



PHILIPS

Colour TV pattern generator PM 5518

Operating manual

TEST & MEASUREMENT

CUSTOMER SUPPORT



9499 520 09001
Second edition
890101

Colour TV pattern generator PM 5518

Operating manual
Gebrauchsanleitung
Notice d'emploi

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Second edition
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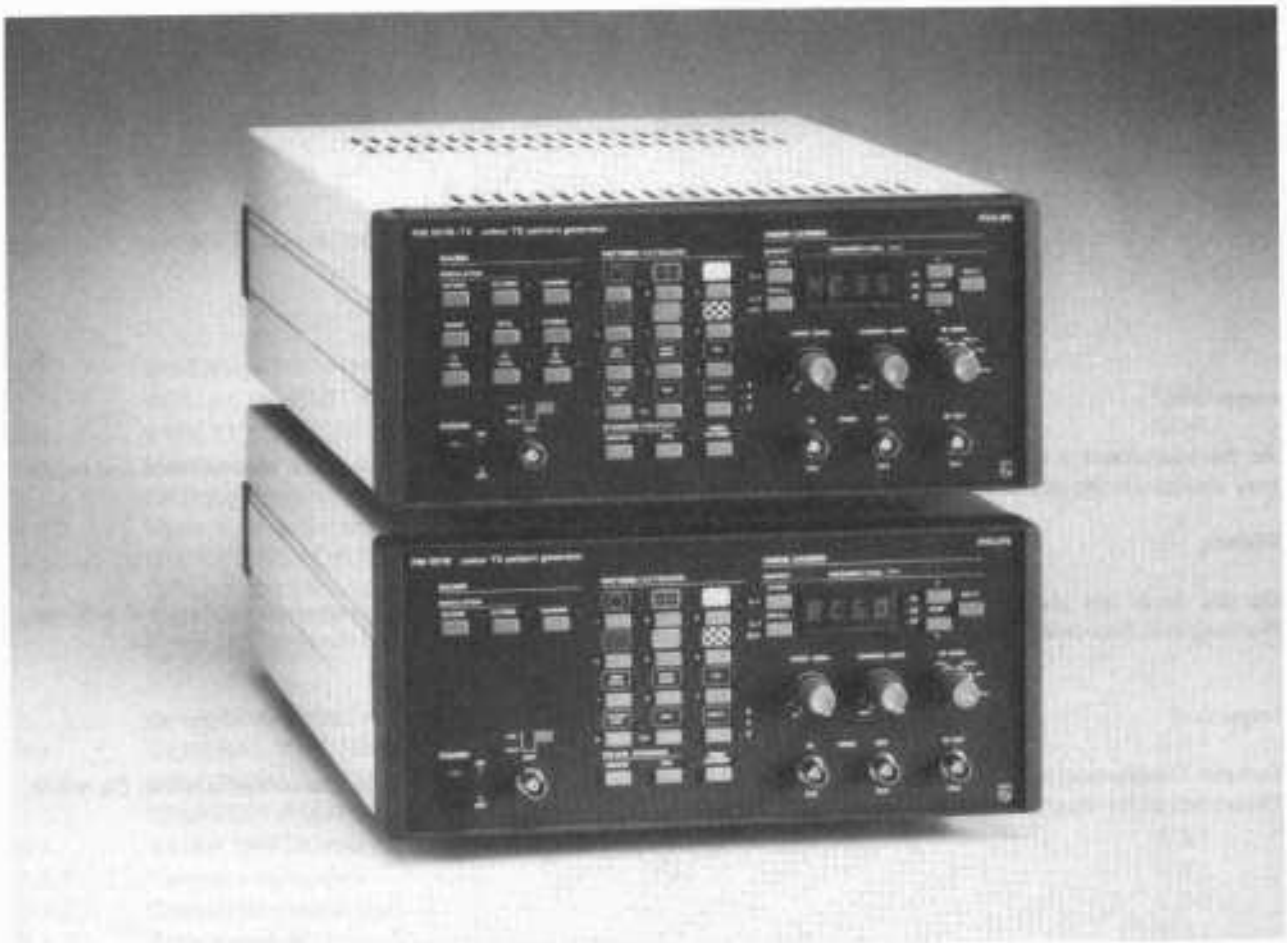
*This operating manual is also valid
for the versions – GTX, – RGB.*

For instruments

PM 5518-TXS (VPS: Video Program System)

PM 5518-TXI (IEEE bus interface)

additional operating manuals are delivered.



PHILIPS

Please note

In correspondence concerning this instrument, please quote the type number and serial number as given on the type plate.

Bitte beachten

Bei Schriftwechsel über dieses Gerät wird gebeten, die Typennummer und die Gerätenummer anzugeben. Diese befinden sich auf dem Typenschild an der Rückseite des Gerätes.

Noter s. v. p.

Dans votre correspondance et dans vos réclamations se rapportant à cet appareil, veuillez toujours indiquer le numéro de type et le numéro de série qui sont marqués sur la plaquette de caractéristiques.

Important

As the instrument is an electrical apparatus, it may be operated only by trained personnel. Maintenance and repairs may also be carried out only by qualified personnel.

Wichtig

Da das Gerät ein elektrisches Betriebsmittel ist, darf die Bedienung nur durch eingewiesenes Personal erfolgen. Wartung und Reparatur dürfen nur von geschultem, fach- und sachkundigem Personal durchgeführt werden.

Important

Comme l'instrument est un équipement électrique, le service doit être assuré par du personnel qualifié. De même, l'entretien et les réparations sont à confier aux personnes suffisamment qualifiées.

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ADDRESSES FOR SALES AND SERVICE

1. GENERAL

1.1. INTRODUCTION

The multi-system colour TV pattern generator PM 5518 is used for check and measurements, maintenance and repair on video equipment, i.e. colour TV, Black/White TV, video cassette recorders, teletext/antiope receivers, video monitors and cable TV equipment.

The pattern generators application areas are development, production, quality control, TV studios, service workshops and education.

The instrument covers the frequency range from 32 to 900 MHz.

The PM 5518 operates according to the CCIR or RTMA TV systems for either PAL/SECAM or NTSC respectively. The generator provides 18 basic test patterns offering over 70 different test pattern combinations.

The microprocessor control enables simple and rapid operation; it also allows a program sequence to be stored and recalled as required. Up to 10 instrument set-ups may be stored in non-volatile registers; they can be recalled in order. Each program may contain any RF vision frequency, test pattern or combination of patterns, as well as any of the sound operating modes.

The TV system selection is achieved by means of pushbuttons SECAM or PAL and the corresponding thumbwheel switch at the rear of the instrument.

The line frequency is automatically selected, either 15625 Hz for CCIR or 15734 Hz for RTMA. Line and field synchronisation are according to the appropriate TV standard and are available as line and field frequency for external applications at the BNC socket at the front panel.

Apart from the basic unit PM 5518 a further version is available:

- PM 5518–TX with FM stereo and second sound channel for PAL G, teletext signal for PAL G and PAL I and antiope for SECAM L

The PM 5518–TX operates according to the CCIR or RTMA TV systems for either PAL/SECAM or NTSC resp.; this version offers a selection of 5 teletext pages and 7 text pages in the ANTIOPE mode to align and check TV equipment with TELETEXT or ANTIOPE facilities.

PM 5518–TX allows for PAL B, G, H to select signals with two sound carriers for use in one- and two-channel mono modes, or to select the right and/or left channel of a stereo signal. The instrument also allows external modulation of a stereo signal by connecting a stereo tuner/amplifier, tape or cassette recorder to the AUDIO input socket at the rear, whereby PM 5518–TX acts as RF modulator.

For PM 5518 and PM 5518–TX the RGB unit is available for applications in the area of video monitors and computer graphic techniques. The RGB, sync and subcarrier signals are available at 5 BNC sockets at the rear side.

A part of the vision carrier section consists of a 4-digit LED display. The first digit indicates which of the selectable memory locations are in operation. The 2nd, 3rd and 4th digit indicate the vision carrier frequency in MHz.

Fine adjustment of the frequency setting in increments of 0.25 MHz – 100 kHz steps in the lower frequency ranges – is done by the up and down step keys near the display. LEDs indicate the selected value. Frequency tuning through the RF ranges is done by holding one of the step keys.

Keys for STORE and RECALL allow operation of the memory. The RECALL facility can also be used in combination with the step function which allows to get swiftly through the sequence of stored information.

The VIDEO OUTPUT signal is 1 V standard in stop position; it can be set from 0 to 1.5 V.
The CHROMA amplitude is fixed to 100 % in stop position; it can be set from 0 to 150 %.
The RF OUTPUT signal of 10 mV max. can be attenuated by more than 60 dB.

In addition to this manual please find attached an **operating card** for short-form operating instruction of the instrument.

For adequate customer support and in order to facilitate the service a **test program** is built in. Service is done on component level, so no complete module must be exchanged. In addition the mechanical concept allows quick access to all parts for service purposes: all units except the modulator are plugged into the motherboard.

Basic units, TV systems, instrument versions, RGB unit, identification on type plates

Basic units

code no. on type plate at rear of instrument

Basic units with RGB unit

PM 5518 – SECAM/PAL/NTSC

9452 055 18007

PM 5518 RGB

9452 055 18027

Instrument versions

Versions with RGB unit

PM 5518 GTX – teletext, antiope stereo sound

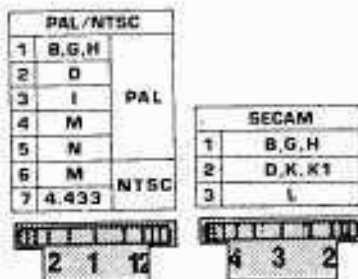
9452 055 18303

PM 5518 GTX, RGB 9452 055 18323

Instrument versions, TV systems

TV system type instrument	PAL					NTSC		SECAM		
	B G H	D	I	M	N	M	M 4.43 MHz	B G H	D K K1	L
PM 5518	x	x	x	-	-	x	x	x	x	x
PM 5518-TX	x Δ x \circ	x	x Δ	-	-	x	x	x	x	x \blacklozenge

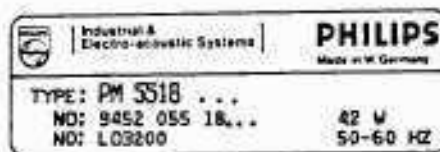
- x = TV system available
- = TV system without chroma signal
- Δ = Teletext
- \circ = Stereo
- \blacklozenge = Antiope



thumbwheel switches at the rear

Identification on the type plate

type number
code number
serial number



1.2. CHARACTERISTICS

1.2.1. Safety characteristics

This apparatus has been designed and tested in accordance with Safety Class I requirements of IEC Publication 348, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. This manual contains some information and warnings which must be followed by the user to ensure safe operation and to retain the apparatus in a safe condition.

1.2.2. Performance characteristics, specifications

Properties expressed in numerical values with stated tolerance are guaranteed by the manufacturer. Specified non-tolerance numerical values indicate those that could be nominally expected from the mean of a range of identical instruments.

This specification is valid after the instrument has warmed up for 30 minutes (reference temperature 23°C).

If not stated otherwise, relative or absolute tolerances relate to the set value.

1.2.3. Instrument versions, TV systems; see E 1-3

1.2.4. Specifications of TV systems

	B,G,H	D	I	M	N	M	B,G,H	D,K,K1	L
TV and chroma standard	CCIR, PAL	CCIR, PAL	CCIR, PAL	RTMA, PAL	CCIR, PAL	RTMA, NTSC	CCIR SECAM	CCIR SECAM	CCIR SECAM
No of lines per frame	625	625	625	525	625	525	625	625	625
Field frequency (Hz)	50	50	50	60	50	60	50	50	50
Line frequency (lines/second)	15625	15625	15625	15734	15625	15734	15625	15625	15625
Chrominance subcarrier (MHz)	4.433619	4.433619	4.433619	3.575611	3.582056	3.579545	f _{0B} =4.250000 f _{0R} =4.406250		
Sound carrier to vision carrier (MHz)	5.5	6.5	6	4.5	4.5	4.5	5.5	6.5	6.5
Sound modulation	FM	FM	FM	FM	FM	FM	FM	FM	AM
Pre-emphasis (µs)	50	50	50	75	75	75	50	50	—
Type and polarity of vision modulation	C3F (instrument generates A3F)						C3F neg.	C3F neg.	C3F pos.
Type of chrominance sub-carrier modulation	Suppressed carrier amplitude modul. of 2 sub-carriers in quadrature						Frequency mod. of line sequentially transmitted chrominance sub-carriers		
Transmitted chrominance information	1. Line sequential E'v and - E'v 2. E'u					1. E'i 2. E'q	line sequential D'R (E'r - E'y) and D'B (E'b - E'y)		

1.2.5. Video carrier

frequency ranges	32 ... 900 MHz	
setting	keyboard	
resolution	100 kHz steps 250 kHz steps	32.0 ... 99.9 MHz > 100 MHz
tuning	step buttons 100 kHz steps 250 kHz steps	in positive or negative direction; tuning speed increase by holding the step button 32.0 ... 44.9 MHz > 45.0 MHz
tolerance	≤ 25 kHz ≤ 35 kHz ≤ 50 kHz	32 ... 300 MHz 300 ... 470 MHz 470 ... 900 MHz
storage/recall	10 memory places	a) 10 RF frequencies b) as a) stored as TV channel nos.
indication	4 digit display	7-segment LED display first digit: memory: store/recall position 2nd, 3rd, 4th digit: a) 3-digit for frequency 3 LEDs for 250/500/750 kHz steps b) TV channel nos. (e.g. C21)

1.2.6. RF OUTPUT

		BNC socket
output voltage	≥ 10 mV	
impedance	75 Ω	
attenuation	> 60 dB	continuous
frequency response	± 2 dB ± 3 dB ± 2 dB	32 ... 300 MHz 300 ... 470 MHz 470 ... 900 MHz
		} at. max. RF amplitude

1.2.7.

Video part**Video modulation**

	AM		internal/external switchable
		SECAM L	
polarity	negative	positive	
RF sync. level	100 %	5 ... 20 %	
RF blanking level		30 %	
RF white level	5 ... 20 %	100 %	

VIDEO INPUT

BNC socket

impedance	75 Ω	
input voltage	1 V _{pp}	
DC component superimposed	-2 V ... +2 V	without signal compression
max. permiss. input voltage	± 5 V	
polarity	white level positive	
coupling	DC	clamping on sync.

VIDEO OUTPUTa) BNC socket
b) Scart (Euro-AV) connector

impedance	75 Ω	
voltage	0 ... 1.5 V	variable, into 75 Ω
nominal value	1 V	in stop position
- tolerance	< 5 %	
max. value	1.5 V	
- tolerance	< 8 %	
polarity	white level positive	
coupling	DC coupling	
DC blanking level	0 \pm 0.2 V DC	at 1 V

Video level

	B,D,G,H,I, N,K,K1,L	M	
sync level	-43 % \pm 3 %	-40 % \pm 3 %	100 % = black to white
blanking level	0 %	0 %	
black level	0 %	7.5 % \pm 2.5 %	
white level	100 %	100 %	

Pulse shapingfor luminance and sync signal;
except multiburst and teletext signals

filter type	\sin^2 -filter	
2T pulse		for crosshatch and centre cross
- pulse width at half amplitude	200 \pm 10 ns	

function switching output	+12 V
- impedance	1.5 k Ω

Scart (Euro-AV) connector

1.2.8. Chroma part

1.2.8.1 PAL/NTSC

timing and data of signals see fig.

TV systems	B,D,G,H,I,M,N M	PAL NTSC	
sub-carrier frequency	4.433619 MHz 3.575611 MHz 3.582056 MHz 3.579545 MHz	PAL B,D,G,H,I PAL M PAL N NTSC	} coupled with line frequency according to system selected
– tolerance	< 30 ppm		
sub-carrier frequency	4.433619 MHz	NTSC/4,433	not coupled with line frequency
– tolerance	< 100 ppm	at 23 °C	
sub-carrier blanking		acc. to system	
Colour burst			in every pattern except crosshatch
amplitude	0 ... 150 %		burst with chroma together adjustable
– nominal value	100 %		of sync amplitude, in stop position
– setting range	0 ... 150 %		continuous adjustable
phase	±135 ° -180 °	PAL, related to E'u axis NTSC, related to E'u axis	
– tolerance	≤ 3 °		
chroma signal			
amplitude			chroma with burst together adjustable
– nominal value	100 % ±5 %		in stop position
– setting range	0 ... 150 %		continuous adjustable
phase tolerance	≤ 3 °		

1.2.8.2 SECAM chroma part

TV system	B,G,H,D,K,K1,L	SECAM	timing and data of signals see fig.
sub-carrier frequency	$f_{0R} = 4.406250 \text{ MHz}$ $f_{0B} = 4.250000 \text{ MHz}$	}	coupled with line frequency
tolerance	$\leq 2 \text{ kHz}$		
Identification pulses (line and frame)			not with crosshatch
amplitude			together with chroma adjustable
- nominal value		}	at luminance amplif. 0.7 V
- - D'R lines	$540 \pm 40 - 50 \text{ mV}$		
- - D'B lines	$500 \pm 50 \text{ mV}$		
- setting range	0 ... 150 %		
position	line 7 ... 15 line 320 ... 328		1st, 3rd, 5th ... field 2nd, 4th, 6th ... field
Colour burst			not with crosshatch
amplitude			together with chroma adjustable
- nominal value		}	at luminance amplif. 0.7 V
- - D'R lines	$215 \pm 23 \text{ mV}$		
- - D'B lines	$167 \pm 18 \text{ mV}$		
- setting range	0 ... 150 %		
sub-carrier blanking	$5.6 \pm 0.2 \mu\text{s}$		after front porch of line sync pulse; during frame blanking interval except during identification pulses and except during line 23
chroma signal			
amplitude	$D'R = -1.9 (E'R - E'Y)$ $D'B = 1.5 (E'B - E'Y)$		
- nominal value	100 %		in stop position; defined by Bell filter
- setting range	0 ... 150 %		
chroma pre-correction			low frequency pre-emphasis and high frequency Bell filter acc. to system
modulation tolerance	$\Delta f_R = \pm 280 \pm 9 \text{ kHz}$ $\Delta f_B = \pm 230 \pm 7 \text{ kHz}$		for red signal of colour bar for blue signal of colour bar
Bell filter centre frequency	$4.286 \pm 0.020 \text{ MHz}$		

1.2.9. Test patterns		see also survey E 3-10; colour reprints of patterns fig.
1.2.9.1 Basic test patterns		
1. Circle white circle on black background		can be added to all test patterns changes to black when used with white pattern; with colour pattern the chrominance signal is not blanked
diameter	9 crosshatch distances	
2. Centre cross and border lines	3 vertical lines 3 horizontal lines on black or white background	1 for centre cross 2 for border lines
picture overscan	4.2 % 4.5 %	CCIR RTMA
3. White pattern	100 % white	with colour burst
4. Dots	12 horizontal lines 13 horizontal lines of 17 dots each	CCIR RTMA
5. Crosshatch with centre indications	12 horizontal lines 13 horizontal lines 17 vertical lines	CCIR RTMA
		no interlacing, chroma off
6. Checkerboard	6 x 8 black/white squares	
7. Greyscale	linear staircase signal with 8 equidistant steps from black to white	
8. Multiburst	8 vertical bars of definition lines 0.8–1.8–2.8–3.0–3.2 –3.4–3.8–4.8 MHz	sinusoidal
amplitude response	< 0.5 dB	
9. VCR pattern		4 horizontal bars
	bar 1: white 100 % Y	1/6 field
	bar 2: multiburst (defini- tion lines) 0.8–1.8–2.8–3.0–3.2 –3.4–3.8–4.8 MHz	2/6 field
	bar 3: saturation steps of linear decreasing chroma (R–Y)	2/6 field
	bar 4: white square stepwise moving from right to left on black bar; duration of 1 circulation: 5.12 s 4.27 s	1/6 field
		CCIR RTMA

10. Colour bar

standard colour bar pattern:
white, yellow, cyan, green,
magenta, red, blue black

amplitudes

100/0/75/0
100/0/100/25
77/7.5/77/7.5

B,D,G,H,K,K1,L,N
I
M

11. DEM pattern

PAL B,D,G,H,I,N

G-Y=0		Y=50%	
Δ	Δ	\square	\square
$\pm(R-Y)$ = 0.28	$\pm(R-Y)$ = 0.28	$\pm(B-Y)$ = 0.5	$\pm(B-Y)$ = 0.5
Δ	Δ	\square	\square
$\pm(R-Y)$ = 0.28	$\pm(R-Y)$ = 0.28	$\pm(B-Y)$ = 0.5	$\pm(B-Y)$ = 0.5
Reference Y = 50 %			

$\Delta(B-Y)=0$ $\square(R-Y)=0$

4 horiz. bars with PAL burst

4 coloured squares (PAL coded)

4 uncoloured squares (anti-PAL coded)

PAL M

G-Y=0		Y=54%	
Δ	Δ	\square	\square
$\pm(R-Y)$ = 0.26	$\pm(R-Y)$ = 0.26	$\pm(B-Y)$ = 0.46	$\pm(B-Y)$ = 0.46
Δ	Δ	\square	\square
$\pm(R-Y)$ = 0.26	$\pm(R-Y)$ = 0.26	$\pm(B-Y)$ = 0.46	$\pm(B-Y)$ = 0.46
Reference Y = 54 %			

$\Delta(B-Y)=0$ $\square(R-Y)=0$

4 horiz. bars with PAL burst

4 coloured squares (PAL coded)

4 uncoloured squares (anti-PAL coded)

NTSC

white(Y=77%)	yellow	cyan	green	magenta	red	blue	blue
Y = 54 % - 0.2280 - 0	Y = 54 % + 0.2280 - 0		Y = 54 % + 0.2280 - 0				
white(Y=100%)	black(Y=7.5%)						

3 horiz. bars with NTSC burst

colour bar

amplitudes: 77/-/77/7.5

height: 4/6 field

2 coloured squares; 1/6 field

2 uncoloured squares; 1/6 field

SECAM

def. Lines 0,8... 4,8 MHz							
30%							0%
M	Y	C	G	M	R	B	BK
75%							0%
M	Y	C	G	M	R	B	BK
Reference white Y = 75 %							

4 horiz. bars

multiburst (definition lines)

colour bar

amplitudes 30/0/30/0

colour bar

amplitudes 75/0/75/0

M: magenta Y: yellow C: cyan G: green

R: red B: blue BK: black

12. Purity patterns

3 primary colours;

red, green, blue;

3 complementary colours;

magenta, yellow, cyan;

white 100 % Y, black

amplitudes:

100/0/75/0

77/7.5/77/7.5

B,D,G,H,I,K,K1,L,N

M

1.2.9.2 Double combinations of patterns

see survey E 3-13 ... E 3-15

contents

as basic patterns,
 except white pattern + colour bar:
 amplitudes 75/0/75/0 CCIR
 77/7.5/77/7.5 RTMA

special

centre cross + purity patterns:
 no chroma blanking for lines

1.2.9.3 Triple combinations of patterns

1. Circle with all double combinations
2. Pattern no. 38

3 horizontal bars

greyscale
 colour bar
 multiburst

bar 1: grey scale
 bar 2: colour bar
 100/0/75/0
 77/7.5/77/7.5
 bar 3: multiburst

CCIR
 RTMA

1.2.9.4 Quadruple combinations of patterns

1. circle
 greyscale
 colour bar
 multiburst

as triple combination no. 38 with circle

2. Pattern no. 41
 greyscale
 colour bar
 multiburst
 VCR

bar 1: greyscale
 bar 2: colour bar
 100/0/75/0
 77/7.5/77/7.5
 bar 3: multiburst
 bar 4: (R-Y) saturation steps
 bar 5: white square stepwise
 moving from right
 to left on black bar

5 horizontal bars:

1/8 field
 1/8 field
 CCIR
 RTMA
 1/8 field
 2/8 field B-Y = 0
 as bar 3 of VCR patt. no. 9
 1/8 field
 as bar 4 of VCR patt. no. 9

3. Pattern no. 39

6 horizontal bars
1/6 field each

greyscale
colour bar
multiburst
DEM

bar 1: greyscale

bar 2: colour bar

100/0/75/0 CCIR
77/7.5/77/7.5 RTMA

bar 3: multiburst

	PAL B,D,G,H,I,N	PAL M	NTSC	SECAM
bar 4: DEM	4 coloured squares Y = 50 % $\pm I/-I = 0.25$ Q = 0 $\pm Q/-Q = 0.25$ I = 0		4 coloured squares as bar 2 of DEM, NTSC	8 colour bars as bar 2 of DEM
bar 5: DEM	4 coloured squares as bar 2 of DEM,		4 coloured squares as bar 2 of DEM, PAL M	8 colour bars as bar 3 of DEM,
bar 6: DEM	2 uncoloured squares Y = 50 % $\pm(R-Y) = 0.28$; B-Y=0 $\pm(B-Y) = 0.5$; R-Y=0	2 uncoloured squares Y = 54 % $\pm(R-Y) = 0.26$; B-Y = 0 $\pm(B-Y) = 0.46$; R-Y = 0	2 'Venetian blind' squares as bar 4 of DEM	Y = 75 %

1.2.9.5. Special Test Patterns

see also E 3-13/E 3-15

1. Three horizontal bars

amplitudes	100/0/75/0 77/7.5/77/7.5	B, D, G, H, I, K, K1, L, N M
bar 1	2 uncoloured squares; grey as 3rd step of greyscale; grey as 6th step of greyscale;	4/6 field left square right square
bar 2	greyscale	1/6 field as basic pattern no. 7
bar 3	colour bar	1/6 field, as standard colour bar no. 10

2. 6 horizontal colour bars

amplitudes	- / - / 75 / 0 - / - / 77 / 7.5	B, D, G, H, I, K, K1, L, N M
	bar 1: yellow bar 2: cyan bar 3: green bar 4: magenta bar 5: red bar 6: blue	1/6 field each

3. Black/white pattern

amplitude	100 / 0 / - / - 100 / 7.5 / - / -	symmetrical black/white pattern B, D, G, H, I, K, K1, L, N M
-----------	--------------------------------------	--

1.2.10. Synchronisation

line and field synchronisation

	CCIR	RTMA
no of lines per field	625	525
	624	524
line frequency	15625 Hz	15734.26 Hz
– tolerance	< 0.4 Hz	< 0.4 Hz
field frequency	50 Hz	59.94 Hz

sync output signal

impedance	8 k Ω
line pulse amplitude	2.6 \pm 0.3 V
field pulse amplitude	5 \pm 0.2 V
polarity	negative pulses

timing and data see fig.

acc. to TV system, with interlacing;
no interlacing with white crosshatch

white crosshatch

BNC socket;

combined signal with line and field
synchronisation pulses with amplitude
difference

1.2.11. Sound part**sound input**

DIN socket

impedance	0.5 M Ω
max. input voltage	± 40 V
bandwidth	40 Hz ... 15 kHz

sound output

Scart (Euro-AV) socket

impedance	1 k Ω
voltage	0.4 V

1.2.11.1 MONO sound**sound carrier**on/off switchable;
coupled with line frequency

frequency	4.5 MHz
	5.5 MHz
	6.0 MHz
	6.5 MHz

M,N
B,G,H
I
D,K,K1,L

tolerance	< 30 ppm
------------------	----------

vision/sound carrier ratio	13 dB
	13 dB
	12 dB
	11 dB

M,N
B,G,H
I
D,K,K1,L

sound modulation	internal
	external

on/off switchable
on/off switchable

type of modulation	FM
	AM

frequency modulation
amplitude modulation**FM frequency modulation**

B, D, G, H, I, K, K1, M, N

pre-emphasis	50 μ s
	75 μ s

B,D,G,H,I,K,K1
M,N

FM INTERN	1 \pm 0.1 kHz
------------------	-----------------

sinewave

modulation deviation	30 \pm 2 kHz
	27.5 \pm 2.5 kHz
	24 \pm 4 kHz
	15 \pm 5 kHz

B,G,H
I
D,K,K1
M,N
} measured with de-emphasis

FM EXTERN	0.4 V
------------------	-------

0.4 V will give same deviation as with
internal modulation; measured with de-emphasis**AM amplitude modulation**

SECAM L

AM INTERN	1 \pm 0.1 kHz
modulation degree	50 % \pm 3 %

sine wave

AM EXTERN	0.4 V
------------------	-------

0.4 V will give same degree as with internal
modulation

1.2.11.2 DUAL, STEREO sound

Mono sound mode

sound carrier 1

for -X and -TX versions

frequency 4.5 MHz
5.5 MHz
6.0 MHz
6.5 MHz

on/off switchable;
locked to line freq. with PLL

M,N
B,G,H
I
D,K,K1,L

tolerance < 30 ppm

vision/sound carrier ratio 13 dB
13 dB
12 dB
11 dB

M,N
B,G,H
I
D,K,K1,L

sound modulation internal
external

on/off switchable
on/off switchable

type of modulation FM
AM

frequency modulation
amplitude modulation

FM frequency modulation

B, D, G, H, I, K, K1, M, N

pre-emphasis 50 μ s
75 μ s

B,D,G,H,I,K,K1
M,N

FM INTERN 1 \pm 0.1 kHz
3 \pm 0.3 kHz

sinewave
switchable

modulation deviation 30 \pm 2 kHz
27.5 \pm 2.5 kHz
24 \pm 4 kHz
15 \pm 5 kHz

B,G,H
I
D,K,K1
M,N

} measured with de-emphasis

FM EXTERN 0.4 V

0.4 V will give same deviation as with
internal modulation;
measured with de-emphasis

AM amplitude modulation

SECAM L

AM INTERN 1 \pm 0.1 kHz
3 \pm 0.3 kHz

sine wave

modulation degree 50 % \pm 3 %

AM EXTERN 0.4 V

0.4 V will give same degree as with
internal modulation

Dual, stereo sound mode

sound carriers		carrier 1	carrier 2	
frequency		5.5 MHz	5.7421875 MHz	locked to line frequ. with PLL
tolerance		< 30 ppm	< 30 ppm	
vision/sound carr. ratio		13 dB	20 dB	
modulation		FM internal FM external		on/off switchable on/off switchable
pre-emphasis		50 μ s	50 μ s	
FM INTERN		1 \pm 0.1 kHz 3 \pm 0.3 kHz switchable	1 \pm 0.1 kHz	sine wave
modulation deviation		30 \pm 2 kHz 15 \pm 1 kHz 30 \pm 2 kHz	30 \pm 2 kHz 30 \pm 2 kHz	DUAL, 1 kHz STEREO, right carrier off STEREO, both carriers on
FM EXTERN		0.4 V	0.4 V	0.4 V will give same deviation as with internal modulation; measured with de-emphasis

Operation mode detection

pilot frequency	54.6875 kHz (3.5 \times f _H)	coupled with line frequency
tolerance	< 30 ppm	
modulation	AM	
modulation degree	50 % \pm 5 %	
identification frequencies	274.1 Hz (f _H /57) 117.5 Hz (f _H /133)	DUAL STEREO
tolerance	< 30 ppm	
deviation of sound carrier 2	\pm 2.5 \pm 0.5 kHz	

1.2.12. TELETEXT (PAL), ANTIOPE (SECAM)

TELETEXT (UK teletext)		PM 5518-TX	PAL B,G,I
ANTIOPE (DIDON)		PM 5518-TX	SECAM L
	Teletext	Antiope	
data synchronisation frequency (bit rate)	6.9375 MHz (444xfH)	6.203125 MHz (397xfH)	
transmission mode	NRZ (non-return-to-zero)		
data signal	see figures chapter 3.5.5		
timing reference point	Teletext: penultimate '1'-bit of clock run-in after front porch of line sync. Antiope: front porch of 1st clock-bit to front porch of line sync at half amplitude		
'0' level	Teletext: black level Antiope: blanking level		
'1' level	Teletext: 66 % \pm 6 % of white level (100 % = blanking to peak white level) Antiope: 7/3 +0 % -10 % of sync amplitude 0.3 V		
signal shaping	\sin^3 -filter		
Text data			
TEST mode (decoder alignment)	not for PM 5518-TX; on/off switchable; no combination possible with test patterns		
data lines	all lines in active field with identical contents		
data contents	clock run-in (bit sync.) framing code (byte sync.) rest data pseudo random		
PAGE mode	on/off switchable; PM 5518-TX: can not be switched off; combination possible with all test patterns except crosshatch		
data lines	22 and 335		
data contents	5 test pages 7 test pages	Teletext Antiope	
signal output	VIDEO OUT	Scart (Euro-AV) socket	

1.2.13. RGB unit

PM 5514 V, PM 5515, PM 5516, PM 5518:
all versions; not PM 5514

OUTPUT signals

BNC sockets (rear panel)

1. RED/GREEN/BLUE

impedance	75 Ω
voltage	
– 625 line systems	0.7 \pm 0.05 Vpp
– 525 line systems	0.714 \pm 0.05 Vpp
black level lift	0.054 \pm 0.006 V
DC blanking level	0.5 ... 0.85 V

} into 75 Ω
 } amplitude blanking level = 100 % white
 for 525 lines (RTMA)

Remarks:

- DEM signals
 - PAL/NTSC
 - SECAM
- VCR signals

only luminance part is fed out
 colour bar 30/0/30/0 represented as
 R= B= G= 0

bar 3, saturation steps:
 only luminance part is presented

2. PAL/NTSC SUBCARRIER

impedance	75 Ω
voltage	1 \pm 0.15 Vpp

not for SECAM

into 75 Ω

3. Composite SYNC

impedance	75 Ω
voltage	2 \pm 0.3 Vpp
polarity, level	negative going

into 75 Ω

related to 0 V

1.2.14. Power supply	ac mains
nominal values	110 V/127 V/220 V/240 V } selectable by wiring depending 100 V/120 V/220 V/240 V } on version; see chapter 2.2.3
nominal operating range	-12 % +10 % of selected nominal value
operating limits	-12 % +10 % of selected nominal value
nominal frequency range	50 ... 60 Hz
– tolerance range	47.5 ... 63 Hz
power consumption	ca. 42 W

1.2.15. Environmental capabilities

The following environmental data are valid only if the instrument is checked in accordance with the official checking procedure. Details on these procedures and failure criteria are supplied on request by the PHILIPS organization in your country or by PHILIPS International B.V., Industrial & Electro-acoustic Systems Division, EINDHOVEN, THE NETHERLANDS.

Ambient temperature:

reference value	+23 °C ±1 K
nominal working range	+ 5 °C ... +40 °C
limits for storage and transport	-20 °C ... +60 °C

Relative humidity:

reference range	40 ... 50 %
nominal working range	20 ... 80 %
limits for storage and transport	5 ... 95 %

Air pressure:

reference value	1000 ±15 hPa
nominal working range	798 ... 1064 hPa

Air speed:

reference value	0 ... 0.2 m/s
nominal working range	0 ... 0.5 m/s

Heat radiation:

direct sunlight radiation not allowed

Vibration:

limits for storage and transport	max. 0.35 mm amplitude (10 to 60 Hz)
	max. 5 g (60 to 150 Hz)

operating position:

normally upright on feet or in sloping position on tilting support

warm-up time

30 min

1.2.16. Safety and quality data; Cabinet

protection type (see DIN 40 050)	IP 20
protection class (see IEC 348)	class I, protective conductor
line connection	mains connector
call rate	≤ 0.20
radio interference voltage	} acc. to VDE 0871
radio interference radiation	
overall dimensions:	
height	140 mm
width	300 mm
depth	400 mm
weight	ca. 7.5 kg

1.3. ACCESSORIES**1.3.1. Standard**

operating manual, 9499 520 09001
incl. operating card 9499 520 09111
mains cable
spare fuse
4 rubber feet for lateral position

PM 9538

RF cable 75 Ω, BNC-TV connector (DIN 45325)

1.3.2. Optional

PM 9539

RF cable; impedance transformer 75 Ω – 300 Ω,
BNC-TV connector (DIN 45317)

PM 9575

cable 75 Ω, BNC-BNC

service manual PM 5515, PM 5516, PM 5518:
9499 525 01111

1.4. OPERATING PRINCIPLE; block diagram Fig. 30

Five supply voltages are generated by the **power supply** of the motherboard (unit 11).
 Three stabilized voltages, + 5 V and ± 12 V, are realized by four-terminal voltage regulators.
 A supply voltage of + 6 V, generated from the + 12 V supply, is used for some CMOS components.
 A slightly stabilized voltage of + 30 V is used for the tuning voltage amplifier of the CITAC.

The **Central Processing Unit CPU** on the motherboard consists of a microprocessor 8085 with RAM and PROM memory, a combined RAM/port circuit P8155 for input and output operations and the CITAC for adjustment and control of the VCOs in the RF unit U10.

The 8085 microprocessor reads the program instructions from PROM 313. Address latch 312 serves for generating the address information A0 – A7. Communication with the subunits is achieved via the serial IIC bus (RAM, CITAC) and via the C-bus.

The RAM/port IC314 contains the working memory for the microprocessor and all inputs and outputs for controlling the subunits. Input port A of IC314 enters the status signals from the stereo and teletext unit and the binary codes from the PAL/NTSC- and SECAM system switches.

Information from the keyboard unit is transferred in serial form to the restart input of the processor. Display data are sent from the processor to the display/LEDs via data-line SDA, clock line SCL and the strobe lines LEDEN and DISEN.

The circuit 315 is a battery buffered RAM for saving complete parameter set ups.

A solder switch at the processor must be closed for activating the service test program.

The **master oscillator** on the main unit 11 generates the reference frequencies for PAL/SECAM or NTSC, which clock the **sync pulse generator**. This IC generates the horizontal and vertical H and V pulses and their sub-divided pulses which control all circuitries in the instrument. It also organizes the subcarrier lock in combination with the subcarrier coupler on the PAL/NTSC unit.

On the **digital unit 1** the horizontal elements for all the black/white patterns ('digital patterns') are generated in the line pulse generator and the subsequent gate circuitry, while the field pulse generator takes care of all the vertical elements. In the pattern PROM all information for the colour patterns, i. e. saturation steps, vector informations, are stored. The pattern control register controlled by the data, clock and strobe lines selects the actual pattern out of this PROM. At the output of the digital unit the luminance data are available and fed to the video output path; the chroma data are further processed in the PAL/NTSC and SECAM unit.

Furthermore control signals for the multiburst and circle generation are fed to unit 6.

A special part is the moving pattern generator for the black bar moving in the lower part of the VCR pattern.

On the **PAL/NTSC unit 2** a VCO generates the colour subcarrier frequencies for the 4 different TV systems. The selected frequency is locked in a phase loop with the subcarrier coupler which is controlled by the sync pulse generator and the TV system control on the main unit 11. So the correct relationship between subcarrier and line frequency is achieved.

On the second part of this unit 2 the complete chroma data from the digital unit, consisting of the colour components, the saturation step signals and the vector information together with the PAL or NTSC burst are applied to the U- and V-matrix. The colour difference signals are composed in two summing points and fed via low-pass filters to the PAL/NTSC encoder. This IC encodes the colour difference signal $R - Y$ and $B - Y$ onto one subcarrier. Quadrature modulation allows the coding to be in accordance with either the PAL or NTSC system.

The **SECAM unit 3** consists of the modulator controller and the encoder (modulator) as well as circuitries for signal shaping according to the SECAM system.

The colour bar and greyscale signals are weighted, summed and fed to the encoder which produces sequential, frequency modulated colour signals. Further circuitries are the band limitation, the low-frequency pre-emphasis and the high frequency 'anti-bell filter'.

The modulator controller generates two subcarrier frequencies necessary for the modulation and feeds a control voltage for the encoder.

All video signals, i. e. luminance, chroma, multiburst, teletext/antiope, are fed through the **CVBS summing amplifier** on unit 11 to the VIDEO OUT socket; furthermore the signals are fed via an amplifier, where the right video polarity is selected and the residual carrier can be adjusted, via the RF modulator to the RF OUT socket.

Dependent on instrument and selected TV system **teletext signals** on unit 4 are available. PM 5515-T generates 5 teletext pages and a test pattern (wall paper). PM 5518-T generates 5 teletext pages for system PAL and 7 pages for SECAM L (Antiope). Teletext data are sent in lines 22 and 335. The text contents depends on software.

The teletext clock is generated in a phase-locked-loop, 6.93 MHz for teletext and 6.20 MHz for SECAM. The sub-divided frequency reads parallel teletext data from the teletext PROM which are serialized and formed by a filter path. For teletext the contents of a data line comprises 360 bits as 45 bytes of 8 bits each. The complete teletext signal is applied from unit 4 to the video summing amplifier on the main unit.

For the **RGB unit 5** the complete luminance data are applied from the digital unit 1. The luminance data are weighted in three summing points for RED, GREEN and BLUE.

The single colour components are applied via \sin^2 filters to the differential amplifier output stages.

The multiburst pattern signals are directly applied to the output stages.

The sync signal and the PAL/NTSC subcarrier complete the five output signals at the BNC sockets at the rear of the instrument for control of colour monitors and graphic terminals.

For SECAM the subcarrier output is not used.

The **multiburst generator** on unit 6 comprises a counter, a summing amplifier, current sources for the subsequent triangle generator, a sine shaper and a start/stop circuit.

On each TV line the circuit delivers 8 packages of sine waves.

A counter with subsequent summing amplifier deliver a staircase signal which in a triangle generator is converted into packages of sinewaves with stepwise increased frequencies from 0.8 to 4.8 MHz.

The **circle generation** on unit 6 is achieved by two pulses, which at the intersection of the line and the circle are two times actuated by the comparator during the active line time.

Sound units

Depending on the type of instrument different sound units are built in. The dual/stereo sound versions PM 5515 / PM 5518 indicated by an 'X' in the type number are equipped with two sound units: LF stereo sound (U7) and RF stereo sound (U8). All other instruments and PM 5516 are equipped with the Mono sound unit 9 instead.

The **mono sound unit 9** comprises a shift register with sound logic for different TV systems, the sound oscillator (1 kHz), input circuitry for external sound signals, programmable sound carrier oscillator and the AM/FM modulator.

Unit 9 is controlled from the CPU via C-bus lines DATA, CLOCK and STROBE. Dependent on the chosen TV system the sound carrier frequency, level and modulation deviation is selected.

RF dual/stereo sound unit (U8):

Unit 8 in general comprises two mono sound units 9 and generates the sound carrier frequencies 4.5/5.5/6 and 6.5 MHz according to the different TV system. Some parts are built into the LF dual/stereo unit 7.

Unit 8 is controlled from the CPU via C-bus lines DATA, CLOCK and STROBE. Dependent on the chosen TV system the frequencies for sound carrier 1, modulation and carrier levels are selected.

The sound carrier 2 frequency 5.742 MHz is generated if the instrument is switched to the modes DUAL or STEREO.

Sound carrier 1 and sound carrier 2 are summed up and applied to the RF unit 10.

LF dual/stereo sound unit (U7):

Depending on the selected sound mode unit 7 generates the audio frequencies 1 kHz and 3 kHz as well as the pilot carrier 54.68 kHz and the two identification frequencies 274.1 Hz/117.5 Hz in the DUAL/STEREO mode. The line frequency serves as reference. The mode dual and stereo are only possible in the TV system PAL G. The different sound modes are controlled from the CPU via C-bus lines DATA, CLOCK and STROBE by the shift register.

The **RF unit 10** serves for generating a double-sideband modulated TV signal in the frequency range 32 MHz to 900 MHz. The unit consists of six oscillators, two amplifiers, modulator part, divider and low-pass filter. All circuits are built into different screened sections in the RF box.

The oscillators VCD1A to F for the RF frequency are switched on and tuned by the CITAC (Computer Interface for Tuning and Control) via lines F1 to F6 resp. AFC from the motherboard. Signals F1 to F6 are additionally used for switching the corresponding path of the low-pass filter.

The RF carrier is fed into a mixer which is used as AM modulator. The video and sound signals are added at its modulating input. From the output of the mixer the double-sideband modulated RF carrier is fed to the low-pass filter path and the RF attenuator to the RF output.

Additionally the RF carrier signal is used for the frequency control loop. After division by 256 the signal is fed via DIV OUT to the CITAC. The CITAC compares this frequency with an internally generated reference (4 MHz) to supply the tuning voltage AFC for the VCOs in order to lock the RF carrier frequency to the set value.

The **Keyboard and display unit 12** contains a 4-digit LED display, 21 to 29 pushbutton keys with the assigned LEDs next the keys (depending on version) and its decoder/driver circuits.

Data transfer from the CPU is performed via the C-bus lines SCL, SDA and the control lines 'display enable' and 'LED enable'.

Input data sensed from the keyboard matrix are sent as serial information from the control transmitter via line KEYDAT to the CPU.