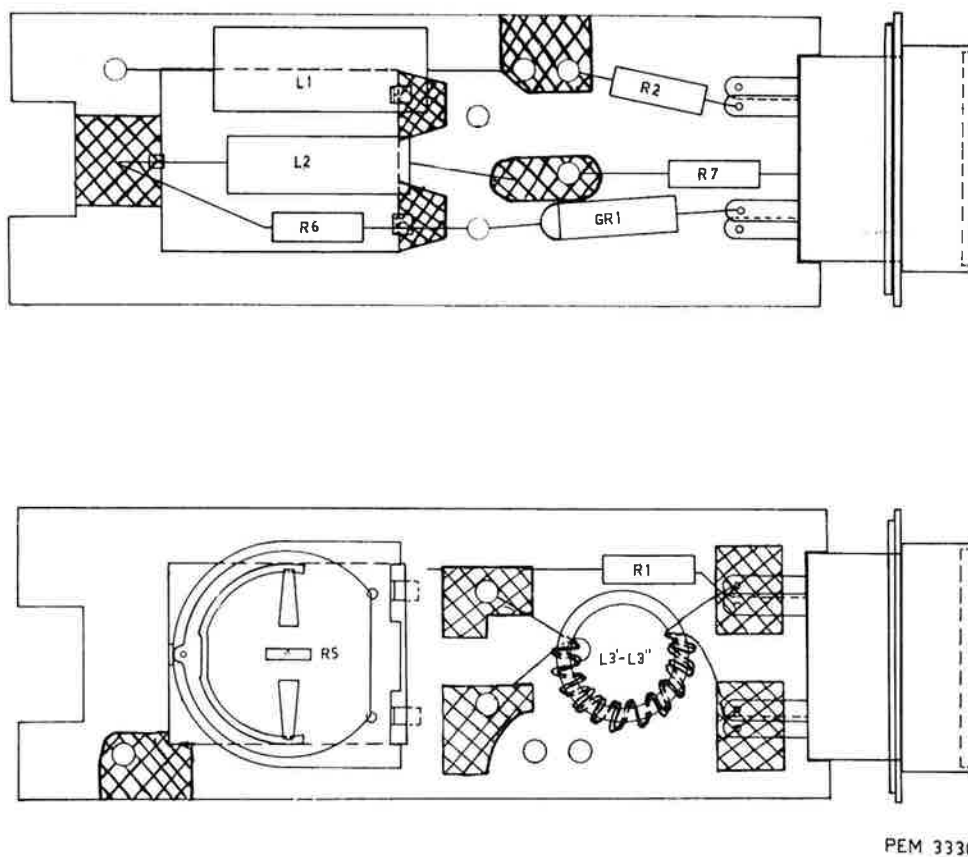


Fig. 9. Printplate unit 1 of cathode follower probe PM 9340

Parts lists of accessories

VI

A. LIST OF PARTS PM 9340

Item	Number	Fig.	Code number	Description
1	3	8	4822 526 10047	Ferroxcube ring
2	1	8	4822 532 60325	Clamping piece
3	1	8	4822 325 50064	Grommet
4	1	8	4822 447 60032	Contact piece
5	1	8	4822 447 60033	Insulator
6	1	8	4822 264 10031	Connector (General Radio: 874-CL58A)
7	1	8	4822 264 40022 (978/4 × 270)	Plug (Preh: 6081)
8	2	8	4822 447 60031	Cap
10	1	8,9	4822 216 90073	Unit 1
11	1	8	4822 255 70115	Valve support
12	1	8	4822 532 10329	Fixing ring
L1		9	4822 157 50317	Coil 22 μ H
L2		9	4822 157 50318	Coil 1 μ H
L3		9	4822 158 10131	Coil
C1		—	4822 122 70068	Ceramic capacitor 3300 pF, 500V
R1		9	4822 111 30238	Carbon resistor 82 Ω , 0.1 W, 5%
R2		9	4822 111 30238	Carbon resistor 82 Ω , 0.1 W, 5%
R3		—	4822 111 30239	Carbon resistor 43 Ω , 0.1 W, 5%
R4		—	4822 111 20256	Carbon resistor 3 M Ω , 0.25 W, 5%
R5		9	4822 100 10059	Potentiometer 200 Ω
R6		9	4822 111 30241	Carbon resistor 33 Ω , 0.1 W, 5%
R7		9	4822 111 30242	Carbon resistor; 620 Ω , 0.1 W, 5%
GR1		9	BAY 38	Diode
B1		8	EC 1000	Triode

B. LIST OF PARTS PM 9341

Item	Number	Fig.	Code number	Description
1	1	10	4822 265 20049	Earthing clip
2	2	10	4822 492 60937	Clamping spring
3	1	10	4822 535 90356	Pin
4	1	10	4822 447 60029	Coupling capacitor
5	1	10	4822 210 70033	× 10 attenuator
6	1	10	4822 210 70034	× 20 attenuator
7	1	10	4822 210 70035	× 50 attenuator
8	1	10	4822 210 70036	× 100 attenuator
9	1	10	4822 210 70037	× 200 attenuator
10	1	10	4822 210 70038	× 500 attenuator
11	1	10	4822 210 70039	× 1000 attenuator

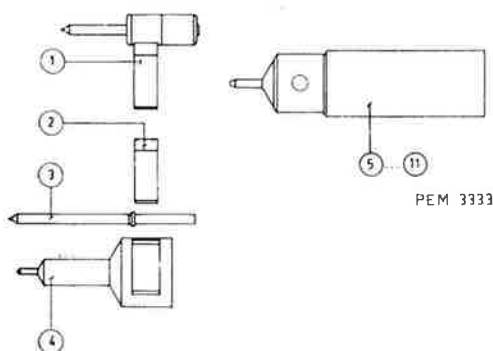


Fig. 10. Slip-on accessories PM 9341

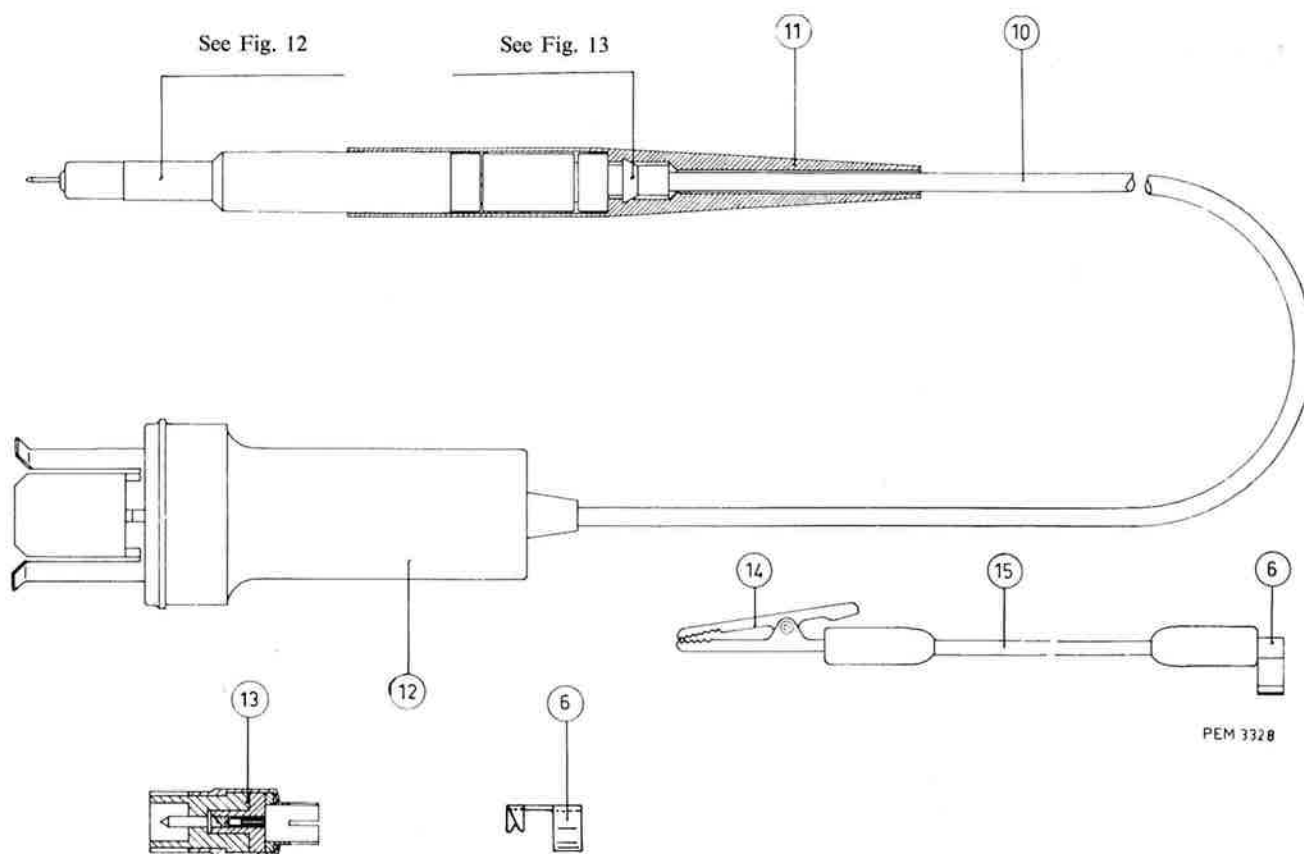


Fig. 11. Attenuator probe PM9342-PM9343

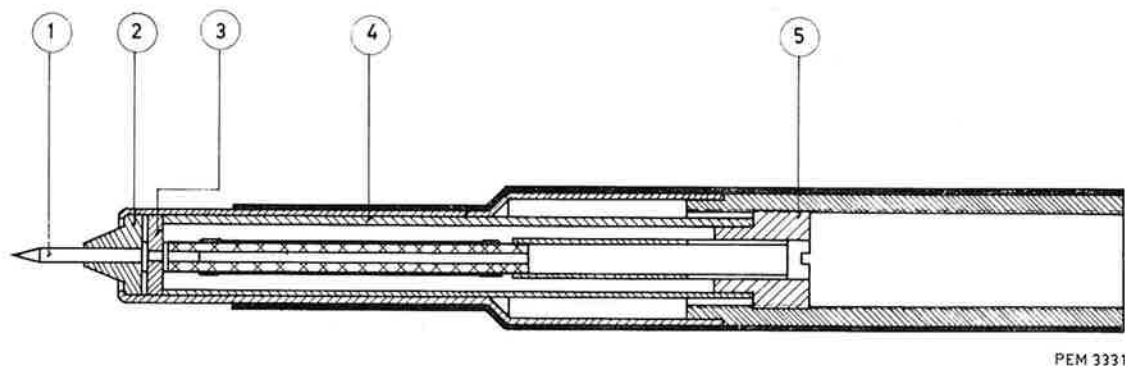


Fig. 12. Front piece PM9342-PM9343

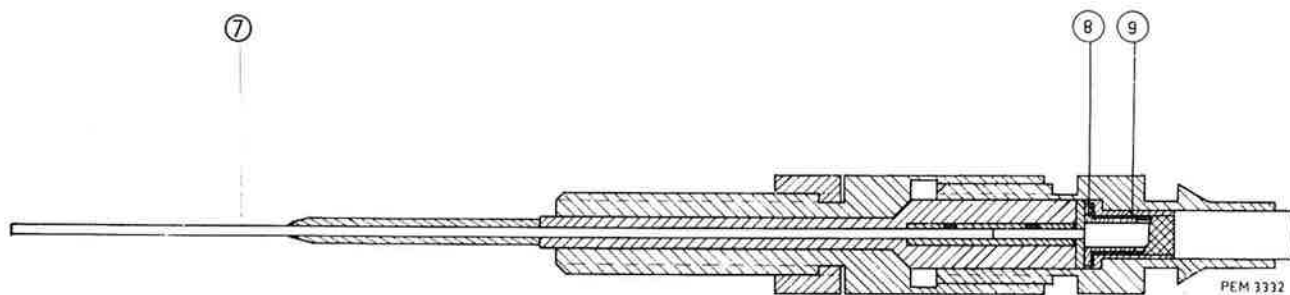


Fig. 13. Rotor PM 9342-PM9343

C. LIST OF PARTS PM 9342 AND PM 9343

Item	Number per instrument	Fig.	Code number	Description
1	1	12	4822 111 90027	Resistor PM 9342
1	1	12	4822 111 90028	Resistor PM 9343
2	1	12	4822 532 50522	Insulation
3	1	12	4822 466 90329	Plate
4	1	12	4822 532 70093	Bushing
5	1	12	4822 502 10656	Screw
6 (2 ×)	6	11	4822 492 60938	Earthing clip
7	1	13	4822 535 90357	Pin
8	1	13	4822 535 20315	Bush
9	1	13	4822 532 20314	Bush
10	0.5 m	11	4822 320 10037	Cable
11	1	11	4822 325 50062	Grommet PM 9342
11	1	11	4822 325 50063	Grommet PM 9343
12	1	11	4822 264 10029	Connector (General Radio: 874-C174A)
13	1	11	4822 263 50022	Adaptor
14	1	11	4822 290 40044 (978/9)	Crocodile clip
15	10 cm	11	4822 322 10001	Earthing wire

D. LIST OF PARTS PM 9344

Item	Number	Fig.	Code number	Description
1	2	14	4822 267 10027	Connector (General Radio: 874-BL)
2	1	14	4822 535 80313	Pin
3	2	14	4822 532 10328	Contact flange
4	2	14	4822 492 60936	Spring
5	1	14	4822 535 80322	Pin

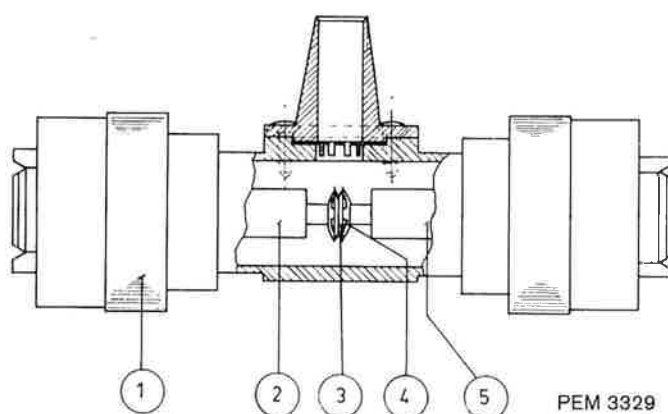


Fig. 14. T-piece PM 9344