PHILIPS *Service*

27-5-1968	PM 3419B/01	Cd 576

Information
PIT-EMA

Already published: Cd 524, Cd 538, Cd 556 and Cd 565

Re: Earthing of printed wiring board 2

It can happen that, when switch "X DEFL" (S5) is set to position "10 samples/cm" or "100 samples/cm", the trace does not reach its full lenght or -in some cases- starts jumping.

The reason is that the earthing of printed wiring board 2 is not good enough. The six nuts, which are riveted in this board, do not make good contact with the printed wiring.

To ensure a good contact, the riveted nut situated near soldering point 41 (see Fig. 9 of the Service Manual) should be soldered to the printed wiring.

Bereits veröffentlicht: Cd 524, Cd 538, Cd 556 und Cd 565

Betr.: Erdung von Printplatte 2.

Wenn Schalter "X DEFL" (S5) in Stellung "10 samples/cm" oder "100 samples/cm" gebracht wird, kann es vorkommen dass das Schirmbild nicht seine vollständige Länge erreicht oder bisweilen zu springen anfängt.

Die Ursache ist eine nicht einwandfreie Erdung der Printplatte 2. Die sechs in dieser Printplatte vernieteten Muttern stellen keinen guten Kontakt mit der gedruckten Verdrahtung her.

Zum Erhalt eines guten Kontaktes ist die vernietete Mutter bei Lötstelle 41 (siehe Abb. 9 der Kundendienstanleitung) auf die gedruckte Verdrahtung zu löten.

CS17478

Déjà publié: Cd 524, Cd 538, Cd 565 et Cd 565

Concerne : Mise à la terre de la plaque de câblage imprimé 2

Il peut arriver que, lorsque le commutateur "X DEFL" (S5) est placé en position "10 samples/cm" ou en position "100 samples/cm", la trace n'atteigne pas toute sa longueur ou que -dans certains cas- elle se mette à sauter.

La cause est que la mise à la terre de la plaque de câblage imprimé 2 n'est pas suffisamment bonne. Les six écrous qui sont rivétés sur cette plaque, ne font pas un bon contact avec le câblage imprimé.

Afin d'assurer un bon contact, l'écrou rivété situé près du point de soudage 41 (voir la figure 9 de la Notice d'emploi et d'entretien) doit être soudé au câblage imprimé.

PHILIPS *Service*

4-3-1968	PM 3419B/01	Cd 565

Information
PIT-EMA

Already issued: Cd 524, Cd 538 and Cd 556
Re : Tunnel diodes MS 1705

We have found, that the stability of tunnel diodes MS 1705 (Z113 and Z120) is not high enough. Therefore, when these tunnel diodes do not meet the requirements (for checking them see Service Information Cd 556), it is recommended to replace them by tunnel diodes of the 1N3720 type.

In this case, the following modifications should be made (see enclosed figures 1 and 2):

- Replace Z113 and Z120 (MS 1705) by tunnel diodes 1N3720. Be careful when soldering these diodes. (Ordering number: 4822 130 30013)
- Replace R132 by a resistor of 56 Ω (ordering number: 4822 110 60074).
- Mount a diode BAX13 (Z132) in series with R132 (ordering number of Z132: 4822 130 40182).
- Replace Z118 (BSX27) by a select-on-test transistor BSX44 (ordering number: 4822 130 40183).
- Replace R129 by a resistor of 330 Ω (ordering number: 4822 110 60094).
- Replace R138 by a resistor of 15 Ω (ordering number: 4822 110 60058).
- Replace R122 by a resistor of 4.7 Ω (ordering number: 4822 116 60003).

After having made these modifications, it is necessary to adjust the triggering according to the procedure described in chapter IV. "CHECKING AND ADJUSTING",, section C. "TRIGGERING", of the Service Manual.

N.V. PHILIPS' GLOEILAMPENFABRIEKEN, Eindhoven, Holland

Printed in Holland

Bereits veröffentlicht: Cd 524, Cd 538 und Cd 556
Betrifft : Tunneldioden MS 1705

Es hat sich herausgestellt, dass die Stabilität der Tunneldioden MS 1705 (Z113 und Z120) ungenügend hoch ist. Daher sind sie, falls sie den Anforderungen nicht entsprechen (zur Kontrolle siehe man Service-Information Cd 556), durch Tunneldioden vom Typ 1N3720 zu ersetzen.

In dem Falle sind folgende Änderungen vorzunehmen (siehe eingeschlossene Abbildungen 1 und 2):

- Z113 und Z120 (MS 1705) durch Tunneldioden 1N3720 (Bestellnummer 4822 130 30013) ersetzen. Vorsicht beim Anlöten dieser Dioden!
- R132 durch einen 56-Ω-Widerstand ersetzen (Bestellnummer 4822 110 60074).
- Eine Diode BAX13 (Z132) in Serie mit R132 (Bestellnummer 4822 130 40182) montieren.
- Z118 (BSX27) durch einen ausgewählten Transistor BSX44 ersetzen (Bestellnummer 4822 130 40183).
- R129 durch einen 330-Ω-Widerstand ersetzen (Bestellnummer 4822 110 60094).
- R138 durch einen 15-Ω-Widerstand ersetzen (Bestellnummer 4822 110 60058).
- R122 durch einen 4,7-Ω-Widerstand ersetzen (Bestellnummer 4822 116 60003).

Nach diesen Änderungen ist es notwendig, die Triggerung nach dem in Abschnitt IV. "PRÜFUNG UND ABGLEICH", Absatz C. "TRIGGERUNG" der Kundendienstanleitung erwähnten Vorgang einzustellen.

Déjà publié: Cd 524, Cd 538 et Cd 556
Concerne : Diodes tunnel MS 1705

Nous avons constaté que la stabilité des diodes tunnel MS 1705 (Z113 et Z120) est insuffisante. Par conséquent, lorsque ces diodes tunnel ne répondent pas aux exigences (pour les contrôler, voir Information Service Cd 556), il est recommandé de les remplacer par les diodes tunnel du type 1N3720.

Dans ce cas, il faut apporter les modifications suivantes (voir les figures 1 et 2 ci-jointes):

- Remplacer Z113 et Z120 (MS 1705) par les diodes tunnel 1N3720. Souder ces diodes avec précaution (numéro de commande: 4822 130 30013).
- Remplacer R132 par une résistance de 56 Ω (numéro de commande: 4822 110 60074).
- Placer une diode BAX13 (Z132) en série avec R132 (numéro de commande de Z132: 4822 130 40182).
- Remplacer Z118 (BSX27) par un transistor BSX44 selectionné (numéro de commande: 4822 130 40183).
- Remplacer R129 par une résistance de 330 Ω (numéro de commande: 4822 110 60094).
- Remplacer R138 par une résistance de 15 Ω (numéro de commande: 4822 110 60058).
- Remplacer R122 par une résistance de 4,7 Ω (numéro de commande: 4822 116 60003).

Après avoir apporté ces modifications, il est nécessaire de régler le déclenchement selon la procédure décrite dans le chapitre IV. "CONTROLE ET REGLAGES", paragraphe C. "DECLENCHEMENT", du mode d'emploi.

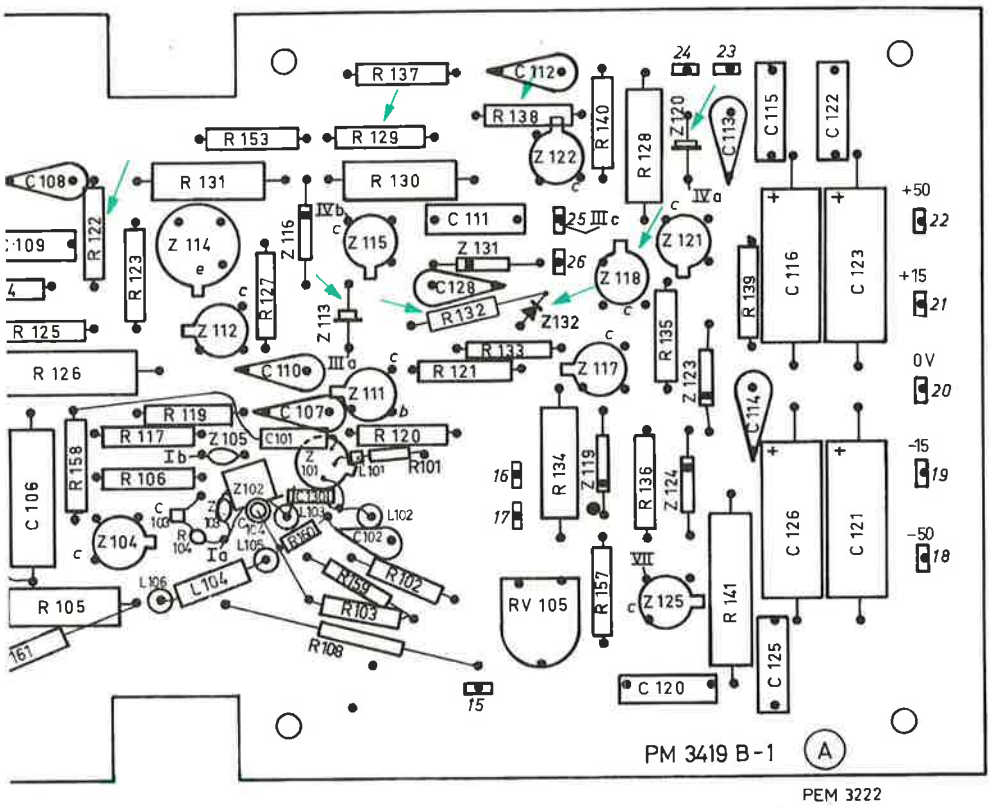

Fig. 1 Detail of circuit diagram PM 3419B (Print 1)

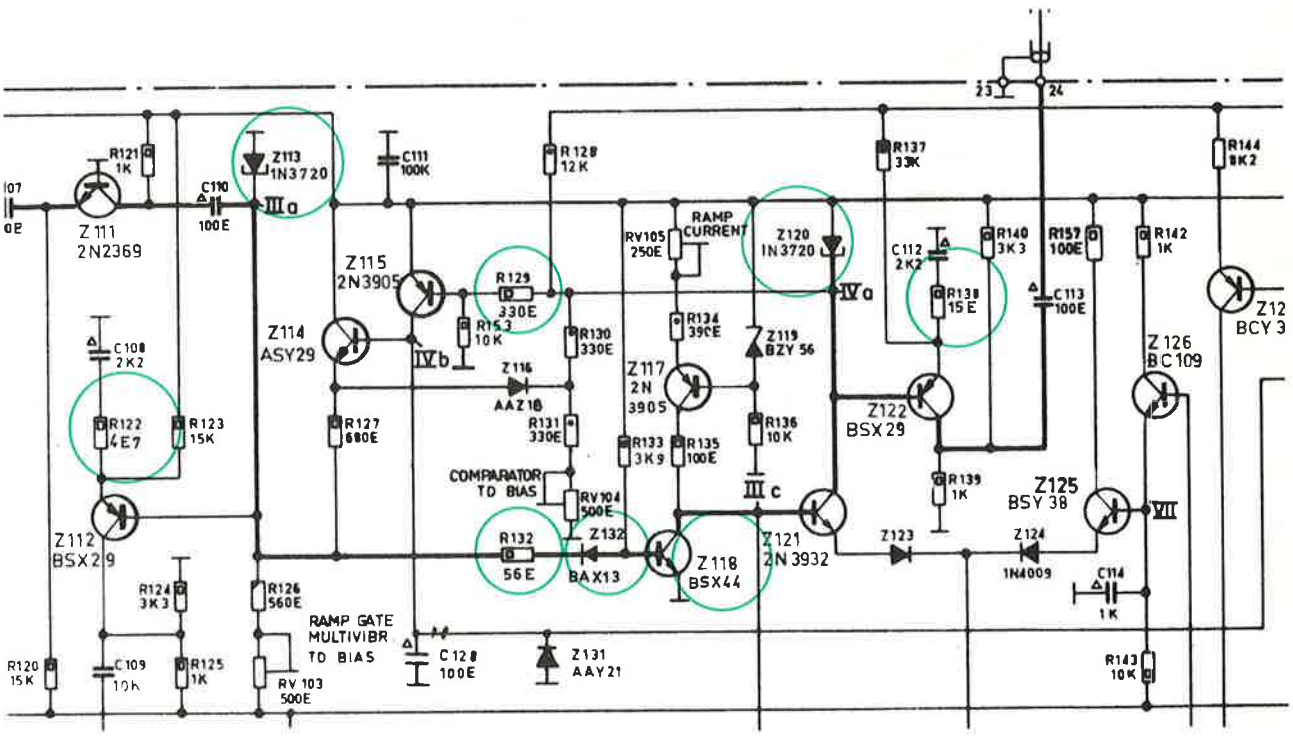

Fig. 2 Detail of Print PM 3419B

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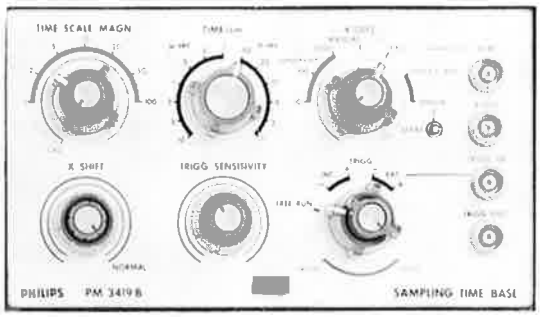

Service manual

PM 3419B — Sampling time base unit

Contents

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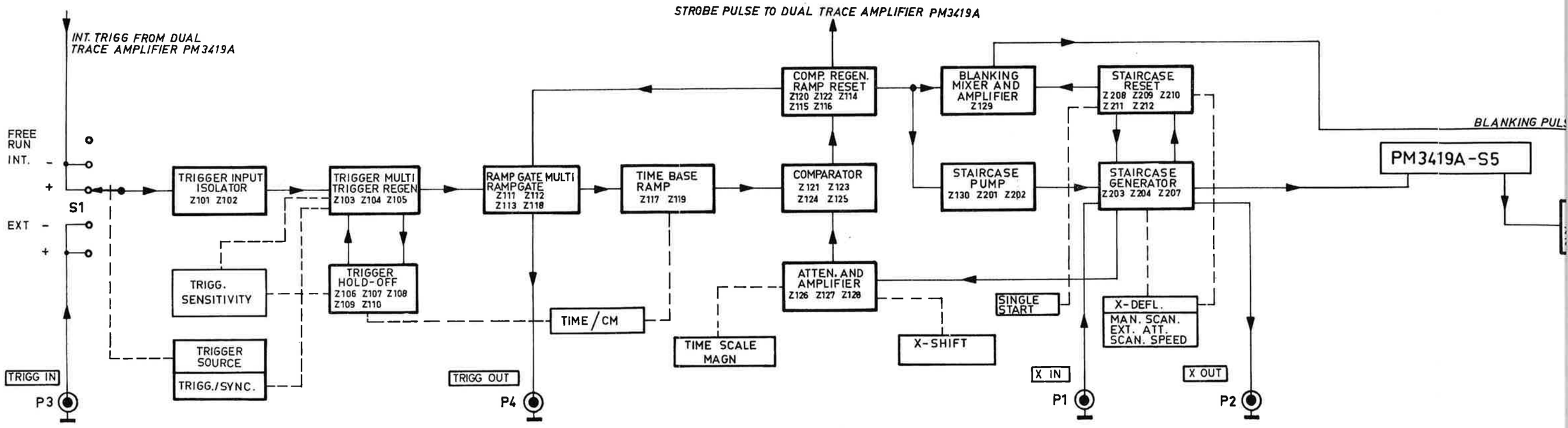


Fig. 1. Block diagram

Triggers

Input waveform

Sampling pulses

Display

Staircase voltage

Fast ramp voltage

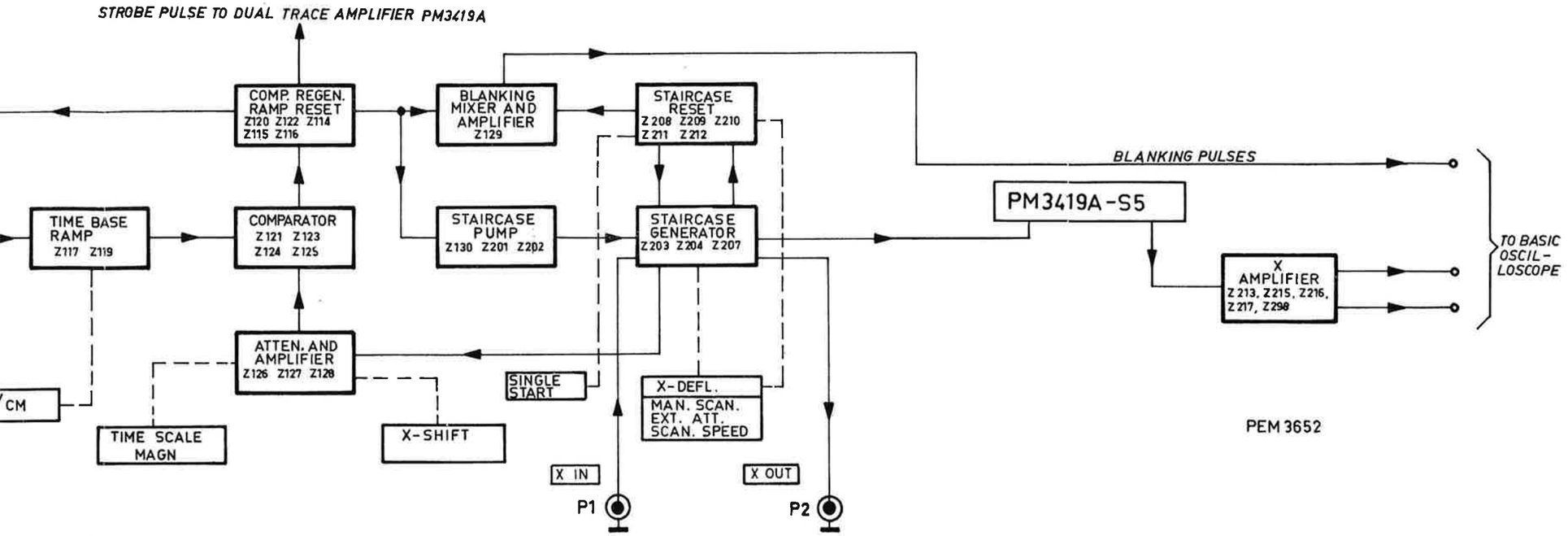
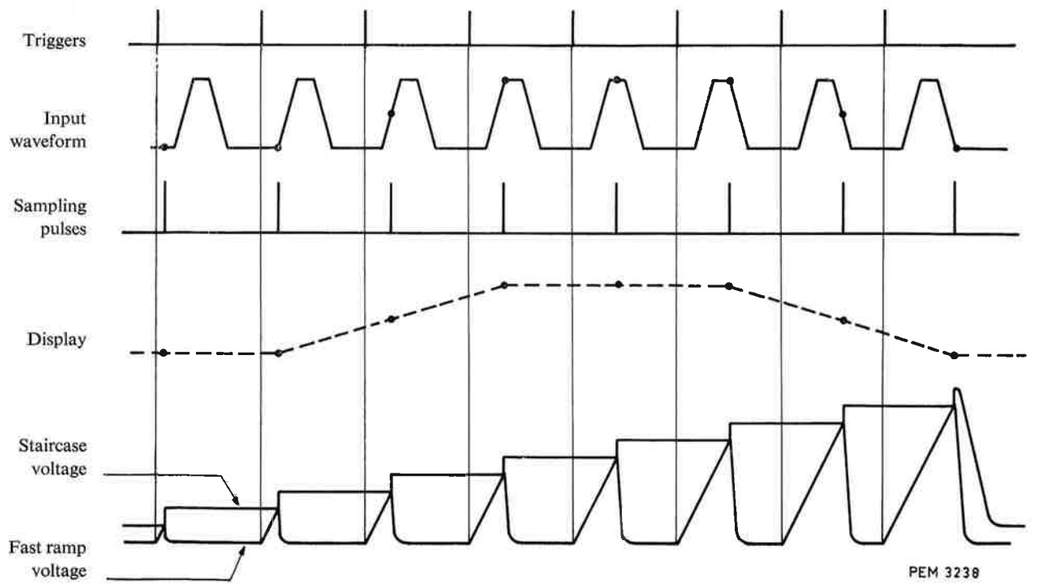


Fig. 2. The sampling principle



Description of the block diagram

The major functional parts of the Sampling Time Base PM 3419 B are:

1. The trigger circuits
2. The time base circuits
3. The horizontal deflection circuits.

The trigger circuits serve two important functions, viz: recognition of a certain part of the input waveform for triggering and for frequency count-down. The circuit responds to input signals with repetition rates from single pulses up to 1000 MHz. For frequencies below about 20 MHz the trigger system selects a trigger and presents a steady display even when the triggers are randomly spaced. The sampling rate is limited by the recovery time of the circuits in the Sampling Dual Trace Amplifier PM 3419 A to 100 kHz and by the time base circuits to about 30 times the sweep time/cm. Therefore, a hold-off and count-down circuit is used to provide triggering for frequencies above the maximum sampling rate. For input frequencies above 20 MHz the synchronizing mode usually gives less time jitter than the triggering mode.

Each time the trigger circuits are actuated a fast ramp is started. The slope of this ramp determines the real time scale. The ramp voltage is compared to a staircase voltage in a comparator circuit. A strobe pulse is generated at the moment when the ramp voltage is equal to the staircase voltage. The strobe pulse is transferred to PM 3419 A, where it initiates the sampling pulse. It also goes into a diode pump circuit, which increases the staircase voltage one step. This means that the next strobe pulse is generated somewhat later, because it takes a longer time for the ramp voltage to reach the new level of the staircase. As a consequence of this the sampling is also delayed. The second sample therefore represents a later part of the input waveform See Fig. 2.

The real time scale is changed by changing the slope of the fast ramp.

The horizontal deflection on the CRT is taken from the staircase and can be varied completely independently of the real time scale. The height of the individual step determines the number of samples taken per cm of the CRT, and it can be varied in steps of 10, 100 or 1000 samples/cm. Time scale magnification is realized by attenuation of the staircase voltage before it is applied to the comparator. In that way all the samples are taken from a smaller part of the fast ramp and consequently the time scale is enlarged with constant number of samples/cm. Further possibilities for the X deflection can be achieved by replacing the staircase voltage by a voltage determined by a potentiometer. By turning the potentiometer the input signal waveform can be manually scanned. External deflection voltage or an internally generated slow sawtooth can also be used.

Circuit description

Trigger circuits

The trigger signal can be selected either from an external source or internally from one of the trigger take-off transformers in the PM 3419 A Dual Trace Amplifier. The triggers can be either positive or negative.
For example when an internal negative signal is used, the signal path is from the trigger take-off transformer in PM 3419 A to section 5F & R in the switch S1 and further to section 3F & R through transformer T1and via section 2 F & R, to the base of transistor Z101. A positive input signal is phase-inverted in transformer T1 before it is supplied to the base of Z101. The transistors Z101 and Z102 together, make an AC coupled differential amplifier the function of which is to form a trigger input isolator stage. The trigger multivibrator stage consists of the tunnel diode Z103, the transistor Z104 and the inductance L104. The multivibrator is free running in the drawn position of the switch S1 ("TRIGG"), because the current via R108 and section 1F in the switch S1 exceeds the peak current of the tunnel diode Z103. In "SYNC." position of S2 ("TRIGG/SYNC.") the multivibrator is astable over the whole range of RV1 ("TRIGG. SENSITIVITY") for synchronization of frequencies above 20 MHz. The multivibrator can run up to about 20 MHz and synchronize to frequencies up to 1000 MHz.
Together with the trigger hold-off circuit (Z106, Z107, Z108, Z109 and Z110) the trigger regenerator (Z105) has a gate function which limits the sampling frequency to 100 kHz. When a negative step from Z103 appears at Z105 this tunnel diode switches on, and the transistor Z110 is conducting. When Z110 is conducting the hold-off capacitor C106 starts discharging from —15 V to earth. Depending on the position of the switch S3 ("TIME/cm") one of the capacitors C2, C3, C4, C5 or C6 will be connected in parallel with C106. When the capacitors are discharged to near zero the transistors Z106 and Z107 are cut off and the bias-current to the tunnel diode Z105 is removed. When the bias-current disappears the tunnel diode switches back to its initial stage, which means that the negative voltage at the base of Z110 also disappears. The hold-off capacitors will now be charged through R116 and RV2. When the voltage at C106 reaches —15 V the charging current is fed through Z108, the transistors Z106 and Z107 start to conduct again and the bias-current to the tunnel diode can flow. The trigger regenerator tunnel diode Z105 is now ready to switch on for the next negative step from the trigger multivibrator tunnel diode Z103.

Fast ramp

The negative step from Z105 also starts the ramp gate multivibrator Z113. The ramp gate transistor Z118 is cut off by means of the negative step from Z113. When Z118 is cut off the time base ramp starts. The time base ramp circuit consists of the transistor Z117, the zener diode Z119 and the capacitors CV1—CV3 and C7—C19 in section 2F of the switch S3 ("TIME/cm"). Depending on the position of the switch S3 some of these capacitors start charging by means of a constant current from Z117. Therefore, a linear ramp voltage appears at the base of Z121.
The negative step from Z113 is also fed to the amplifier stage Z112 and from the collector of this transistor a trigger signal is supplied to connector P4 ("TRIGG. OUT") for triggering external equipment.

Comparator

The comparator consists of a DC coupled differential amplifier Z121 and Z125 and a tunnel diode Z120. Z121 is normally not conducting and Z125 carries the current from R141. At a certain level (which depends on the voltage on the base of Z125) current starts to flow through Z121 and this transistor takes over the current. The tunnel diode Z120 switches on when the current through Z121 together with the bias-current exceeds the peak point current of the tunnel diode. A negative step is delivered from Z120 and is fed to the base of transistor Z122. From the collector of Z122 a positive strobe pulse is fed to the sampling pulse generator in the Sampling Dual Trace Amplifier PM 3419 A.
The step from the tunnel diode Z120 is also fed to transistor Z115 and further to Z114. The tunnel diodes Z113 and Z120 are then reset by the current through Z114. When Z113 is reset Z118 is conducting again and the ramp slope capacitors are discharged through Z118.

Blanking

A pulse is fed from the collector of Z115 to the bases of Z129 and Z130. Z129 is an amplifier for blanking pulses to the CRT. Z129 receives blanking pulses both from the collector of Z115 and the collector of Z212. From the collector of Z129 blanking pulses are fed to the Basic Oscilloscope, where they extinguish the spot during a short time after each sampling when the vertical deflection is changed and during the reset time of the sweep.

Staircase generator and X deflection

The staircase generator consists of Z203. Z204 and Z207, connected to form a DC amplifier, and a feedback capacitor, C209 or C210, connected between the output and the input of this amplifier. Temperature compensation of Z203 and Z204 is effected by the diodes Z205 and Z206. The base current to Z203 is adjusted via the potentiometer RV201 ("BAL"). The circuit can be driven either by pump pulses from the capacitor C21 or C22 or by a DC current.

Depending on the position of the switch S5 ("X DEFL.") 10, 100 or 1000 samples/cm can be made. Capacitors C210 and C21 are connected in position 10 samples/cm, capacitors C210 and C22 in position 100 samples/cm, and capacitors C209 and C22 in position 1000 samples/cm. In these positions of S5, a staircase-shaped voltage is built up on the emitter of Z207 by means of the pump-pulses from C21 or C22. These pump-pulses are supplied from the collector of Z130. The voltage at the emitter of Z207 is fed both to the connector P2 ("X OUT") for external use and via the switch S4 ("TIME SCALE MAGN.") to the comparator. The voltage from Z207 is also fed to the emitter of Z213 via R206 and the switch S5 in the Sampling Dual Trace Amplifier PM 3419 A and further to the X amplifier.

The increasing staircase voltage on the emitter of Z207 results in an increasing current to the tunnel diode Z210 via R212, Z209, RV202 ("SWEEP LENGTH") and R213. When the peak current of Z210 is reached, the tunnel diode switches on, which results in a positive step at the collector of Z212. This positive step is fed to the base of Z208 via resistor R211. Z208 starts conducting by this step and the capacitors C209 and C210 will be discharged. Consequently the staircase generator is reset. The step from the collector of Z212 is also fed to the base of Z129 and used for blanking of the CRT during the sweep reset. When the staircase generator is reset, the tunnel diode Z210 is switched off by the next negative pump-pulse from the collector of Z130 via R21.

If the switch S5 is set in position "SINGLE ADJ." or "SINGLE" no pump-pulses are fed to the base of Z203 but a DC current via R23 from RV7 ("scan speed"). By means of this potentiometer the scan speed can be adjusted. When S5 is set in position "SINGLE" no reset pulses are fed to the tunnel diode Z210 after the sweep reset, but the tunnel diode is now reset by the push-button S6 ("SINGLE START"). If the "SINGLE START" button is still depressed when the sweep reaches the right hand side of the screen, the sweep will not be reset as long as the push button is kept depressed.

In positions "MANUAL" and "EXT". the staircase generator is disconnected. In position "MANUAL" a DC voltage from RV7 ("SCAN") is fed via deck 3R to the base of Z207. Consequently manual scanning can be effected by means of the potentiometer RV7 in this case. When S5 is set in position "EXT." the same potentiometer RV7 ("ATT") functions as an attenuator for the input signal to connector P1 ("X IN").

Therefore, depending on the position of the switch S5, the waveforms on the emitter of Z207 can be as shown in Fig. 3.

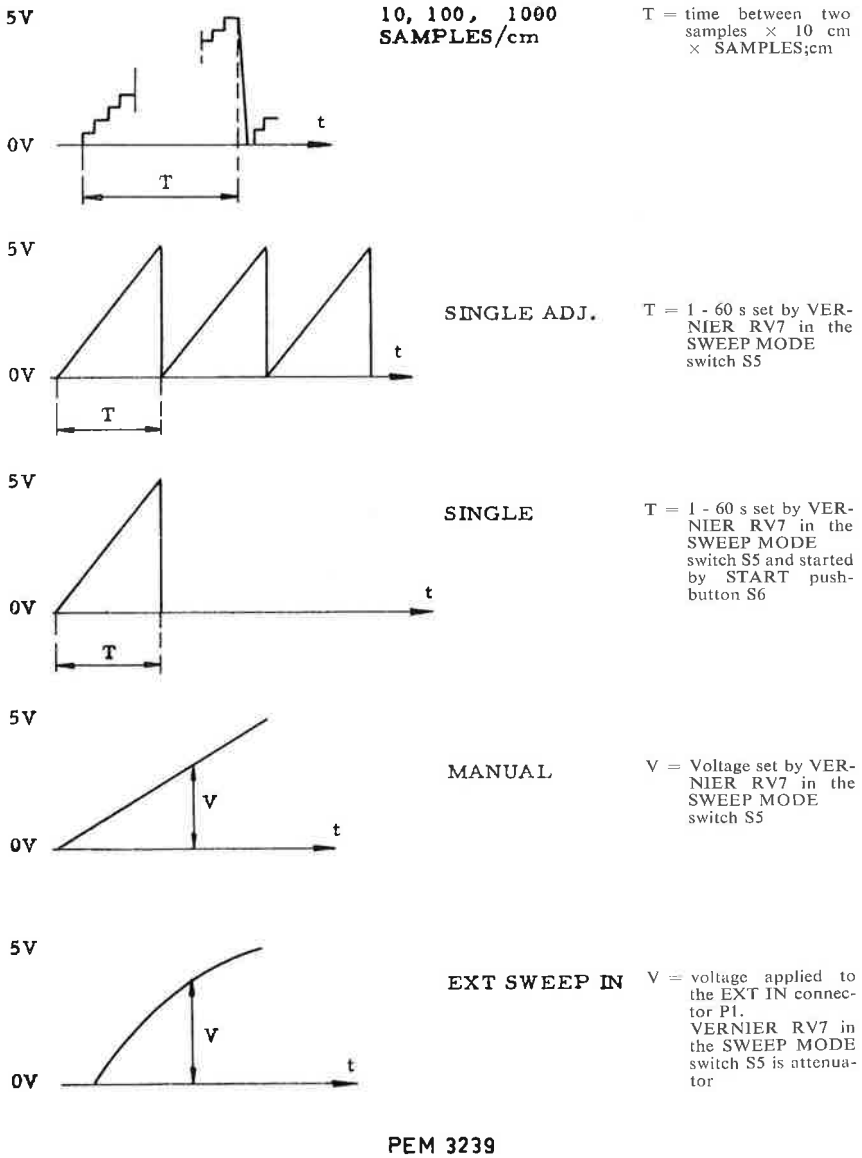


Fig. 3. Different sweep mode switch positions

Time scale magnifier

As mentioned earlier, current starts to flow through Z121 at a certain level of the ramp voltage on the base of Z121. Because the comparator Z121 and Z125 is a differential amplifier this level depends on the voltage level on the base of Z125. The voltage on the base of Z125 is determined by the output voltage from the staircase generator and the position of the switch S4 ("TIME SCALE MAGN."). The resistors R13-R18 on S4 form an attenuator which attenuates the staircase voltage from Z207. A constant current flows through the emitter-follower Z128 and the resistors R7-R12 and the potentiometers RV5 ("DELAY ZERO"), RV4 ("X SHIFT VERNIER") and RV3 ("X SHIFT"). The staircase voltage is fed from RV3 to the comparator via an emitter-follower Z126.

The design is such that the magnifier function always enlarges around the middle-point of the screen. This is achieved by means of R7–R12 on the switch S4 and the X SHIFT function. The X SHIFT is in reality a time-delay. In position "NORMAL" the delay is zero. It is always possible to delay as much as a full, unmagnified swwep. The delay remains unchanged by the magnifier. For instance, when the time/cm is 1 ns/cm a full sweep is 10 cm times 1 ns or 10 ns, which is equal to the delay range.

X amplifier

The X amplifier consists of the transistors Z215–Z218 which form a differential amplifier. The staircase voltage on the emitter of Z207 is fed via S5 in PM 3419 and transistor Z213 to the X amplifier. The balance A of the X amplifier is adjusted with potentiometer RV8 ("X POS."). The X gain can be adjusted by means of the potentiometer RV9 ("X GAIN"). The X deflection voltage to the Basic Oscilloscope is fed from the emitter-followers Z216 and Z217.

Adjusting elements and their functions

III

Adjustment	*Adjusting elements*	*Instrument required*	*Specifications*	*Proposed model*	*Chapter IV section*
X-amplifier	RV8, RV9	Digital voltmeter or calibrated oscilloscope	Input impedance $>$ 100 kΩ Accuracy: 1% at 6 V	PHILIPS PM2433	B
Delay zero	RV8, RV5 RV202	Square wave generator	Output: 1 V_{p-p}, 200 kHz Rise time $<$ 50 ns	PHILIPS GM 2324	D
Triggering	RV101, RV102 RV 103, RV104	Sine wave generator	Output :100 mV_{p-p}, 10 MHz	PHILPS GM 2621	C
Time calibration	RV105, CV1 CV2, CV3	Sine wave generator	Output: 200–300 mV_{p-p}, 1 and 100 MHz ± 1%	PHILIPS GM 2621	F
X-deflection	RV201	—	—	—	E
Adjustments	—	Extension cable	—	See list of parts	—

Checking and adjusting

IV

A. GENERAL

The adjusting elements and their functions are listed in chapter III.
The tolerances mentioned in the following text apply only for newly adjusted instruments. The values may differ from those given in the technical data, chapter II of the operating manual PM 3419A + PM 3419B.
In order to obtain a high degree of accuracy, it is best to make these adjustments with the aid of the appropriate PM 3410 basic equipment, which must be set correctly.
Do not adjust the internal controls unless the instrument has been repaired or is much out of adjustment.
The adjustments must be performed in the order given and after a warming-up period of at least half an hour for both the basic instrument and the plug-in unit.
The basic equipment must be switched off while the extension cable is being fitted to avoid damage to the transistors.

B. X-AMPLIFIER

1. Connect the PM 3419 B to the basic instrument via the extension cable (instrument switched off). This applies to all adjustments except the adjustment of DELAY ZERO.
2. Short-circuit the pins 9 and 10 on print 1 of the amplifier unit PM 3419A.
3. Connect the voltmeter to X OUT, P2 and set the controls of the units as follows:

PM 3419 A

Y_A mV/cm	50 (Vernier in pos. CAL)
Y_A SHIFT	middle position
Mode S5	B
TRIGG.	A
NORMAL/ SMOOTHED	NORMAL

PM 3419 B

TIME/cm	0.1 µs
TIME SCALE MAGN.	1 (Vernier in pos. CAL)
X SHIFT	NORMAL
SENSITIVITY	middle position
X DEFL.	MANUAL
TRIGG.	FREE RUN
TRIGG./SYNC.	TRIGG.

4. Turn MANUAL SCAN, RV7, until the voltmeter shows 0.0 V.
5. Adjust the dot to the extreme left-hand vertical line with X POS, RV8 (fig. 4).
6. Turn MANUAL SCAN, RV7, until the voltmeter shows 5.0 V.
7. Adjust the dot to the extreme right-hand vertical line with X GAIN, RV9 (fig. 4).
8. Repeat points B.4 to B.7 until the error is within 1 mm.
9. Remove the short circuit mentioned in point B.2.

C. TRIGGERING

1. Set the controls of the units as follows:

PM 3419 A

Y_A mV/cm	100 (Vernier in pos. CAL)
Y_A SHIFT	middle position
Mode S5	B
TRIGG.	A
NORMAL/ SMOOTHED	NORMAL

PM 3419 B

TIME/cm	50 ns
TIME SCALE MAGN.	1 (Vernier in pos. CAL)
X SHIFT	NORMAL
SENSITIVITY	middle position
X DEFL.	100 samples/cm
TRIGG.	INT. +
TRIGG./SYNC.	TRIGG.

2. If no triggering is obtained:
   Set RV101 (print 1) fully anti-clockwise, RV102 (print 1) fully clockwise and RV104 (print 1) in middle position.
   Adjust RV103 (print 1) just until a trace appears. If no trace appears try another position of RV104 and adjust RV103 again.
   Repeat these adjustments until a trace ap
   Turn RV102 just until the trace disappears.
3. Adjust RV101 until the trace appears and turn back to the point where the trace just disappears.
4. Apply a signal (from a sine wave or pulse generator) with an amplitude of 100 mV_{p-p} and a frequency of about 10 MHz to the input Y_A, P1.
5. Set mode S5 to A.
6. Adjust SENSITIVITY for triggering.
7. Adjust RV103 to the middle of the range within which a correct display is obtained.
8. Adjust RV104 to the middle of the range within which a correct display is obtained.
9. Adjust RV102 to the middle of the range within which a correct display is obtained.

D. DELAY ZERO, X POSITION AND SWEEP LENGTH

1. The unit must be inserted in the Basic Oscillsocope when adjusting DELAY ZERO. The adjusting elements can be reached after removing the top plate of the oscilloscope.
   Set the controls of the units as follows:

PM 3419 A

Y_A mV/cm	(200 Vernier in pos. CAL)
Mode S5	A
TRIGG.	A
NORMAL/ SMOOTHED	NORMAL

PM 3419 B

TIME/cm	1 μs
TIME SCALE MAGN.	1 (Vernier in pos. CAL)
X SHIFT	both in pos. NORMAL
X DEFL.	100 samples/cm
TRIGG.	INT. +
TRIGG./SYNC.	TRIGG.

2. Apply a positive pulse to Y_A input, P1.

Amplitude	1 V
Rise time	< 10 ns
Frequency	about 200 kHz

3. Adjust SENSITIVITY to display the signal.
4. Adjust X POS. RV8 (fig. 4) so that the start of the trace is shown on the CRT.
5. Adjust DELAY ZERO RV5 so that the trace starts with the leading edge of the signal.
6. Adjust X POS. RV8 so that the leading edge coincidences with the extreme left vertical line.
7. Adjust SWEEP LENGTH RV202 (print 2) so that the trace has a length of about 105 mm.

E. X DEFLECTION

1. Short circuit pins 9 and 10 on the printed circuit board 1 of the amplifier unit PM 3419 A.
2. Set the controls of the units as follows:

PM 3419 A

Mode S5	B

PM 3419 B

X DEFL.	100 samples/cm
TRIGG.	INT. +
TRIGG./SYNC.	TRIGG.

3. Advance the SENSITIVITY until the trace free-runs, then decrease the SENSITIVITY until the spot stops on the CRT.
4. Adjust BAL RV201 for as slow a dot movement as possible.
5. Remove the short circuit mentioned in point E.1.

F. TIME CALIBRATION

1. Set the controls of the units as follows:

PM 3419 A

Y_A mV/cm	100 (Vernier in pos. CAL)
Mode S5	A
TRIGG.	A
NORMAL/ SMOOTHED	NORMAL

PM 3419 B

TIME/cm	1 μs
TIME SCALE MAGN.	1 (Vernier in pos. CAL)
X SHIFT	middle position
X DEFL.	100 samples/cm
TRIGG.	FREE RUN
TRIGG./SYNC.	TRIGG.

2. Position the line in de middle of the screen with Y SHIFT.
3. Next set the triggering selector in position INT. +.
4. Apply a signal (from a sine wave or pulse generator) with a frequency of 1 MHz ± 1% and an amplitude of 200–300 mV_{p-p}.
5. Set SENSITIVITY for triggering.
6. Adjust RAMP CURRENT RV105 (print 1) so that 10 periods fill 10 cm.
7. Set the frequency of the generator to 100 MHz. ± 1%.
8. Set TIME/cm to 1 ns, TRIGG./SYNC. to SYNC. and Y_A mV/cm to 20. Adjust RAMP SLOPE CAPACITOR CV3 (fig. 5) so that 1 period fills 10 cm.
9. Set TIME/cm to 2 ns.
   Adjust CV2 (fig. 5) so that 2 periods fill 10 cm.
10. Set TIME/cm to 5 ns and Y_A mV/cm to 50.
    Adjust CV1 (fig. 5) so that 5 periods fill 10 cm.

Information for assistance in fault finding

To facilitate checking for correct operation and fault-finding, some oscillograms are given in Fig. 7.
These oscillograms were measured with a sampling oscilloscope at the points indicated on the circuit diagrams and printed wiring boards in Roman numerals.

Remark:

Whenever it is desired to send the plug-in units to a PHILIPS workshop the following points should be observed:

- give the symptoms of the fault as fully as possible.
- tie on a label bearing the name and address of the sender.
- carefully pack the instrument in the original packing or, if the latter is not available, in a wooden box.
- send the instrument direct to the appropriate PHILIPS address provided by the local organization.
- if the repaired units must be set with a high degree of accuracy, the appropriate basic instrument must be sent with the units.

List of parts

VI

A. MECHANICAL

Item	*Number*	*Code number*	*Description*
1	1	4822 455 80051	Textplate
2	4	4822 159 00318	Knob (S1, 3, 4, 5)
3	2	4822 159 00363	Knob (RV1, 3)
4	4	4822 159 00359	Knob (RV2, 4, 6, 7)
5	1	4822 159 00321	Knob (S2)
6	5	4822 159 00358	Knob cap (S2, RV2, 4, 6, 7)
7	1	4822 159 00364	Knob cap (S3)
8	2	4822 273 80093	Switch (S1, 2)
9	1	4822 273 40175	Switch (S3)
10	1	4822 273 40176	Switch (S4)
11	1	4822 273 80094	Switch (S5)
12	1	4822 276 10219	Switch (S6)
13	4	4822 044 00469	Connector (P1, 2, 3, 4)
14	1	W4 125 73	Plug A (Amphenol: 26-159-32)

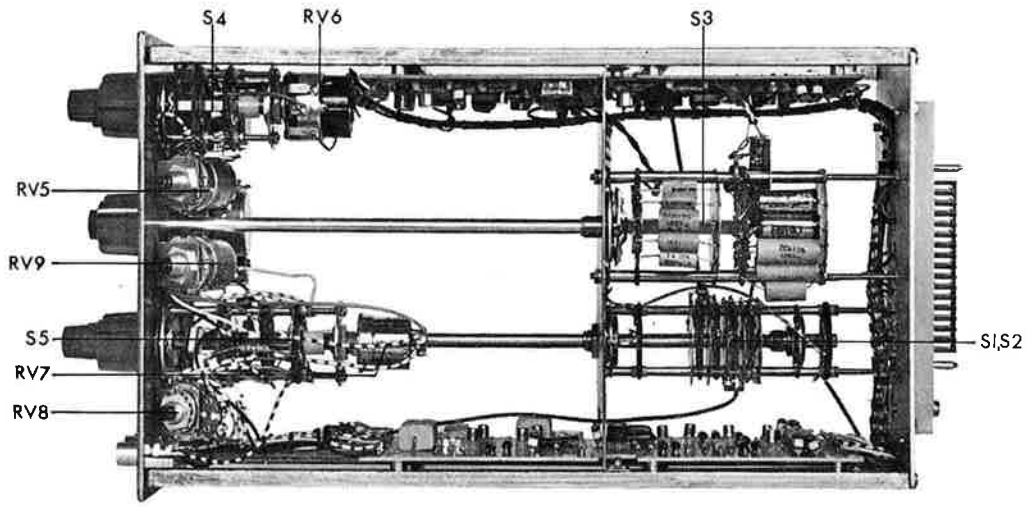


Fig. 4. Top view

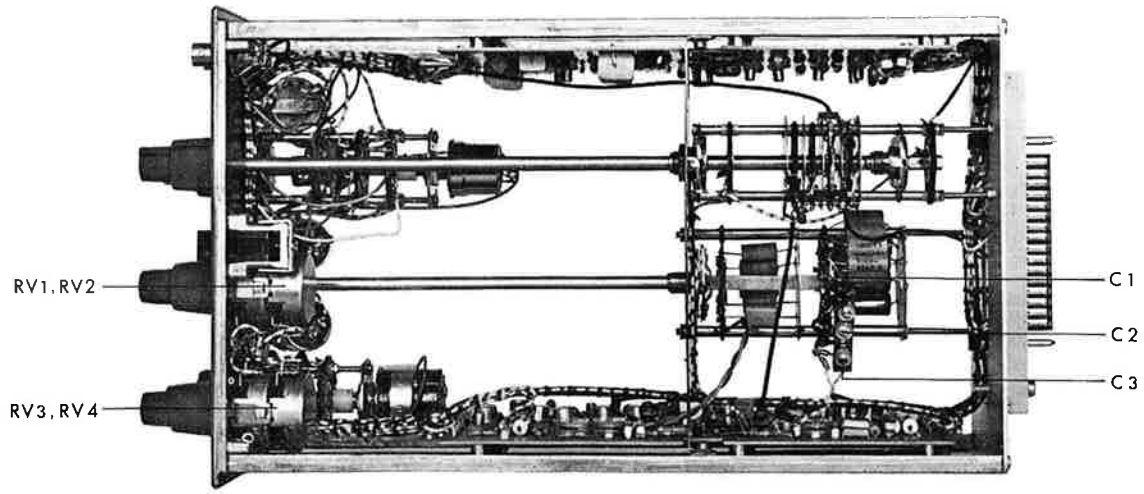


Fig. 5. Bottom view

B. ELECTRICAL — ELEKTRISCH — ELEKTRISCH — ELECTRIQUE — ELECTRICOS

This parts list does not contain multi-purpose and standard parts. These components are indicated in the circuit diagram by means of identification marks. The specification can be derived from the survey below.

Diese Ersatzteilliste enthält keine Universal- und Standard-Teile. Diese sind im jeweiligen Prinzipschaltbild mit Kennzeichnungen versehen. Die Spezifikation kann aus nachstehender Übersicht abgeleitet werden.

In deze stuklijst zijn geen universele en standaardonderdelen opgenomen. Deze componenten zijn in het principeschema met een merkteken aangegeven. De specificatie van deze merktekens is hieronder vermeld.

La présente liste ne contient pas des pièces universelles et standard. Celles-ci ont été repérées dans le schéma de principe. Leurs specifications sont indiquées ci-dessous.

Esta lista de componentes no comprende componentes universales ni standard. Estos componentes están provistos en el esquema de principio de una marca. El significado de estas marcas se indica a continuación.

Carbon resistor E24 series Kohleschichtwiderstand, Reihe E24 Koolweerstand E24 reeks Résistance au carbone, série E24 Resistencia de carbón, serie E24	0,125 W	5%
Carbon resistor E12 series Kohleschichtwiderstand, Reihe E12 Koolweerstand E12 reeks Résistance au carbone, série E12 Resistencia de carbón, serie E12	1 W	≦ 2,2 MΩ, 5% > 2,2 MΩ, 10%
Carbon resistor E12 series Kohleschichtwiderstand, Reihe E12 Koolweerstand E12 reeks Résistance au carbone, série E12 Resistencia de carbón, serie E12	0,25 W	≦ 1 MΩ, 5% > 1 MΩ, 10%
Carbon resistor E12 series Kohleschichtwiderstand, Reihe E12 Koolweerstand E12 reeks Résistance au carbone, série E12 Resistencia de carbón, serie E12	2 W	5%
Carbon resistor E24 series Kohleschichtwiderstand, Reihe E24 Koolweerstand E24 reeks Résistance au carbone, série E24 Resistencia de carbón, serie E24	0,5 W	≦ 5 MΩ, 1% > 5 ≦ 10 MΩ, 2% > 10 MΩ, 5%
Wire-wound resistor Drahtwiderstand Draadgewonden weerstand Résistance bobinée Resistencia bobinada	0,4 – 1,8 W	0,5%
Carbon resistor E12 series Kohleschichtwiderstand, Reihe E12 Koolweerstand E12 reeks Résistance au carbone, série E12 Resistencia de carbón, serie E12	0,5 W	≦ 1,5 MΩ, 5% > 1,5 MΩ, 10%
Wire-wound resistor Drahtwiderstand Draadgewonden weerstand Résistance bobinée Resistencia bobinada	5,5 W	≦ 200 Ω, 10% > 200 Ω, 5%
Wire-wound resistor Drahtwiderstand Draadgewonden weerstand Résistance bobinée Resistencia bobinada	10 W	5%

Tubular ceramic capacitor Rohrkondensator Keramische kondensator, buistype Condensateur céramique tubulaire Condensador cerámico tubular	500 V
Tubular ceramic capacitor Rohrkondensator Keramische kondensator, buistype Condensateur céramique tubulaire Condensador cerámico tubular	700 V
Ceramic capacitor, "pin-up" Keramikkondensator "Pin-up" (Perltyp) Keramische kondensator "Pin-up" type Condensateur céramique, type perle Condensador cerámico, versión "colgable"	500 V
"Microplate" ceramic capacitor Miniatur-Scheibenkondensator "Microplate" keramische kondensator Condensateur céramique "microplate" Condensador cerámico "microplaca"	30 V
Mica capacitor Glimmerkondensator Micakondensator Condensateur au mica Condensador de mica	500 V
Polyester capacitor Polyesterkondensator Polyesterkondensator Condensateur au polyester Condensador polyester	400 V
Flat-foil polyester capacitor Miniatur-Polyesterkondensator (flach) Platte miniatuur polyesterkondensator Condensateur au polyester, type plat Condensador polyester, tipo de placas planas	250 V
Paper capacitor Papierkondensator Papierkondensator Condensateur au papier Condensador de papel	1000 V
Wire-wound trimmer Drahttrimmer Draadgewonden trimmer Trimmer à fil Trimmer bobinado	
Tubular ceramic trimmer Rohrtrimmer Buisvormige keramische trimmer Trimmer céramique tubulaire Trimmer cerámico tubular	

SERVICE

For multi-purpose and standard parts, please see PHILIPS' Service Catalogue.

Für die Universal- und Standard-Teile siehe den PHILIPS Service-Katalog.

Voor universele en standaardonderdelen raadplege men de PHILIPS Service Catalogus.

Pour les pièces universelles et standard veuillez consulter le Catalogue Service PHILIPS.

Para piezas universales y standard consulte el Catálogo de Servicio PHILIPS.

RESISTORS

No.	*Code number*	*Value*	*%*	*Watt*	*Description*
R7	4822 071 00587	4,7 Ω	5	0.125	
R14	B8 305 29D/30E	30 Ω	1	0.05	
R15	4822 116 50173	50 Ω	1	0.05	
R16	4822 071 00783	100 Ω	1	0.05	
R17	4822 071 00738	300 Ω	1	0.05	
R18	4822 071 00764	500 Ω	1	0.05	
R19	B8 305 29D/250E	250 Ω	1	0.05	

POTENTIOMETERS

No.	*Code number*	*Value*	*%*	*Watt*	*Description*
RV1, 2	4822 102 10101	10 kΩ 10 kΩ	20 20	0.25 0.25	Duopotentiometer
RV3, 4	4822 102 10078	1 kΩ 100 Ω	20 20	0.25 0.25	Duopotentiometer
RV5	4822 071 01012	330 Ω	5	2	
RV6	4822 103 20092	2.5 kΩ	10	1	
RV7	4822 071 00892	10 kΩ	5	2	
RV8	916/GE20K	20 kΩ	20	0.125	
RV9	4822 071 00716	1 kΩ	5	2	
RV101	4822 140 00393	2 kΩ	20	0.25	
RV102	4822 100 10037	1 kΩ	10	0.25	
RV103	4822 100 10038	500 Ω	10	0.25	
RV104	4822 100 10038	500 Ω	10	0.25	
RV105	4822 140 00381	250 Ω	20	0.25	
RV201	4822 100 10035	10 kΩ	20	0.25	
RV202	4822 100 10037	1 kΩ	10	0.25	

CAPACITORS

No.	*Code number*	*Value*	*%*	*Volt*	*Description*
C1	4822 121 40029	10 nF	10	250	
C2	4822 069 01065	39 nF	10	250	
C4	4822 069 00913	6.8 nF	10	63	
C7	4822 121 40101	100 nF	1	250	
C8	4822 121 40101	100 nF	1	250	
C9	4822 121 50232	20 nF	1	63	
C10	4822 121 50232	20 nF	1	63	
C11	4822 121 50097	10 nF	1	63	
C12	4822 069 00574	2 nF	1	125	
C13	4822 069 00574	2 nF	1	125	
C14	4822 121 50185	910 pF	1	500	
C16	C785 AB/D200E 4822 069 00608	380 pF	1	100	In parallel
C20	909/C1, 6	1.6 µF	— 10 +100	25	Electrolytic
C23	4822 069 01105	100 nF	20	250	
C24	4822 122 30025	47 nF	— 20 +100	6	
C101	4822 122 40003	10 nF	— 20 +100	40	
C102	4822 122 40003	10 nF	— 20 +100	40	
C103	4822 122 30006	10 pF	20	30	
C104	4822 122 40003	10 nF	— 20 +100	40	

No.	*Code number*	*Value*	*%*	*Volt*	*Description*
C105	4822 069 01105	100 nF	20	250	
C106	4822 121 50184	820 pF	1	500	
C108	4822 122 40003	10 nF	— 20 +100	40	
C109	4822 069 01093	10 nF	20	250	
C111	4822 069 01105	100 nF	20	250	
C112	4822 122 40003	10 nF	— 20 +100	40	
C115	4822 069 01105	100 nF	20	250	
C116	909/Z10	10 µF	— 10 + 50	25	Electrolytic
C119	4822 069 01105	100 nF	20	250	
C120	4822 069 01105	100 nF	20	250	
C121	4822 069 00957	4 µF	— 10 + 50	64	Electrolytic
C122	4822 069 01105	100 nF	20	250	
C123	4822 069 00957	4 µF	— 10 + 50	64	Electrolytic
C124	4822 069 01105	100 nF	20	250	
C125	4822 069 01105	100 nF	20	250	
C126	909/Z10	10 µF	— 10 + 50	25	Electrolytic
C127	909/Z10	10 µF	— 10 + 50	25	Electrolytic
C129	4822 069 01105	100 nF	20	250	
C130	4822 122 30026	100 nF	— 20 +100	6	
C201	4822 069 01105	100 nF	20	250	
C202	909/Z10	10 µF	— 10 + 50	25	Electrolytic
C203	4822 069 01105	100 nF	20	250	
C204	4822 069 00957	4 µF	— 10 + 50	64	Electrolytic
C205	4822 069 01105	100 nF	20	250	
C206	4822 069 00957	4 µF	— 10 + 50	64	Electrolytic
C207	4822 069 01105	100 nF	20	250	
C208	909/Z10	10 µF	— 10 + 50	25	Electrolytic
C209	4822 069 00622 } selected to be	1 µF	5	100	
C210	4822 069 01064 } 5%	100 nF	5	100	
C211	4822 069 01105	100 nF	20	250	
C212	4822 069 01093	10 nF	20	250	
C213	4822 069 00957	4 µF	— 10 + 50	64	Electrolytic
C214	4822 069 00622	1 µF	10	250	
C215	4822 069 01105	100 nF	20	250	

VARIABLE CAPACITORS

No.	*Code number*	*Value*	*%*	*Volt*	*Description*
CV1	4822 069 01121	4.5–20 pF		160	
CV2	4822 069 01121	4.5–20 pF		160	
CV3	4822 125 50025	2.5– 6 pF		160	

TRANSFORMERS

No.	*Code number*	*Description*
T1	4822 158 10122	

MISCELLANEOUS

No.	*Code number*	*Description*
Print 1	4822 214 10049	Printed circuit board with components
Print 2	4822 216 50112	Printed circuit board with components

COILS

No.	Code number	Description
L1	4822 325 30005	
L2	56 590 65/20	Ferroxcube tube
L3, L4, L5, L6, L7, L8	4822 325 30005	

No.	Code number	Description
L101, L102, L103	4822 526 10011	Ferroxcube tube
L104	4822 128 00487	
L105, L106	4822 526 10011	Ferroxcube tube

SEMI CONDUCTORS

No.	Type		Description
Z1	BA114		Diode
Z2	BZY59		Zener diode
Z101	2N3932	RCA	Transistor
Z102	2N3932	RCA	Transistor
Z103	TD253A	General Electric	Tunnel diode
Z104	BSY39		Transistor
Z105	TD253A	General Electric	Tunnel diode
Z106	ASY27		Transistor
Z107	ASY29		Transistor
Z108	ASY29		Transistor
Z109	AAZ18		Diode
Z110	ASY27		Transistor
Z111	2N2369		Transistor
Z112	2N 3905	Motorola	Transistor
Z113	MS1705	Micro State Electronics Corp.	Tunnel diode
Z114	ASY29		Transistor
Z115	2N 3905	Motorola	Transistor
Z116	AAZ18		Diode
Z117	2N 3905	Motorola	Transistor
Z118	BSX27	S.G.S.-Fairchild	Transistor
Z119	BZY56		Zener diode
Z120	MS1705	Micro State Electronics Corp.	Tunnel diode
Z121	2N 3932	RCA	Transistor
Z122	2N 3905	Motorola	Transistor

No.	Type		Description
Z123	BAX13		Diode
Z124	1N4009		Diode
Z125	BSY38		Transistor
Z126	BC109		Transistor
Z127	2N 3905	Motorola	Transistor
Z128	2N 3905	Motorola	Transistor
Z129	BSX21		Ttransisor
Z130	ASY29		Transistor
Z131	1N4009		Diode
Z201	1N4009		Diode
Z202	1N 4009		Diode
Z203	BC109		Transistor
Z204	BC109		Transistor
Z205	BA114		Diode
Z206	BA114		Diode
Z207	BC109		Transistor
Z208	BSY38		Transistor
Z209	1N4009		Diode
Z210	1N3716	General Electric	Tunnel diode
Z211	ASY29		Transistor
Z212	BCY30		Transistor
Z213	BC109		Transistor
Z214	BA114		Diode
Z215	BC109		Transistor
Z216	BSY39		Transistor
Z217	BSY39		Transistor
Z218	BC109		Transistor

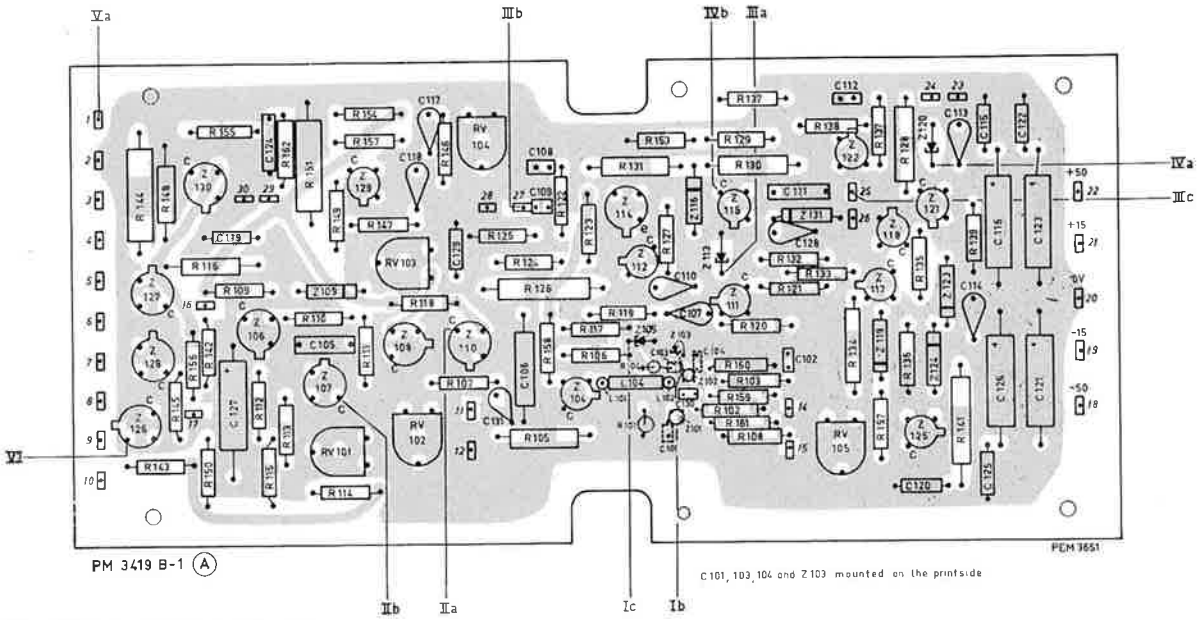


Fig. 6a. Print 1, component side

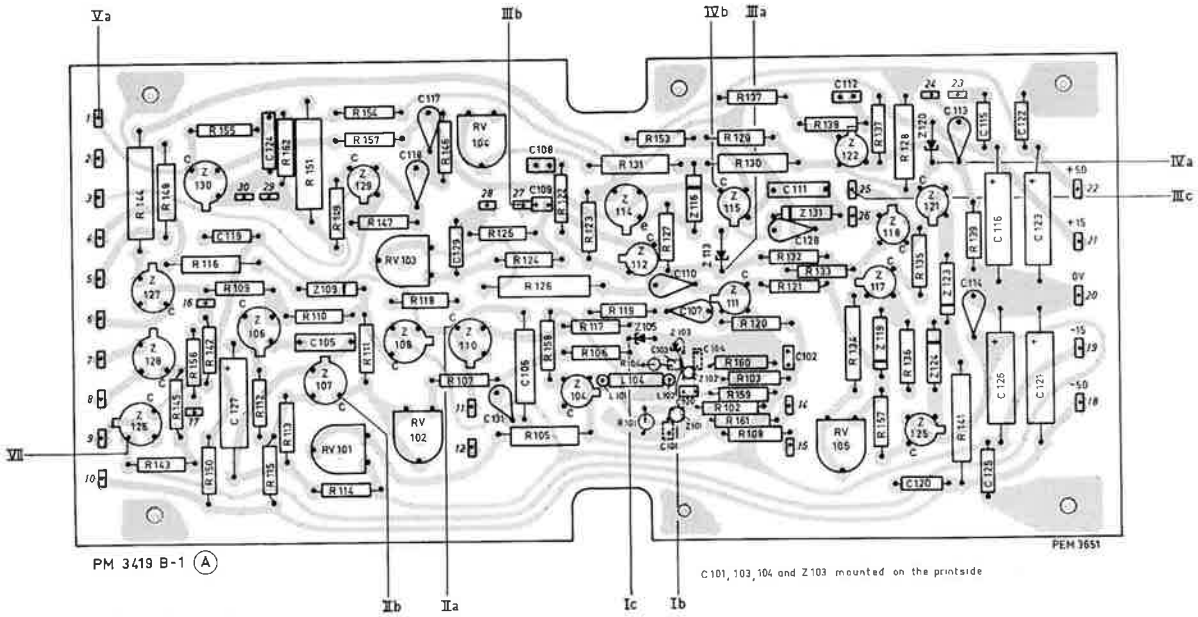
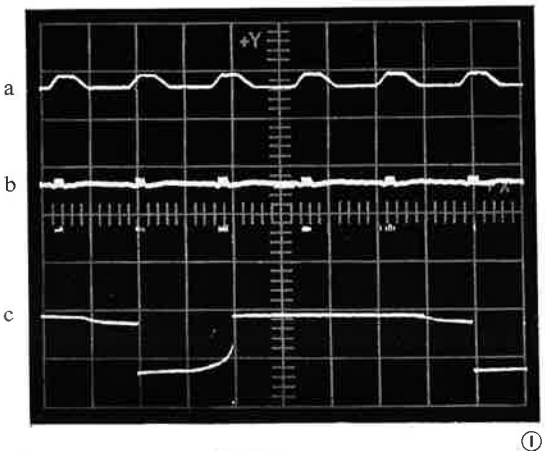


Fig. 6b. Print 1, print side



a 200 mV/cm

b 500 mV/cm

c 500 mV/cm

①

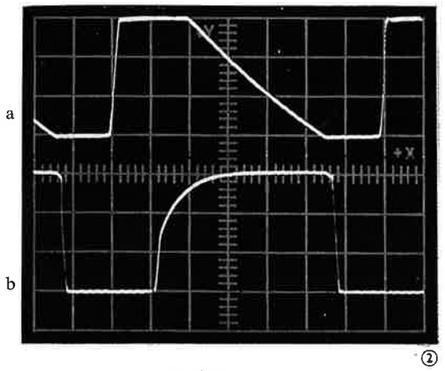
I. 2 µs/cm

a. External input signal on P3

b. Z103–L105

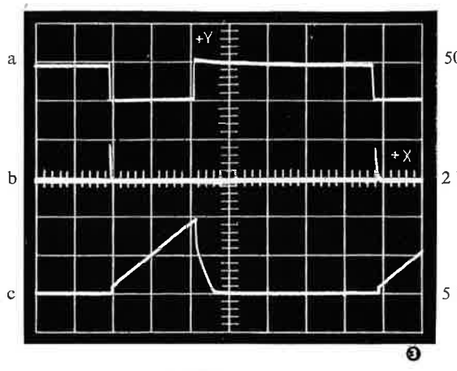
c. Z105

An external trigger signal of waveform "a" is applied to TRIGG. IN, P3.
S1 in position EXT. +.



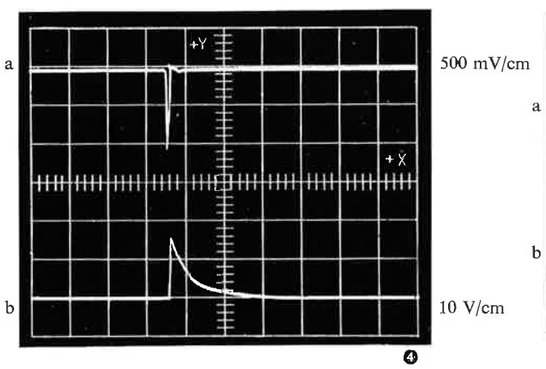
II.
a. Z110c
b. Z107c

See I.



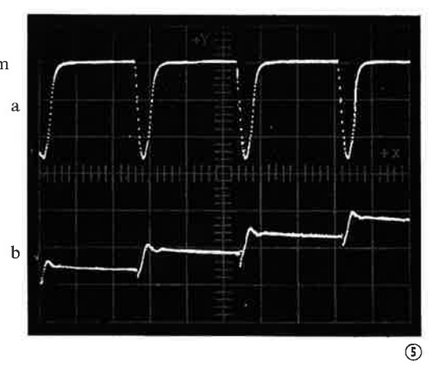
III.
a. Z113
b. TRIGG. OUT P4 (loaded with 50 Ω)
c. Z121b

See I.
Position manual. Pulse width dependent on RV7.



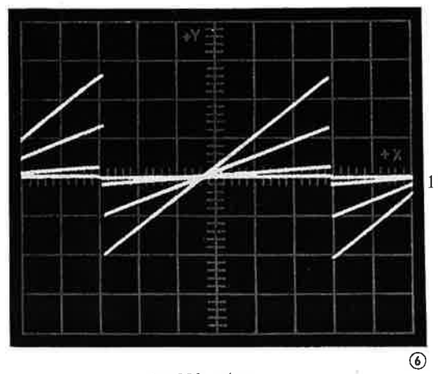
IV.
a. Z120
b. Z115c

See I.
Position manual



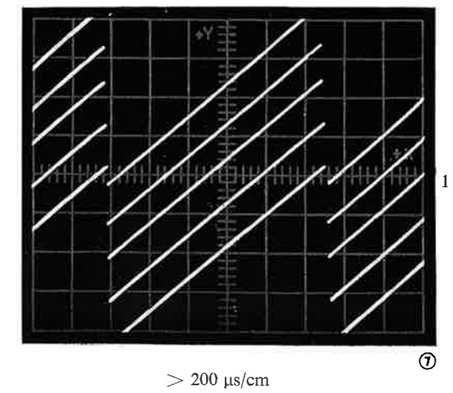
V.
a. Z130 c
b. X OUT P2

See I.
X DEFL. selector in position 10 samples/cm



VI.
RV 5, point 3

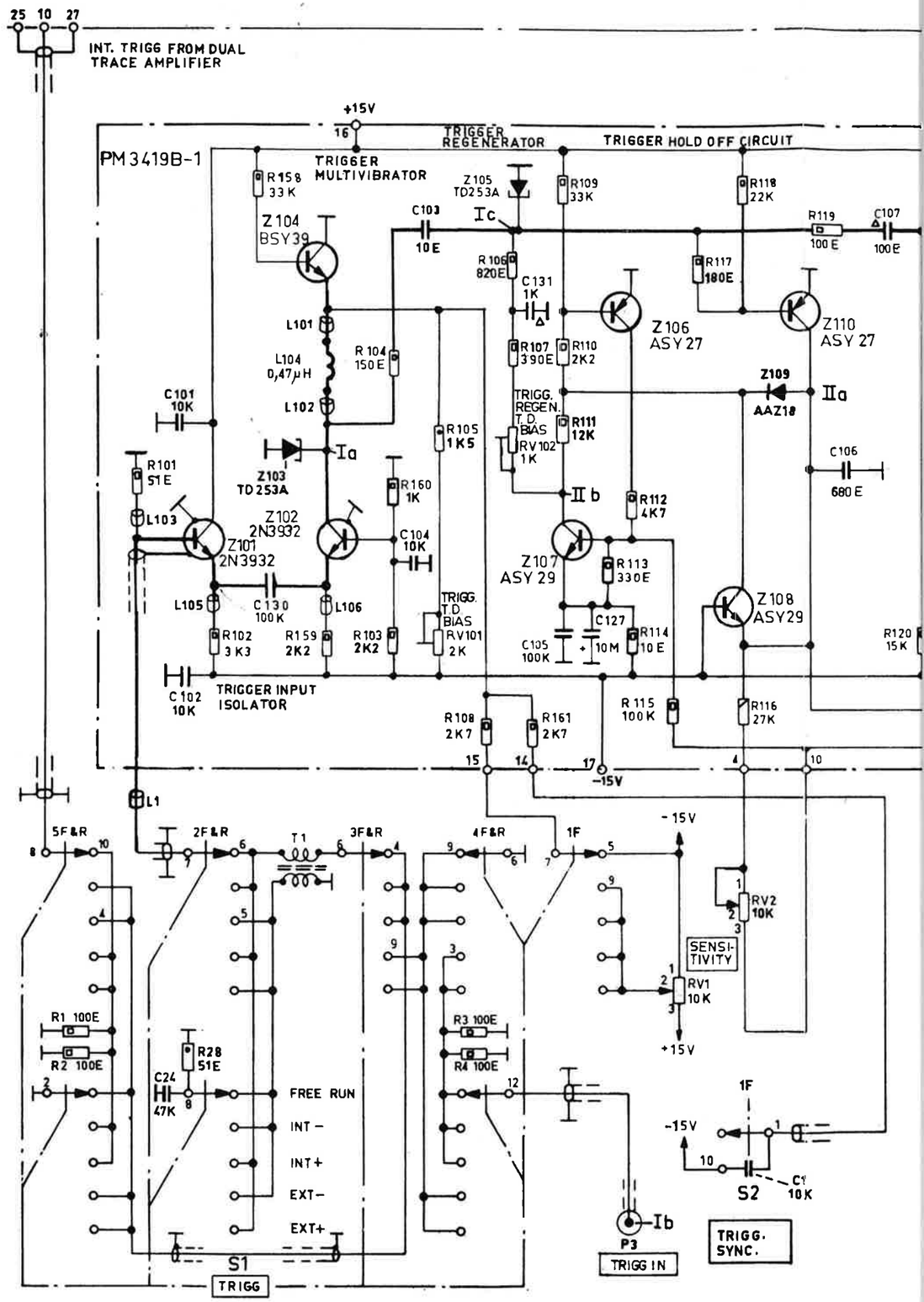
See I.
TIME SCALE MAGN. in positions 1, 2, 10 and 100.



VII.
Z125b

See I.
Five positions of RV 3, X SHIFT

Fig. 7. Oscillograms



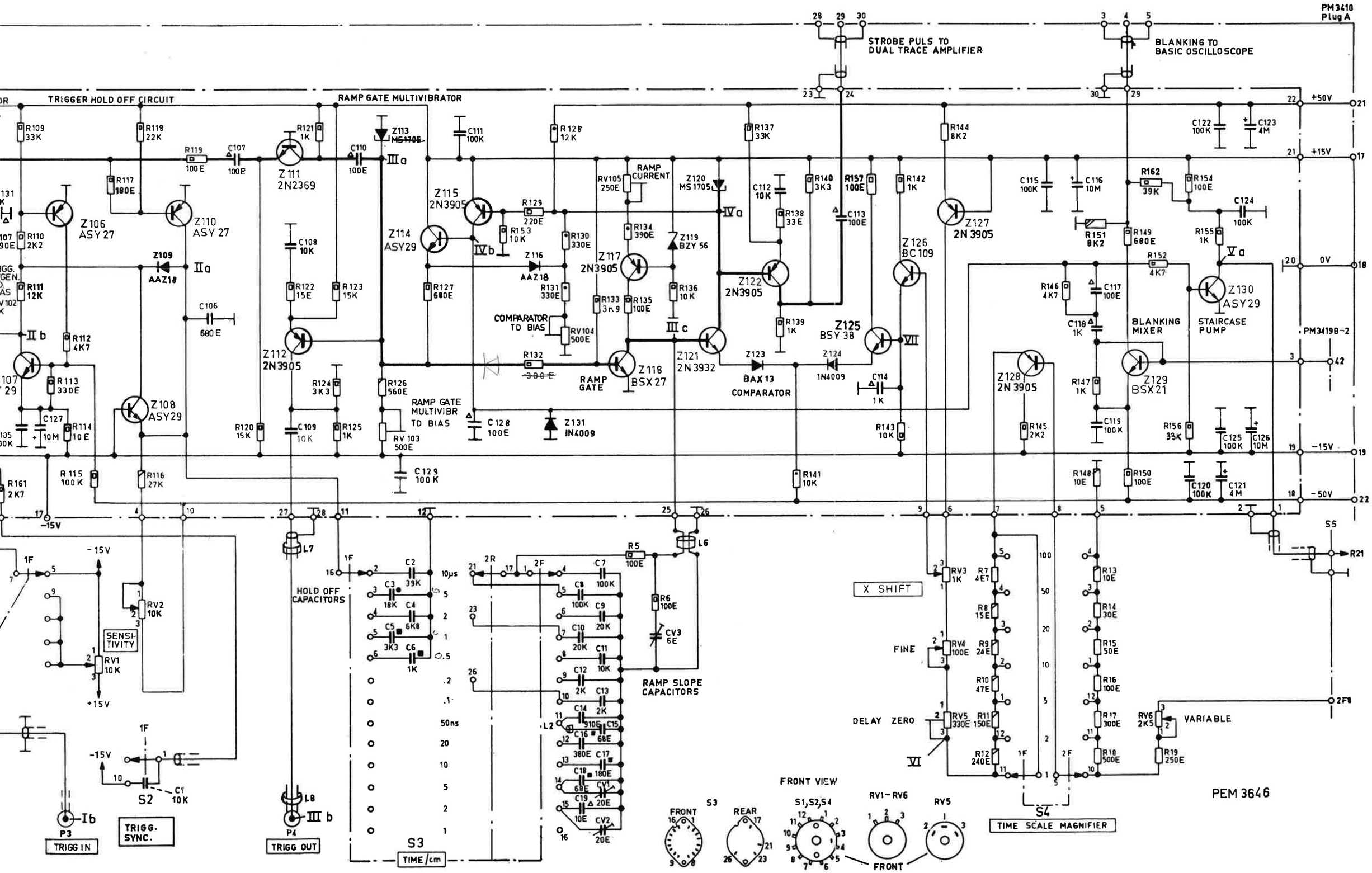


Fig. 8. Circuit diagram

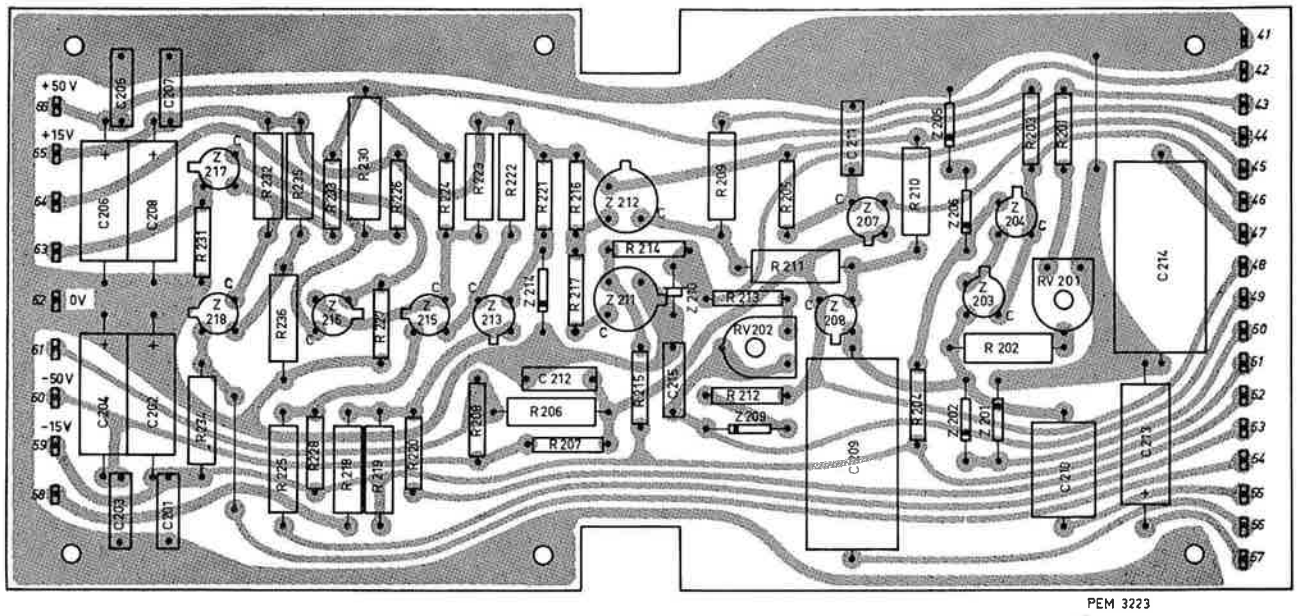
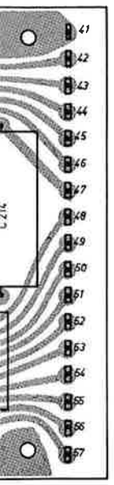

+50 V
+15V
0V
-50V
-15V
C 206
C 208
C 204
C 202
C 203
C 201
C 205
C 207
C 209
C 210
C 211
C 212
C 213
C 214
R 206
R 207
R 202
R 211
R 212
R 214
RV 201
RV 202
PEM 3223

Fig. 9. Print 2



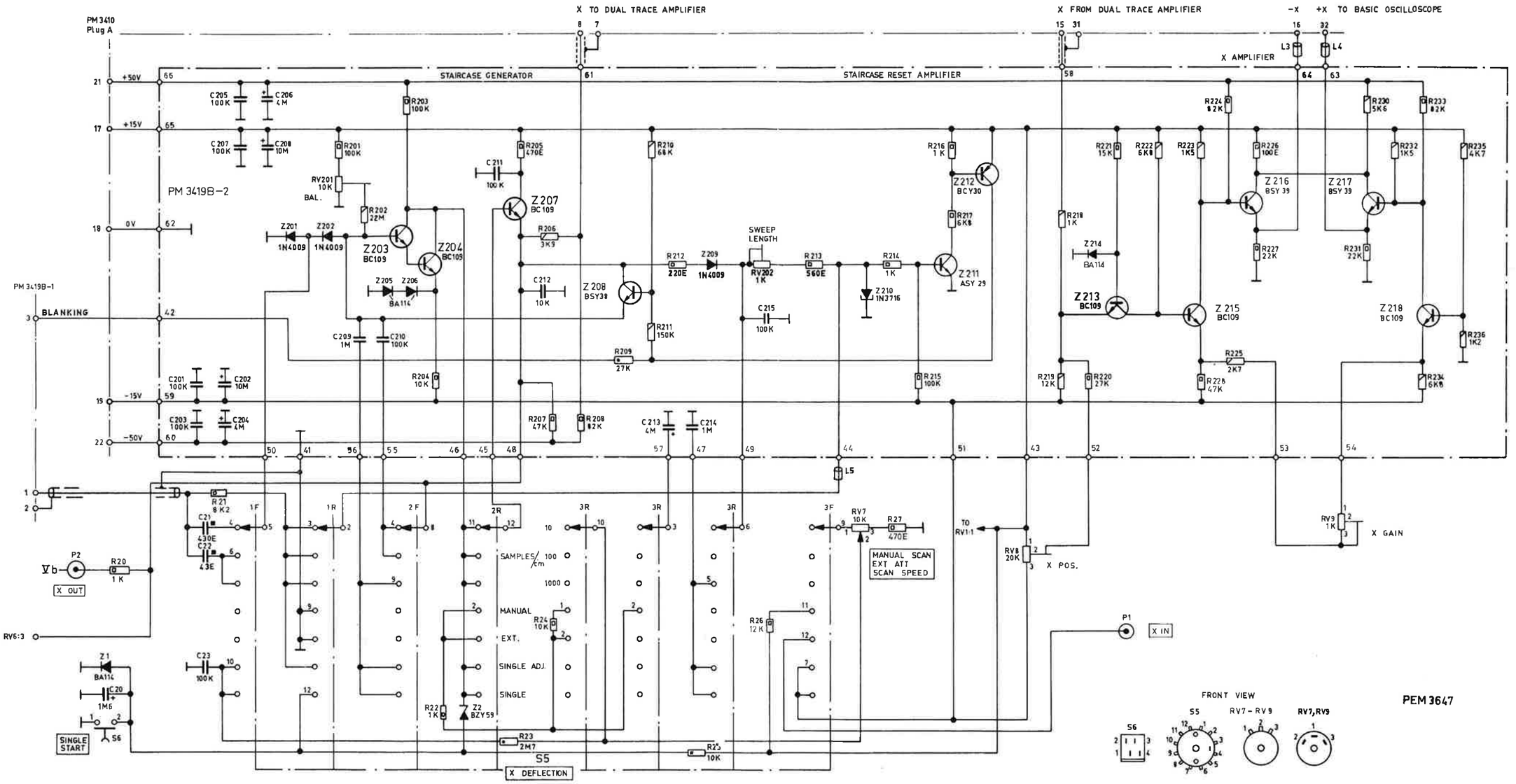


Fig. 10. Circuit diagram