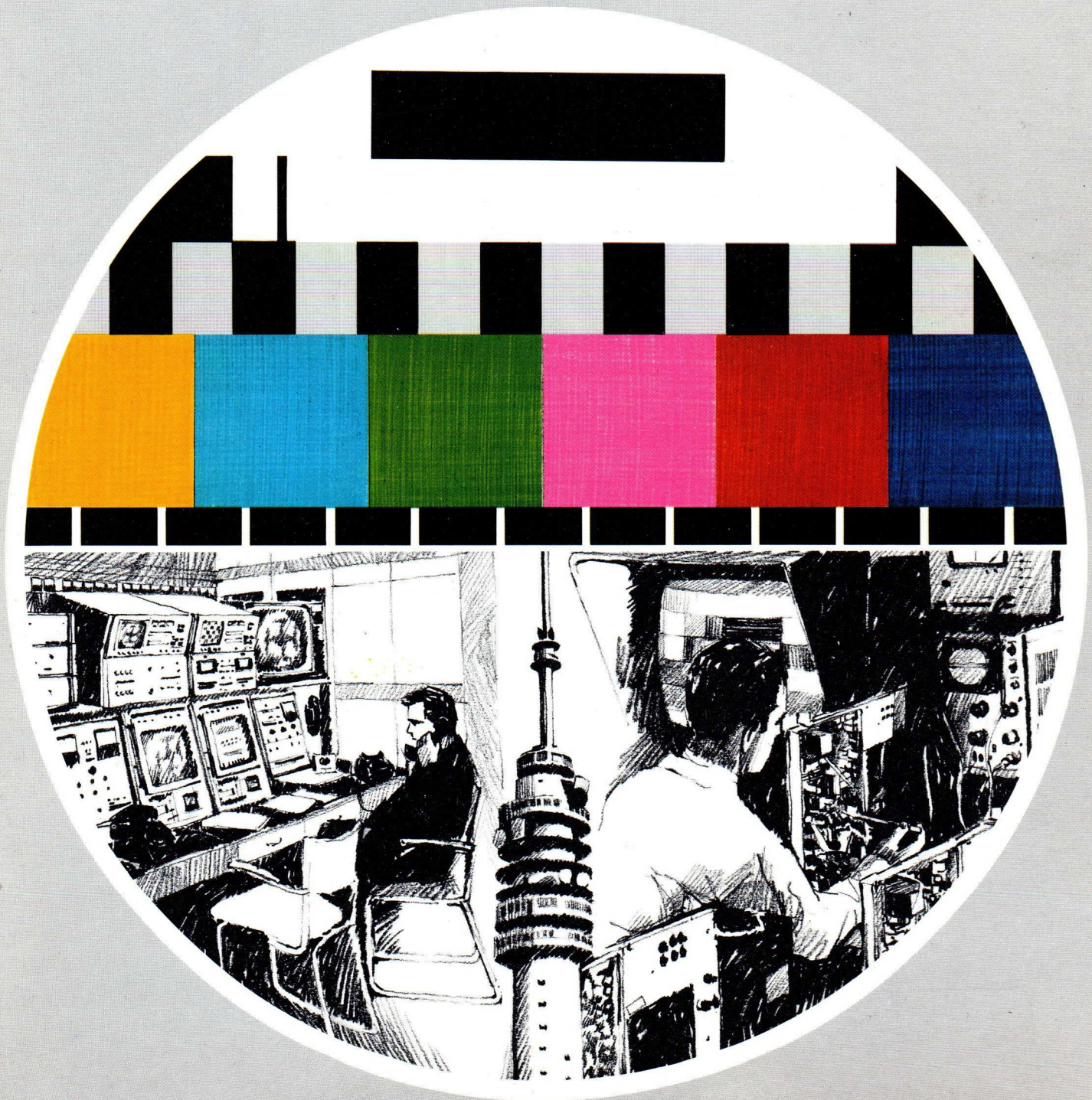
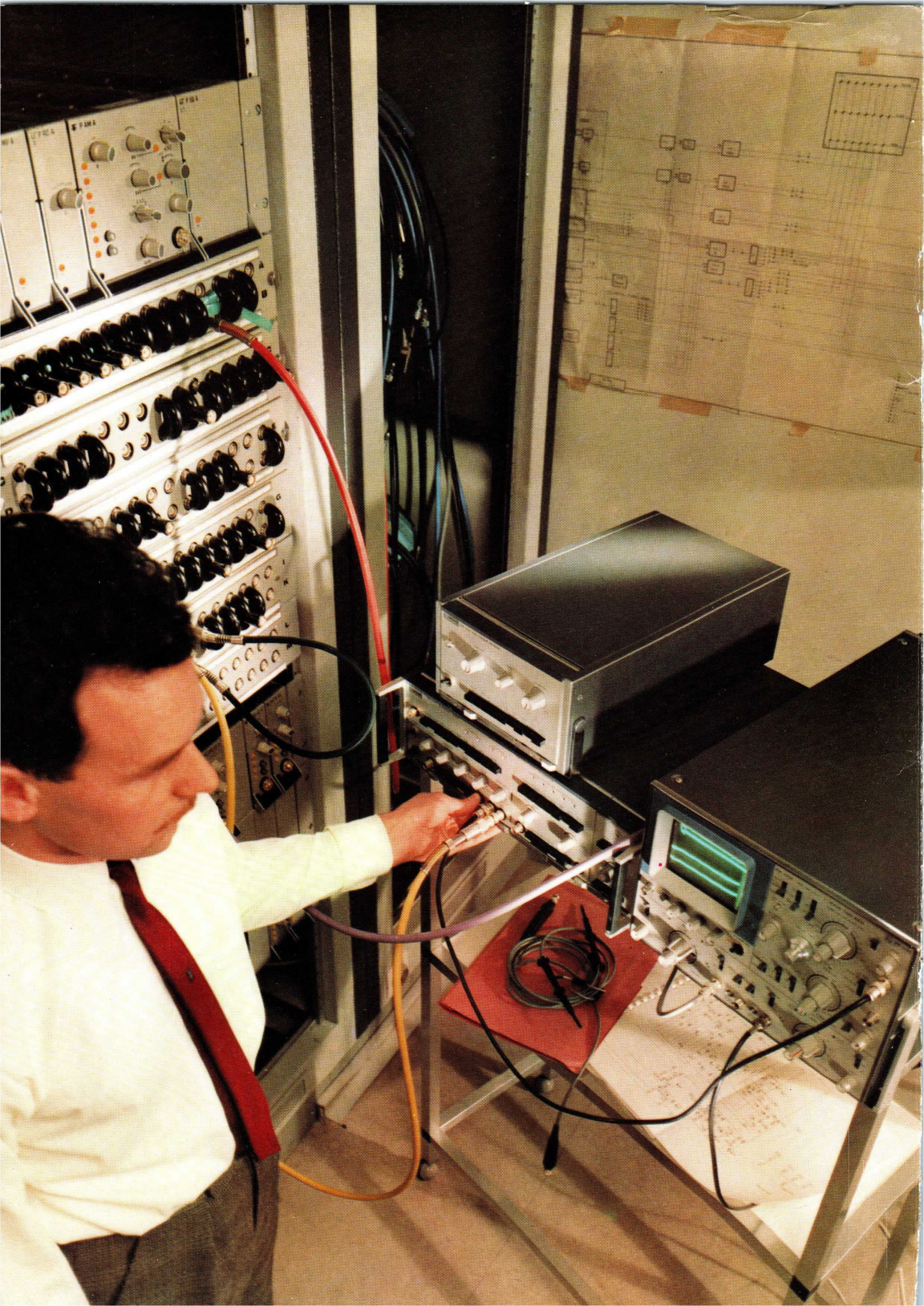
PHILIPS

TV measuring equipment





Philips knows your measurement problems.
We know them because we're one of the world's biggest manufacturers of TV equipment. (When you make everything from the camera to the receiver you cannot help knowing them).
We also know most of the solutions, because we're also one of Europe's largest manufacturers of advanced test and measuring instruments.
Only Philips has this combined know-how. So expect to find some unique products and interesting solutions to your measuring problems in this brochure.
Sorry, our measuring problems.

The problem — measurement of differential distortion on a studio distribution system. The solution — apply a line sawtooth with superimposed subcarrier, which is one of the many signals of the highly-versatile video test generator PM 5572/73/74. (See page 27). The output from the system is then decoded with the PM 5564 which has a special calibration facility giving separate differential gain and phase outputs. These can then be displayed on a standard oscilloscope, in this case the Philips 50 MHz: 2 mV PM 3250.

Receiver test systems

Philips receiver test systems bring a new approach to test signal generation. Their fundamental flexibility enables the same equipment to meet the test and alignment procedures of all types of sets and set manufacturers. The unique go/no go test philosophy enables relatively unskilled personnel to perform the most complex chroma alignments. The test signals are built-up in such a way that the chroma section of the receiver gives zero output displays on an oscilloscope when the circuitry is correctly aligned. Each part of the chroma section can be adjusted with the generator in this way. The big advantage is that the operator is carrying out the test and alignment on a go/no go basis with no subjective interpretation and no pos' sibility of error.

Four examples of the many ways in which the generators and modulators can be used to align sub-units and check-out completed receivers. NB, the instruments and sub-units are not shown in proportion to each other.

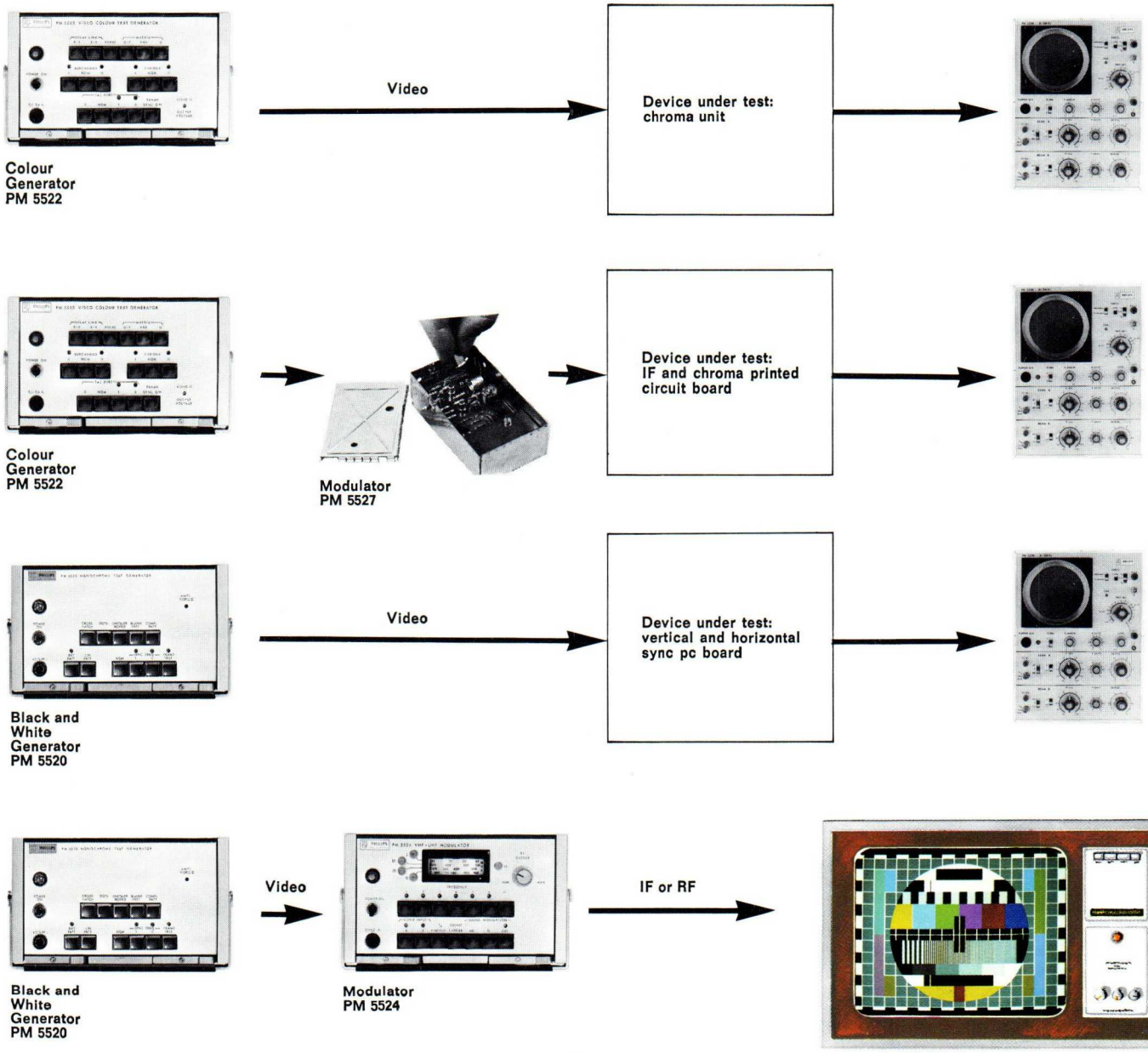
Ideal for automated production

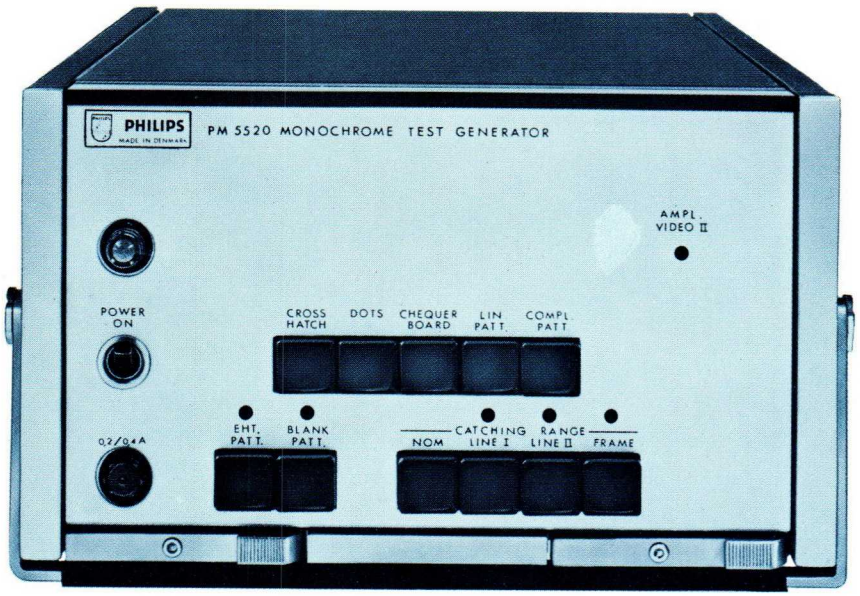
By either mechanical or logic switches the functions of the front panel controls can be remotely controlled. Remote buttons can therefore be coded in sequence as required by the test procedure. The provision for remote, programmable operation allows the change-over to automated testing to be made easily and economically when production volume rises, or when unskilled personnel must be used.

Change of modulation capability

Either generator can be fitted with the modular unit PM 5527 that gives a limited, but very accurate IF or Band I modulation capability. For a complete VHF/UHF capability the separate unit PM 5524 is used, which has six outputs that can be connected up internally to any of the modulators of Band I, III, IV and V.

Philips receiver test systems have thus been designed with maximum signal versatility and give optimum solutions to production problems. They are complemented by our well-known signal distribution equipment described on page 7 which in turn provide the optimum solution for large volume production.





Monochrome test generator PM 5520

Signals supplied for alignments and test of:

Line time base

Frame time base

Deflection amplitude

Grey scale tracking

Resolution

EHT supply

Combined rhombic/diagonal test pattern for accurate linearity checks

Additional test signals for convergence and purity tests suitable for colour as well as monochrome receivers
Facility for simple, programmable operation (i.e. remote control)

PM 5520 has been designed to provide a wide variety of test signals for monochrome receivers on a direct video basis. Additionally, it gives a blank pattern with adjustable white level, and cross hatch and dot patterns, which respectively are suitable for purity and convergence tests on colour receivers.
When used in combination with the built-in, single-channel modulator PM 5527 or the multi-channel PM 5524, the resultant RF signal can be fed into the aerial or IF input.
A very useful feature of this generator is the simple, versatile programmable operation. All the front panel controls are effectively reproduced on a rear-mounted 24-way plug.
Connecting the appropriate pins to earth, by either mechanical or logic switches, therefore has the same effect on the output signal as the front panel controls. And a simple sequence coding on these remote buttons allows the procedure to be followed by relatively unskilled personnel.

Technical specification

Signals
Crosshatch
Number of horizontal lines: 11
Width: 1 line
Number of vertical lines: 15
Width: abt. 230 nsec
Dots
White dots located at intersections of crosshatch grid
Chequer board
6 x 8 black/white squares accurately centered
Linearity pattern
Combined rhombic/diagonal pattern
Accuracy: 2%
Complete pattern
A chequer board where on column is replaced by a grey scale and on with a definition line scale.
Grey scale:
Number of steps: 6
Gradation: linear
Definition lines:
Frequency: 0.8 - 1.8 - 2.8 - 3.8 - 4.43 -4.8
Long term stability: 1%
Wave form: square
EHT pattern
a 100% white window and an adjustable 0-60% screen area.

Blank pattern
Adjustable 50-100% white level

Line and frame frequencies
Nominal line and frame frequencies
Offset I, Offset II } Nom. ± 20%
Frame frequency offset (no line information), +20%...40%

Electrical specifications
System: 625 lines/50 Hz
Number of lines: 312.5
Line frequency: 15625 kHz ± 2 Hz (x-tal controlled)
Frame frequency: 50 Hz derived from line frequency except for the blank pattern test signal where mains locked is used. (Random interlacing)
Line sync pulse: 4.7 μs ± 0.2 μs
Line front porch: 1.9 μs ± 0.1 μs
Line blanking: 12.8 μs ± 0.2 μs
Duration of frame sync.: 2½ line
Frame blanking: 25 lines
Accuracy of all luminance steps: better than 2%
Rise time:
Sync: 250 ns
Luminance step: 50 ns

Outputs (BNC at the rear)
Video I: 1 V_{pp} in 75 Ω with a DC content (sync peak at —1.12 V) matched to PM 5527
Video II: 50 mV — 2 V_{pp} in 75 Ω
Line trigg: Differentiated sync. pulse ≈ 2 V_{pp} in 75 Ω
Frame trigg: Differentiated sync. pulse ≈ 2 V_{pp} in 75 Ω

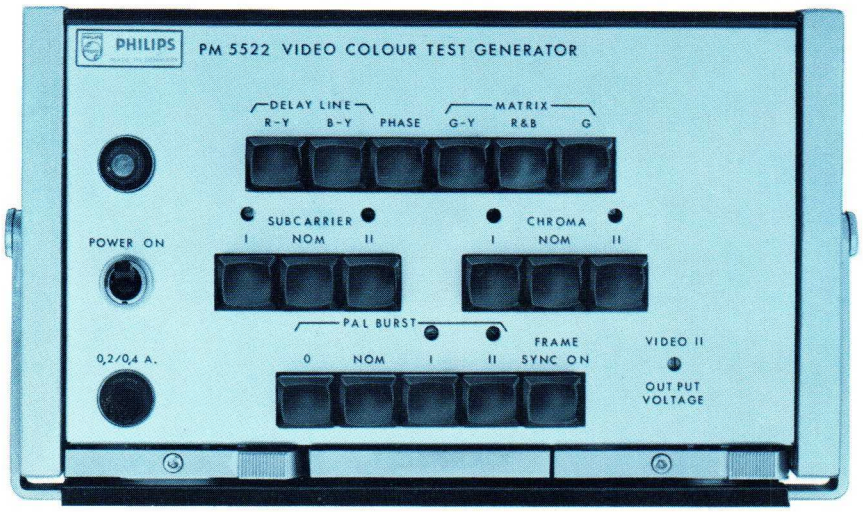
Temperature range
Operating: 0 to + 50°C
Storage: —30 to + 70°C

Power Supply (Mains)
115/230 V ±20%; 48...65 Hz, 20 W at 220 V

Remote programming
(multiplug at the rear)
In action when the multiplug is attached (Pin 23 S.C. to 24)
All front panel functions are programmable.
Single line control for each function.
Operated by contact closure to ground or by a logic circuit.
The levels are: —1.7 V < low < +2.5 V
+5.5 V < high < +16 V

Mechanical specification
Cabinet: Philips standard system
Plug-in module: 3/6 of full rack
Multiplug for remote control:
24 pole Amphenol 57
Weight: 8 kg

Quality standard
According to M2/C2



Video colour test generator PM 5522

Signals supplied for specific chrominance function checks such as delay line, demodulator and matrix

Wide choice of signal parameters: subcarrier frequency, chrominance and burst amplitude

Facility for simple, programmable operation (i.e. remote control)

PM 5522 has been designed to provide a wide variety of test signals on a direct video basis. Its main application is the factory alignment of the chrominance part of PAL colour tv receivers. The signals are principally intended for display on an oscilloscope, but can also be viewed on the receiver screen. In sets with RGB-matrixing in the tube, the dematrixing will only be indicated on the screen and the matrix test signals have been designed with this fact in mind.
Where test signals are required on an RF basis, the PM 5522 can be very easily modified by the addition of the modular unit PM 5527 detailed opposite, or the VHF/UHF modulator PM 5524 detailed overleaf.

Technical specification

System: PAL - AB 625 lines/50 Hz
Test signals

Check or alignment of Delay line circuit	**Signal build-up**
a. in R - Y section	half a line (R - Y) half a line (B - Y)
b. in B - Y section	half a line ± (B - Y)* half a line ± (R - Y)*
Demodulator phasing	half a line ± (B - Y)*) phase inversion half a line (R - Y)) every 10 ms
(G - Y) matrix	half a line luminance only half a line (G - Y) = 0*, phase inversion every 10 ms
R and B matrix	half a line luminance half a line luminance + chrominance* (magenta)
G matrix	half a line luminance half a line luminance + chrominance* (green)

* line alternating shift

Parameters

- *Subcarrier frequency:* nominal frequency
  2 adjustable offset frequencies, max. offset ± 400 Hz
- *Chrominance amplitudes:* nominal amplitude
  2 adjustable amplitudes, range +6 to —20 dB
- *Burst amplitude:* off
  nominal
  2 adjustable amplitudes, range 0 - 200%

Sync signal
Line frequency: 15625 Hz ± 2 Hz, crystal controlled
Field frequency: mains locked, can be switched off.

Subcarrier frequency
Frequency: 4.43361875 MHz ± 10 Hz, oven controlled

Chrominance signal data
Modulator unbalance: < 1%
Quadrature phase: ∠ ± 1°

Rise times
Luminance step: about 100 ns
Sync signal: about 150 ns

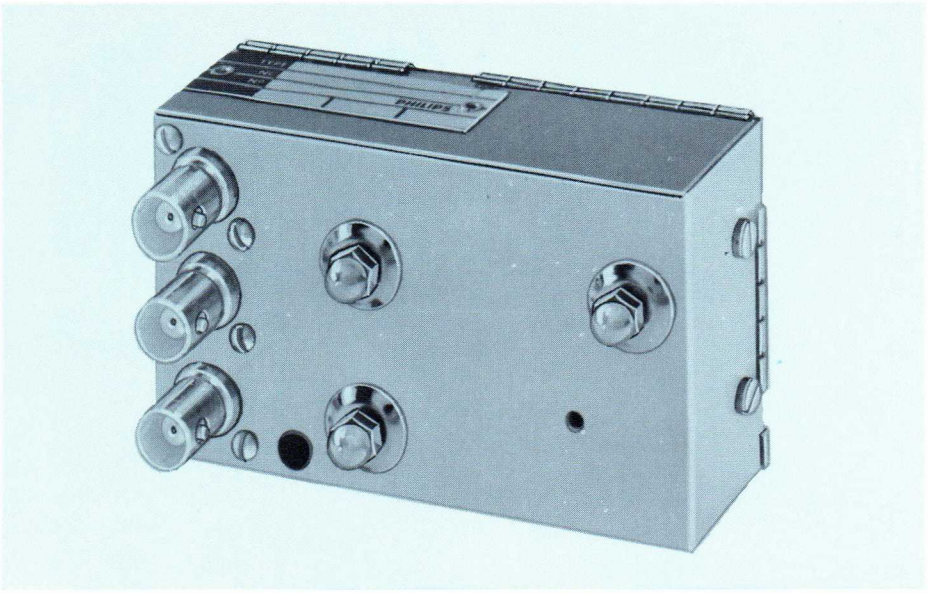
Output
Video I: 1 V_{pp} in 75 Ω with a DC content matched to single channel modulator PM 5527
Video II: adjustable from 50 mV . . . 2 V_{pp} in 75 Ω
Subcarrier: 2 V_{pp} in 75 Ω
Sync: 2 V_{pp} in 75 Ω

Temperature range
Operating: 0 - + 50 °C

Power supply
Frequency: 48 . . . 65 Hz
Voltage: 115/230 V ± 20%
Power consumption: 28 W at 220 V (with oven switched on)

Remote control
Remote control facility provided enabling control of any function with switch or logical circuit.
Several functions are programmable.
Interface signal levels
— 2.2 < "0" < 2.5 V
5.5 < "1" < 16 V

Mechanical specification
Module: 3/6 module of Philips universal 19" system
Weight: 8 kg



IF/VHF modulator PM 5527

Frequency range 38 - 65 MHz

Supplies either the IF frequency (38.9 MHz) or one of the band I frequencies

Other IF standards are optionally available

Easily fitted into PAL video colour test generator PM 5522 and/or monochrome test generator PM 5520

The PM 5527 has been designed to give an economical IF or band I capability to the PAL video colour test generator PM 5522 and the forthcoming video monochrome test generator PM 5520. Where extensive VHF/UHF tests are required, it is recommended that the more comprehensive modulator PM 5524 be used.

The modulator is supplied tuned to the IF 38.9 MHz frequency. The three crystals for band I, channels 2, 3 and 4 are supplied with the instrument. The user can then remove the IF crystal and replace it with the relevant band I crystal as required and re-tune, which is a very simple procedure.
Other IF standards such as the British 39.5 MHz are optionally available.

Technical specification

Video input
Amplitude: 1 V_{pp} (top sync —1.12 V), nominal output PM 5520/22

Polarity: Sync pulse negative
Impedance: 75 Ω ± 5% (BNC)

RF Oscillator
Frequency range: 38 - 65 MHz
The modulator will be equipped with a 38.9 MHz IF X-tal at delivery

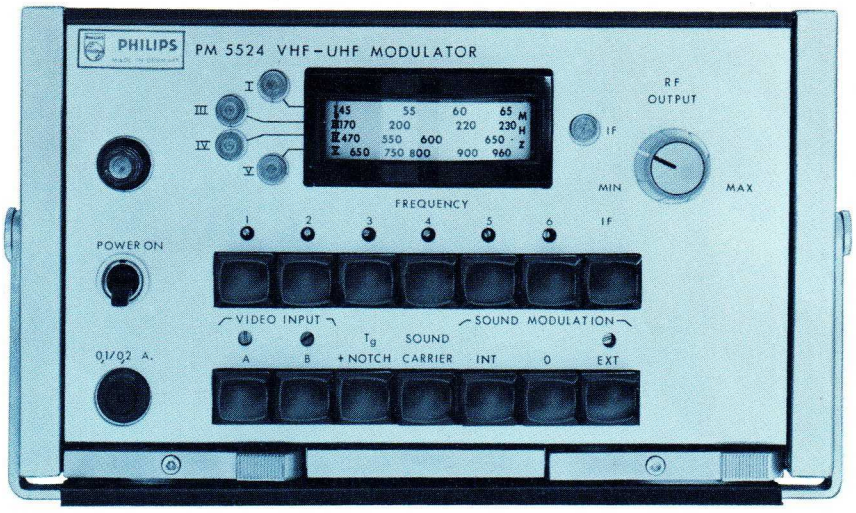
Vision modulator
Type: balanced diode modulator
Spectrum: double side band
Polarity: negative modulation
Distortion:

< 1% differential gain
< 0.5° differential phase
} 10% and 80% measured between carrier level

Amplitude response: DC - 6 MHz ± 0.5 dB
Modulation depth: white 12 % ± 2 % rest carrier

Output voltage
Amplitude: 2 outputs, 20 mV_{rms} and 2 mV_{rms}
Impedance: 75 Ω

VHF/UHF modulator PM 5524



VHF bands I and III

UHF bands IV and V

Two video inputs, adjustable ± 6 dB

Switchable 5.5 MHz trap and group delay pre-correction

5.5 MHz FM sound signal with internal 1 kHz or external modulation

Simple, front panel channel adjustment

Facility for simple, remote programmable operation

Versions for other TV standards optionally available

PM 5524 is designed primarily for use in conjunction with the PM 5522 PAL video colour test generator and the monochrome video test generator PM 5520. It is used to check out colour tv receivers, where a more comprehensive VHF/UHF capability is required than can be provided by the single channel modulator PM 5527.
The instrument has built-in varicap oscillators covering all the normal tv bands. These can be adjusted on the front panel. The screwdriver potentiometers are located directly above the relevant channel buttons.
The modulator is of the balanced diode type and supplies a signal with a double side band spectrum. The modulation amplifier is fitted with a keyed clamp circuit. A 5.5 MHz trap can be switched in.
A group delay pre-correction filter can be switched in to give the correct 170 ns relationship to the luminance and chrominance information.
The two 1 V_{pp} video inputs are adjustable ± 6 dB.

The sound information is provided by a conventional 5.5 MHz FM oscillator. Modulation can be either internal from a 1 kHz oscillator or external. The video and sound signals are both added together and applied to one common VHF/UHF modulator.
The PM 5524 can be programmed in the same manner as described for the PM 5522.

Technical specification

(Version for standard B and G is described here)

Frequency ranges
1. *Band I:* 45 - 65 MHz (alternative 53 - 83 MHz)
2. *Band III:* 170 - 230 MHz
3. *Band IV:* 410 - 650 MHz
4. *Band V:* 600 - 960 MHz

(*Adjustable on front panel*)

5. *IF:* 38.9 MHz (crystal controlled)

Video modulation
Video inputs I and II: input impedance 75 Ω, 1 V_{pp} ± 6 dB
Frequency response:
50 Hz - 5 MHz ± 0.5 dB
Rejection filter (switchable): 5.5 MHz - 20 dB

Group delay (switchable)

Frequency	*Pre-correction:*
1 MHz	50 ns
2 MHz	90 ns
3.75 MHz	0 ns
4.43 MHz	—170 ns

Sound modulation
Internal modulation: 1 kHz
Deviation: 15 - 50 kHz
External modulation:
Input impedance 600 Ω
1 V_{rms} adjustable to —20 dB
Frequency range: 50 Hz - 15 kHz
Pre-emphasis: 50 μs
Deviation: 0 - 50 kHz

RF output (BNC connector at the rear)
Spectrum: double sideband
Sound to video spacing: 5.5 MHz
Sound-video power ratio: 1 : 10
Output level: > 100 mV { RMS value during sync peak
Attenuator:
Continuously variable > —40 dB
Output impedance: 75 Ω
Distortion (10 % - 80 % carrier level):
a. Differential gain: < 5 %
b. Differential phase: < 3°

Power supply
Frequency: 48 - 65 Hz
Voltage: 115/230 V ± 20% (internally switchable)
Consumption: 30 W at 230 V

Temperature range
Operating: 0 - 50 °C

Remote control
(multiplug at the rear plate)
In action when the multiplug is attached.
Any function can be controlled by a simple switch or logical circuit.

Mechanical specification
Cabinet: Philips universal 19" cabinet system
Plug-in module: 3/6 of full rack
Multiplug for remote control:
24 pole Amphenol 57
Weight: 8 kg

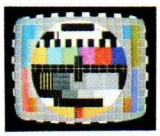
Complete receiver check-outs

The introduction of the previously descibed generators and modulators does not make the famous Philips "signal distribution" system obsolescent. Complete receivers still need complete check-outs, that is video test patterns that are in complete conformity with the aerial signal obtained in the home. The difference is that the distribution system can now be used for this **specific** test function, and complement the other specific test functions supplied by the new equipment. Thus wherever in the factory a complete video test signal is required, the system can be used to maximum advantage.

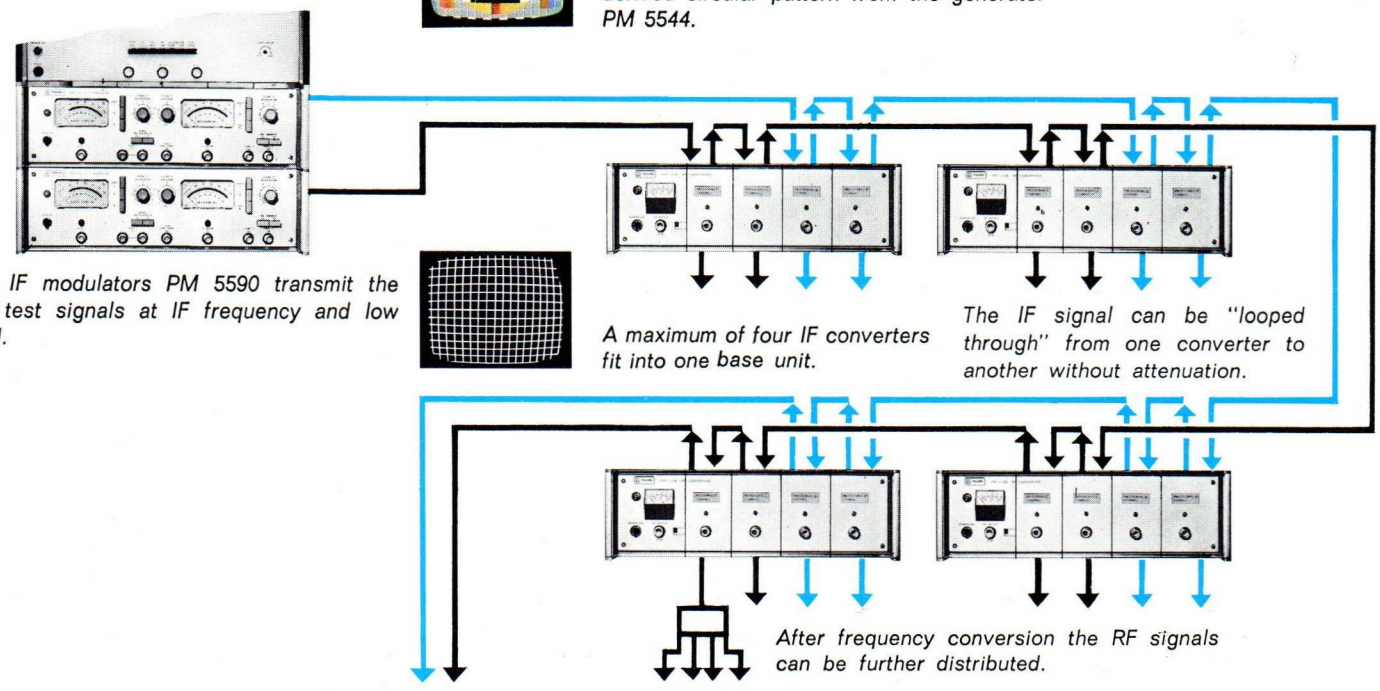
TV signal distribution system

Any of the three generators described under the "pattern generation" section can be used to supply the test pattern, which is then modulated at a central point by the IF modulator PM 5590, as shown in the diagram. This signal is then distributed at IF frequency and low amplitude to the check-out booths, where the converters PM 5591/93/94/95 convert the signal in the required bands I to V. This method eliminates the radiation and reflection problems of the conventional high frequency and high level distribution systems.

The various test signal generators and IF modulator can be positioned anywhere in the factory. Distribution to the test booths is at IF frequency and low amplitude levels.



Any of the various Philips test signals can be distributed: shown here the digitally-derived circular pattern from the generator PM 5544.



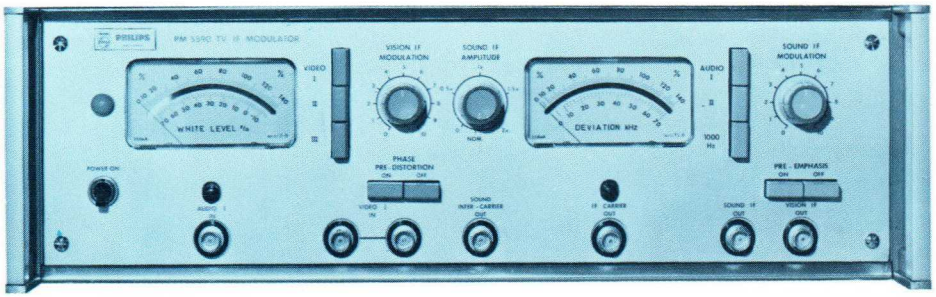
Two IF modulators PM 5590 transmit the two test signals at IF frequency and low level.

A maximum of four IF converters fit into one base unit.

The IF signal can be "looped through" from one converter to another without attenuation.

After frequency conversion the RF signals can be further distributed.

IF Modulator PM 5590



Balanced video modulator

Vestigial sideband filter with phase correction

Phase pre-correction circuit

Clamp circuit on the backporch
Peak-reading meter for video modulation

Deviation meter for sound modulation

The PM 5590 is a combined vision and sound modulator operating at an IF of about 39 MHz depending on the TV system used. It supplies a signal with vestigial sideband characteristic in full compliance with the standard. The instrument (in combination with the system of converters PM 5591/96) is recommended for use in TV laboratories and factories, for checking and aligning TV receivers and also for use as part of larger TV transmitter installations.

Technical specification

Versions

Type number	System	Line number	Vision/sound distance
PM 5590A	EIA	525	4.5 MHz
PM 5590E	CCIR	625	5.5 MHz
PM 5590B	TAC	625	6 MHz
PM 5590R	OIRT	625	6.5 MHz

For vision and sound carrier frequencies see table on opposite page

SOUND PART

External modulation signal

Two inputs
Input voltage: 77.5 ... 1000 mV
Input impedance: Ri > 500 kΩ at 1 kHz
Frequency response: 30 Hz ... 15 kHz ± 0.5 dB
Pre-emphasis: 50 μs (can be switched off)

Internal modulation signal

Internal oscillator: 1 kHz ± 0.2 %
Distortion: < 0.1 %
Amplitude instability: < ± 1 %

Modulation meter

Peak-peak reading
Calibration: 0 ... 140 % = 0 ... 70 kHz deviation

Intercarrier frequency oscillator

Frequency: 5.5 MHz (or 4.5, 6.0 or 6.5 MHz)
Tolerance: < ± 10^{-4}
Modulation distortion: < 1 % at ± 50 kHz deviation
Frequency response: 30 Hz ... 15 kHz ± 0.5 dB
Pre-emphasis: 50 μs (can be switched off)

VISION PART

Input

Three separate inputs
Voltage: 0.5 ... 2.0 V_{pp}
Reflection: > —30 dB
Frequency range: 50 Hz ... 6 MHz
Impedance: high ohmic, can be looped through

Clamping

DC on back porch of line blanking
No influence on or from colour subcarrier burst
Line sag: < 1 %

Modulation meter

Mode: measures peak-white level
Frequency limit: approx: 1 MHz
Calibration: 0 ... 140 % of nominal modulation and in percentage of white level
No influence of reading by colour subcarrier

Intermediate frequency oscillator

Frequency: 38.9 MHz (38.0 or 39.5 MHz)
Temperature drift: < ± 5.10^{-6} from 10 ° ... 40 °C
Stability: better than 5.10^{-6}/days

Type of modulator

Balanced diode modulator
Unbalance: < 1 % after 10 min. heating up

Overall figures for response and distortion

Amplitude response: vestigial sideband characteristic according to system specification
Suppression 38.9 MHz (38.0 or 39.5 MHz) + colour subcarrier frequency: > 40 dB
Group delay response:
Without or with phase pre-distortion according to system specification
(Modification possible to a certain degree, max. slope 200 ns/MHz)
Nonlinear distortion:
Differential gain < 2 %
Differential phase 1 °
(Both measured between 10 % and 80 % of carrier level)

Output signals

Sound intercarrier: V_0 adjustable from 0 ... 200 mV in 75 Ω, nominal value 100 mV
Unmodulated vision carrier: V_0 = 200 mV in 75 Ω, distortion < 2 %
33.4 (31.5 or 33.5) MHz AF-modulated carrier: continuously adjustable 0 ... 200 mV in 75 Ω, nominal output V_0 = 100 mV
Video-modulated vision carrier: V_0 = 200 mV ± 10 % in 75 Ω, harmonic content < 1 %
Composite IF signal (2 separate outputs):
Video carrier V_0 = 1000 mV* in 50 Ω
Sound carrier V_0 = 450 mV in 50 Ω
Sound carrier continuously adjustable between 0 and + 6 dB
Output impedance: Z_0 = 50 Ω, SWR < 1.1

Supply

115 or 230 V ± 20 %, 50 ... 60 Hz, 30 W

Temperature ranges

Operating conditions: —10 ° ... + 45 °C

Cabinet

19" rack/table model
Height: 3 units = 150 mm, including feet
Depth: 420 mm including handles
Weight: 10 kg

* Video modulated RF levels refer to the RMS value during sync peaks at nominal modulation.

VHF and UHF converters PM 5591/93/94/95 Base unit PM 5596

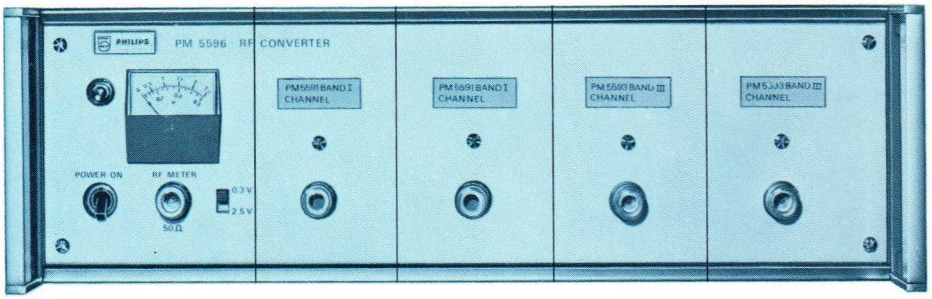
Very low distortion

Easy change of frequency within the band

Directional coupler in the IF output

Large number of converters can be operated from one IF source

PM 5591, 5593, 5594 and 5595 convert IF to VHF and UHF bands I, III, IV and V respectively. They are designed for use together with the IF modulator PM 5590. The combination of PM 5590 and one or more converters is recommended for all applications where a high-quality, low-level RF TV signal is needed. Applications include development and research laboratories, quality test and approbation laboratories, TV factories etc.



Technical specification

Type number	*TV band*	*Frequency range*
PM 5591	Band I	43 ... 70 MHz
	(Am. version	52 ... 85 MHz)
PM 5593	Band III	160 ... 230 MHz
PM 5594	Band IV	470 ... 700 MHz
PM 5595	Band V	650 ... 960 MHz
PM 5596	Base unit for max. four converters, with power supply and built-in voltmeter circuitry	

Input

Composite signal from IF Modulator PM 5590 viz.

Type no.	*TV System*	*Vision Carrier frequency*	*Sound*
PM 5590A	EIA	38.9 MHz	34.4 MHz
PM 5590B	British	39.5 MHz	33.5 MHz
PM 5590E	Europ. CCIR	38.9 MHz	34.4 MHz
PM 5590R	OIRT	38.0 MHz	31.5 MHz

Sensitivity: adjustable from 300 mV ... 1000 mV sync peak value
Impedance: 50 Ω, 2 N-connectors, signal can be looped through
SWR: < 1.1
Directional coupler: insertion loss < 0.1 dB directivity > 30 dB

VHF/UHF oscillator

Frequency: crystal-controlled
Frequency stability (with Philips HC - 27 U crystals):

	Temperature drift 10 ° ... 40 °C	Stability 90 days
PM 5591	< 1 kHz	< 500 Hz
PM 5593	< 2 kHz	< 1 kHz
PM 5594	< 7 kHz	< 3 kHz
PM 5595	< 10 kHz	< 5 kHz

Distortion

At nominal output voltage between 10 % and 80 % carrier level
Differential gain: < 1 %
Differential phase: < 0.5 °

Frequency response

Amplitude tolerance: > 7 MHz ± 0.5 dB
Group delay tolerance: > 7 MHz ± 10 ns

Output voltage

VHF and UHF: Nominal 200 mV_{rms} sync peak value in 50 Ω
(The output voltage can be increased to some extent, the specification data however can then no longer be completely guaranteed)
Impedance: 50 Ω, N-connector
SWR: < 2 over 7 MHz bandwidth

Meter circuit

The built-in wide band voltmeter enables checking output voltage and is an aid in case tuning to another frequency is needed.

Supply

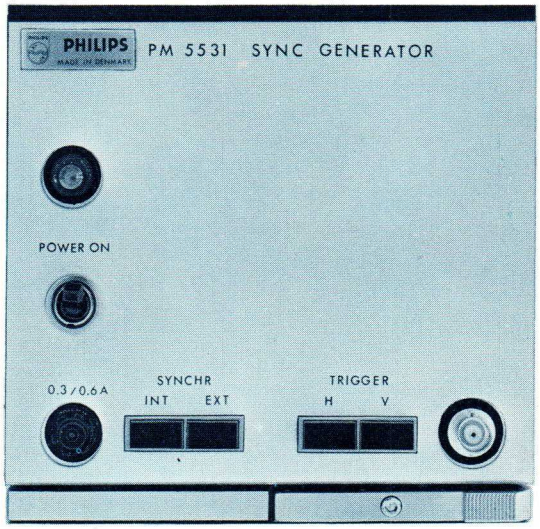
115 and 230 V ± 20 %, 50 ... 60 Hz
Power consumption: 20 W at 220 V

Mechanical data

Up to four converter units can be housed in and get their power from one base-unit PM 5596
The converter units can be plugged in from the rear and interconnected with cables to the power supply

Cabinet

19" rack/table model
Height: 3 E = 150 mm including feet
Depth: 420 mm including handles
Weight: 10 kg



Sync pulse generator PM 5531

All signals conform to CCIR 625 and RTMA 525 line standards

Simple modification from 625 to 525 lines and vice versa

Crystal controlled or external control

Miniature construction

Integrated circuits and silicon transistors used throughout

This new sync pulse generator can be considered as a monochrome generator as opposed to the colour tv sync generator PM 5532 described opposite. Thus the PM 5531 is ideal for applications where only the basic sync and blanking signals are needed - TV studios, laboratories, production centres and for transmission purposes.
The PM 5531 takes up only 2/6 of a standard 19" cabinet.
In the 625 lines version the unit is controlled by a 2.5 MHz clock frequency, which can be taken either from a crystal oscillator or a 2.5 MHz multivibrator. The crystal oscillator mode is obtained by pushing the "Synchr Int" button and the multivibrator by the "Ext" button, which then demands an external double line frequency signal.
No delay line is required to fix the timing of the various signals. A simple internal modification allows the unit to function in the US 525 line/60 Hz system.

The composite sync and blanking pulses, and the horizontal and vertical drive signals are available at the rear of the generator. The latter signals are also available on the front panel for triggering and other purpose.

Technical specification

(the CCIR 625 lines 50 Hz version is described)

System
CCIR 625 lines 50 Hz (easy change to RTMA 525 lines 60 Hz system)
PM 5531 G: 625 lines/50 Hz
PM 5531 M: 525 lines/60 Hz

Synchronisation
Master oscillator:
Frequency: 2.5 MHz, crystal controlled
Stability and long term drift: better than 100 10^{-6}
Jitter: $<$ 10 ns jitter
External synchronisation:
Frequency: double line frequency $\pm$ 10 %
Amplitude: 1 - 10 V_{pp}, waveform arbitrary

Output signals
Composite sync signal:
Line sync pulses: 4.80 μs $\pm$ 0.15 μs
Interval between field sync pulses: 4.80 μs $\pm$ 0.15 μs
Equalizing pulses: 2.40 μs $\pm$ 0.15 μs
Line front porch: 1.60 μs $\pm$ 0.15 μs
Duration of field sync sequence: 2½ lines
Duration of equalizing pulse sequence: 2½ lines
Rise and fall time: 200 ns $\pm$ 50 ns
Blanking signal:
Line blanking pulses: 12.00 μs $\pm$ 0.15 μs
Field blanking: 25 lines + 12 μs
Rise and fall time: 200 ns $\pm$ 50 ns
Line drive pulses:
Pulse width: 7.20 μs $\pm$ 0.15 μs
Leading edge coincidence with composite sync signal: + 50 ns
Rise and fall time: 200 ns $\pm$ 50 ns
Field drive pulses:
Duration: 10 lines
Leading edge coincidence: with composite sync signal: $\pm$ 50 ns
Rise and fall time: 200 ns $\pm$ 50 ns

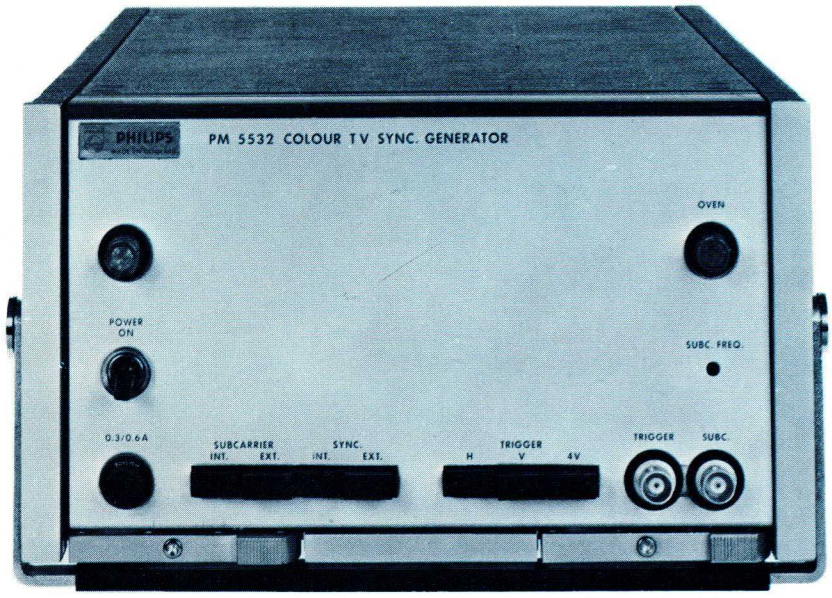
Output terminals
At the rear
2 x composite sync signal
2 x composite blanking signal
1 x line drive signal
1 x field drive signal
Amplitude: 4 V $\pm$ 0.4 V_{pp} into 75 Ω
Polarity: negative
At the front
1 x line or field drive signal, selectable
Amplitude: 4 V $\pm$ 0.4 V_{pp} into 75 Ω
Polarity: negative

Input terminal
At the rear:
1 x external double line frequency
Amplitude: 1 - 10 V_{pp} (looped through)

Power supply
Voltage: 115 or 230 V $\pm$ 20 % (switchable)
Frequency: range 48 . . . 65 Hz

Temperature range
Ambient: 0 °C - 50 °C

Dimensions
The instrument will be housed in a 2/6 module of the Philips 19" cabinet.
Height: 132 mm
Width: 195 mm
Depth: 400 mm



Colour TV Sync Generator PM 5532

Digital circuitry throughout

Ovencontrolled subcarrier crystal oscillator for accurate pulse timing

Locking by external subcarrier or by 2 f_H signal possible

PAL (Europe, Brazil or Argentine) and NTSC versions available

Easy modification from one version to the other

PM 5532 is a colour sync generator used in applications where a high stability time base and subcarrier are needed e.g. in TV research and development laboratories, TV production centres, studios etc.
Due to the special jitter-free circuits the phase relationship between sync and blanking signals and the subcarrier signal is of a very high precision. The instrument's specification therefor completely fulfills the requirements of official broadcast and P & T organizations.

Technical data

N.B.: The European PAL version is described

Time base data
Colour subcarrier frequency:
4.43361875 MHz ± 1 Hz
Stability and long term drift:
5.10^{-7}/90 days for ambient temperatures of 0°...45°C
Jitter of pulses: < 10 ns
Subcarrier frequency:
4.433619 MHz ± 200 Hz
Double line frequency (for monochrome only): 2 f_H = 31.250 kHz ± 10%
Required input voltage (for both cases):
External synchronization
1...10 V_{pp}, loop-thrcugh

Output signals
Colour subcarrier: 4.43361875 MHz
Voltage: 2 V ± 0.2 V_{pp} into 75 Ω, 3 outputs

Composite sync signal
Line sync pulse: 4.70 µs ± 0.2 µs
Interval between field sync pulses:
4.70 µs ± 0.2 µs
Equalizing pulse: 2.30 µs ± 0.1 µs
Front porch: 1.60 µs ± 0.2 µs
Duration of field sync sequence: 2½ lines
Duration of equalizing pulse sequences:
2½ lines
Voltage: 4 V ± 0.4 V_{pp} into 75 Ω

Blanking signal
Line blanking interval: 12.00 µs ± 0.2 µs
Field blanking period: 25 lines + 12 µs
Voltage: 4 V ± 0.4 V_{pp} into 75 Ω

Line drive signal
Pulse width: 7.20 µs ± 0.15 µs
Coincidence leading edge with first field sync pulse: ± 50 ns
Voltage: 4 V ± 0.4 V_{pp} into 75 Ω

Field drive signal
Duration: 10 lines = 640 µs
Coincidence leading edge with first field sync pulse: ± 50 ns
Voltage: 4 V ± 0.4 V_{pp} into 75 Ω

Burst keying signal
Pulse width: 2.40 µs ± 0.1 µs
Positioning: 5.6 µs ± 0.1 µs after leading edge line sync pulse
Burst suppression: 9 lines
Burst start - stop:
1st field (even) line 7 — line 309
2nd field (odd) line 319 — line 621
3rd field (even) line 6 — line 310
4th field (odd) line 320 — line 620
Voltage: 4 V ± 0.4 V_{pp} into 75 Ω

PAL identification signal
By internal selection one of the three signals below can be chosen:
a) Colour axis switching signal:
1. Line drive pulses ahead of lines having positive R-Y phase
Pulse width: 7.20 µs ± 0.15
Repetition rate: half line frequency
2. Symmetrical square wave having positive phase during lines with R-Y phase
Square wave frequency: ½ × 15625 Hz
Step coincidence with line drive pulses: ± 50 ns

b) Field identification signal:
1. Field drive pulses appearing every fourth field only
Pulse duration: 10 lines
Repetition frequency: 12.5 Hz
Field indication: can be selected internally
Voltage: 4 V ± 0.4 V_{pp} into 75 Ω

Rise and fall time of all signals: 200 ns ± 50 ns
Polarity of all signals: negative

Power supply
Mains voltage : 115/230 V ± 20%
Mains frequency : 48...65 Hz
Power consumption : 30 W at 220 V

Versions
The following versions of the colour TV sync generator PM 5532 are available:

Type number	Colour TV standard
PM 5532 G/0 :	European PAL 625 lines
PM 5532 M/0 :	NTSC 525 lines
PM 5532 M/1 :	Brazilian PAL 525 lines
PM 5532 N/0 :	Argentinian PAL 625 lines

Temperature range
Operating: 0 °C...50 °C ambient temperature

Mechanical data
The instrument can be housed in either a table cabinet PM 9713 or a rack mounting cabinet PM 9716
Heigt: 132 mm
Width: 225 mm
Depth: 500 mm
Weight: 5.5 kg
N.B. Modification from one version into another easily possible

TV pattern generation

There is a choice of three generators in this section of the Philips program. Monochrome pattern generator PM 5540 provides black and white composite or single patterns. It uses digital techniques and a ferrite core memory to generate a fully-electronic test circle, which is thus not affected by temperature, mains variations or component aging.

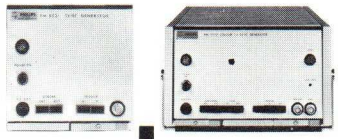
Colour pattern generator PM 5552 supplies a composite pattern or separate test patterns. Seven different test signals can be produced and the colour bars can be switched in three different frequencies.

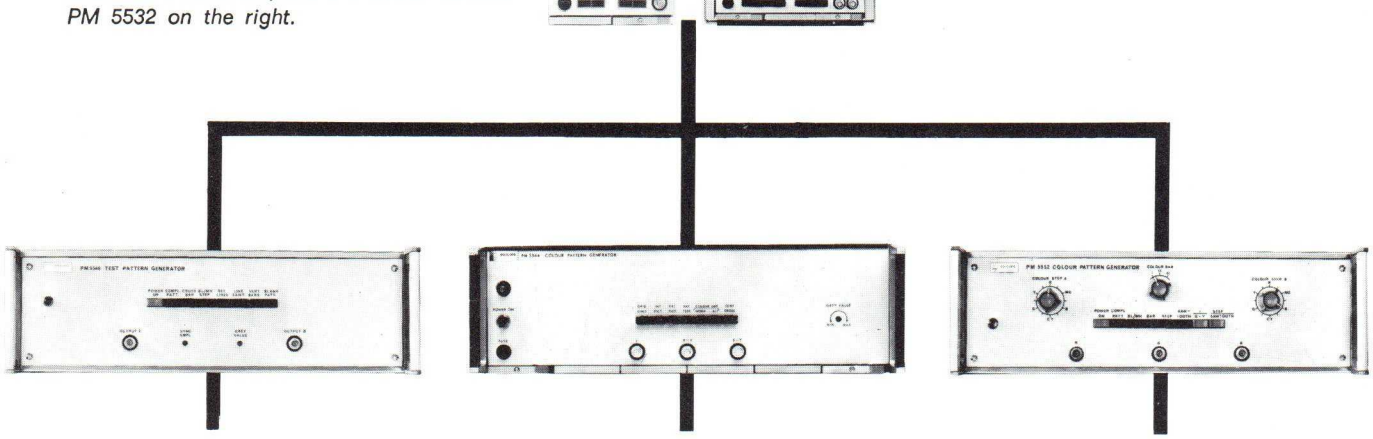
The newest generator in the program is the combined colour/monochrome unit PM 5544.

This generator meets the market need for a combined colour/monochrome test pattern. The numerous contents of this pattern are easily interpreted to provide many test signals for system checking. And the circle is digitally-derived to give maximum stability.

Diagram illustrates the choice of sync pulse generators and test signal generators.

The monochrome sync generator PM 5531 is shown on the left, and the colour version PM 5532 on the right.

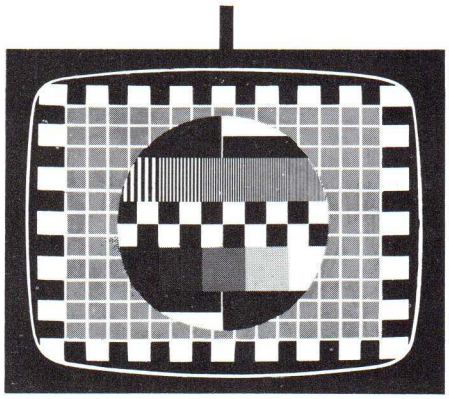




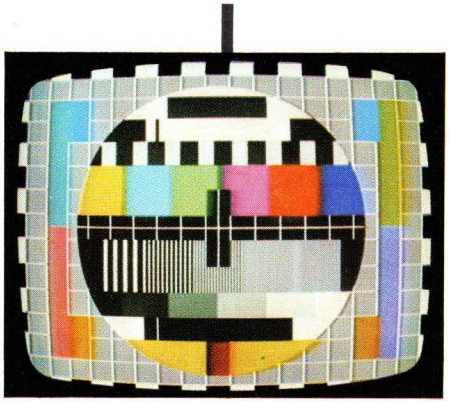
Monochrome pattern generator PM 5540 gives a black/white pattern with digitally derived circle.

The combined colour/monochrome generator PM 5544 provides the test pattern shown below.

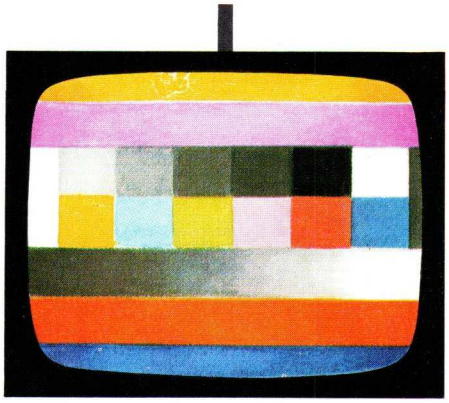
The colour pattern generator PM 5552 supplies separate patterns or the composite signal shown below.



For modulation

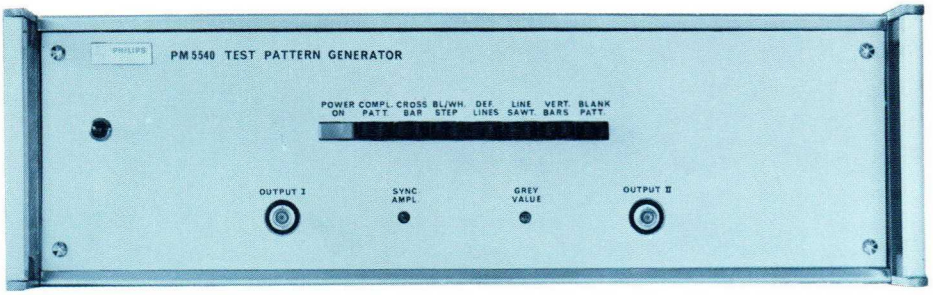


For coding



For coding

Monochrome pattern generator PM 5540



Composite monochrome test pattern or single patterns

Digitally-derived circle and ferrite core memory for inherent stability

Two isolated outputs

When used with a synchronisation and blanking generator the PM 5540 gives separate or combined monochrome test patterns.
The generator uses the same digitally-derived system as the PM 5544, which together with the ferrite memory, provides an inherently stable circle. (See page 16 for details).

Technical specification

The complete test pattern is built up as follows:

Background of crossed lines
Fixed number (vertical 14 lines, horizontal 10 lines)
Thickness: horizontal 2 lines (one of each field), vertical approx. 200 ns
The crossed lines are omitted within the circle

Black and white squares around the borders
The squares in the four corners are white

Circular pattern
Diameter: approx. 75 % of picture height
Accuracy: deviation hor. Ø, vert. Ø $<$ 1 %

Black/white steps and white/black steps
Location: top and bottom segment of circle

Definition lines
Waveform: square waves, horizontally spaced
Frequency: 1, 2, 3, 4 and 5 MHz, fixed phase relation
Long term amplitude constancy. within 1 %

White/black blocks
Frequency: 170 kHz
Location: horizontally spaced around centre of circle

Stair case signal
Number of steps: 5
Gradation: linear
Accuracy of amplitude: $\pm$ 10 % of each step

Needle pulse
Place: white pulse on black background
Waveform: approx. sine squared
Half cycle width: 200 ns $\pm$ 20 ns

Reference marker or text
It is possible to insert a reference signal in one of the black areas

Centre point
The centre of the circle is easy to distinguish

Separate patterns
Crossed lines
Full-screen pattern of crossed lines, same specification as for crossed lines in combined picture

Needle pulse with positive and negative steps at the beginning and at the end of the lines
As needle pulses and stair case signal in combined picture. Width of the white areas about 15 % of the line amplitude.

Definition lines
Same specification as definition lines in combined pattern, the various frequencies are now above each other, however

Sawtooth
Direction: black to white
Linearity: $>$ 0.97

Vertical bars
Number: 5

Blank pattern
Plain grey field, adjustable internally between black and white with screwdriver control

Rise time, overshoot
Rise times of various signals: 30 ... 80 ns
Overshoot: $<$ 1 %

Input sync. and blanking signals
Amplitude: 2 . . . 8 V neg. (high ohmic input)
Number of connectors: 8 (line, field, total sync and total blanking, same number for looping through)

Output composite video
Number of outputs: 2 separate outputs

Output I
Amplitude: nominal 1 V_{pp} incl. sync into 75 Ω, white positive. Sync and video amplitude adjustable 0 ... 200 % and 0.7 ... 1 V_{pp} (excl. sync) respectively
Structural return loss: $>$ 24 dB
DC level: for both outputs and all patterns constant within 2 %

Output II
Same as I but fixed amplitude: 1 V_{pp} incl. sync into 75 Ω, white positive

Input external video signal (marker or text)
Amplitude: 0.7 V_{pp} into 75 Ω

Supply
115 V and 230 V $\pm$ 20 %; 50 ... 60 Hz
Power consumption: 40 W at 220 V

Colour pattern generator PM 5552

Composite pattern combining 7 different test signals

Three different colour sequences in colour bar

Colour step signal with 11 x 12 colour combinations

Both I, Q and R-Y, B-Y and G-Y signals

Black/white staircase signal and "coloured" line sawtooth

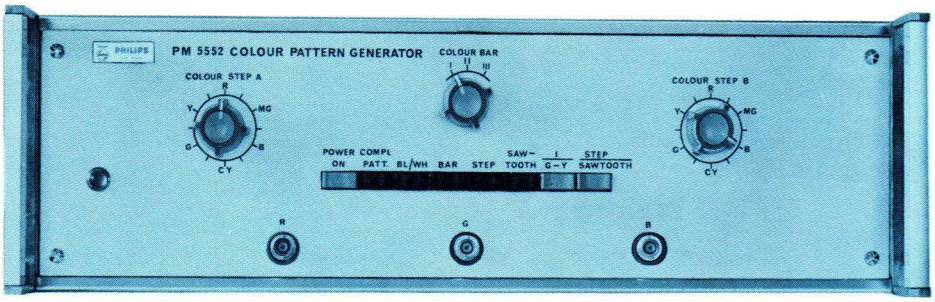


Photo shows monitoring of test patterns at a transmitter site to assess their quality. The monitor on the left has the PM 5552 composite colour pattern, while the one on the right carries the PM 5544 digitally-derived circular pattern.

When used in combination with a synchronisation and blanking generator the PM 5552 supplies a composite pattern or separate test patterns. These may be displayed on an RGB-monitor or coded with an NTSC or PAL encoder (e.g. Philips types PM 5553 or PM 5545 respectively).
The diversity of test signals available means that the PM 5552 may be used for encoding and decoding checks on TV equipment, whether in the studio, laboratory or receiver factory. The facility of having colour difference signals and I and Q signals enables these checks to be made by vector display.
And grey scale tracking is possible through use of the staircase signal.

Technical specification

System

PM 5552E European CCIR 625 lines, 50 Hz or PM 5552A American FCC 525 lines, 60 Hz

Pattern display prior to encoding

A) Combined test pattern consisting of 7 horizontal bars with:
1. Signal with the I or G-Y 90 ° phase (switchable)
2. Signal with Q-phase
3. Five step linear staircase with black/white and white/black step
4. Colour bar consisting of primary and complementary colours plus white and black (sequence of the colours can be chosen in 3 different ways) or freely by simple internal modification

5a. Sawtooth with 10 % superimposed subcarrier with the red phase*,
or b. Adjustable colour steps to be chosen by means of two 12-position switches

6. Signal with the R-Y phase
7. Signal with the B-Y phase

*) Phase can easily be changed to any of the other primary or complementary colours (internal modification)

B) Separate full-screen patterns (to be chosen by means of push-buttons)
1. As A3
2. As A4
3. As A5a
4. As A5b

Input signals

Blanking and sync input
Amplitude: 2 ... 8 V_{pp} negative
Impedance: high-ohmic for looping through
Superimposed hum: max. admissible 100 %

Output signals

Two isolated RGB outputs
Amplitude: nominal 0.7 V_{pp} without sync and set-up, positive into 75 Ω

Rise and fall time

Y signal: < 50 ns
Colour bar and step signals: < 50 ns

Power supply

Voltage: 115 and 230 V ± 20 %, choice by two-position switch
Frequency: 50 ... 60 Hz
Consumption: 30 W at 220 V

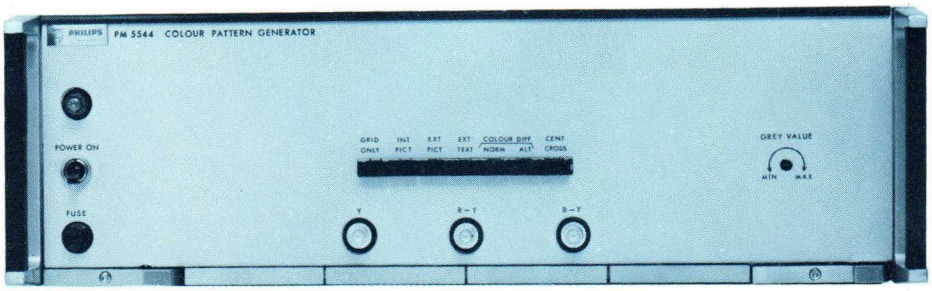
Temperature range

Operating condition: —10 ° ... + 45 °C

Cabinet

19" rack/table model
Height: 3 units = 150 mm including feet
Depth: 420 mm including feet
Weight: 10 kg

Combined colour/monochrome pattern generator PM 5544



Pattern information easily decipherable, both in colour and monochrome

Digitally derived circle and ferrite core memory for inherent stability

Switchable special colour test signals for decoder checks

Horizontal and vertical colour transitions

Inner circle information can be replaced by external colour signal

Convergence cross can be switched into centre of picture

Integrated circuits used throughout

Pictures well balanced and esthetically composed

R, G and B outputs as well as colour difference outputs for coding

The combined monochrome/colour pattern generator PM 5544 is a useful instrument for generating a pattern on behalf of TV transmitters, set factories and studios. It supplies a picture which is equally well suitabe for the various monochrome as for the colour TV checks and measurements. The picture content is such that a number of colour TV alignments can be made directly from the screen without making use of an additional measuring instrument.

Which pattern?

It is important that the information contained in the pattern should be easily decipherable, and shows errors or misalignments of the TV set or equipment to be tested from the screen, both in monochrome and colour. The Philips pattern achieves this objective by placing most of the components inside the circle and by providing a symmetrical design.
Thus inside the circle one finds the four basic components: colour bar scale, grey scale, definition lines and the 250 kHz square-wave signal. And additionally five other signals: in the very centre a grid pattern, the black-white step with black needle pulse, the white-black step with black needle pulse, the black rectangle at the top of the circle and finally the yellow-red-yellow step at the bottom.
There are also several signals outside the circle for checking and aligning TV receivers, which can be switched in and out.

Why a circle? Why digitally derived?

A circle is generally accepted to be the best method of evaluating picture geometry and linearity. Any defects are immediately obvious as a distortion of the circle.
A digitally derived circle is preferred since the inherent stability of the circle must be high. This, unfortunately, has been a failing with many circles generated by the so-called flying spot scanner and also those generated electronically on an analog basis.
In the Philips generator the combination of digital techniques plus a ferrite core memory provides an inherently stable display with a clear yes/no indication of scanning faults.

Technical specification

Composition of the pattern

a. Circle with b/w and colour information
b. Colour information next to the circle
c. Background with a.o. crossed lines

Sub a: Front top to bottom:

1. Black rectangle on white background
Width of rectangle: about 10 μsec
2. Black/white step with needle pulse
Width of needle pulse: 230 nsec $\pm$ 10 %
3. Square wave signals
Repetition frequency: 250 kHz
Amplitude: 75 % of white amplitude (1 same amplitude as R, G and B signals in colour bar and colour step to check saturation in decoders)
4. Colour bar signal
Colours: Yellow, cyan, green, magenta, red, blue
Saturation: 100 %
Gain: 75 %
5. Crossed lines
Width vertical lines: 230 nsec $\pm$ 10 % (to give minimum cross talk in colour channel)
Structure of horizontal center line:
2 lines, one in each field, reversed in sequence with lines of background (check of interlace).
A convergence cross can be switched into
6. Definition lines
the centre of the pattern
Frequency: 0.8, 1.8, 2.8, 3.8 and 4.8 MHz, sine waves
7. Stair case
Number of levels: 6 (modification to 10 levels easily possible)
8. White black step with needle pulse
See 2
9. Colour step
Colours: Red on yellow background
Width: about 3 μsec
Gain: 75 %
10. Circle

Mode of generation: Binary generated circle with ferrite core memory
Diameter: about 83 % of active vertical amplitude
Error of diameter: < 1 %

The video content within the circle can be replaced by an externally applied video signal e.g. from a slide scanner or TV camera. The signal may have full screen size.
Sub b: Colour information next to the circle
Left hand side of circle:
1. Vertical bar with line alternating positive and negative R-Y signal
2. Vertical bars with positive and negative R-Y signal
3. Two rectangles with signal G-Y
Right hand side of circle:
1. Vertical bar with line alternating positive and negative B-Y signal
2. Vertical bars with positive and negative B-Y signal
3. Two rectangles with signal G-Y

The various signals sub b. can be switched off separately.
Sub c. Background
1. Crossed lines
Number: 14 horizontal x 19 vertical lines
Width: 230 nsec ± 10 %
2. Background
Level: adjustable 0 - 80 %
3. Black/white border castellations

Input signals
Composite synchronization and blanking signals: 2 - 8 V_{pp}, negative, loop through
External identification signal: 0.5 - 2 V_{pp}, positive, loop through with or without sync.
External inner circle R, G and B signal: 0.7 V_{pp} without sync, positive, loop through
Frequency response: 6 MHz (3 dB)

Output signals
Y, R-Y and B-Y signals: 0.7 V_{pp} without sync, positive, impedance 75 Ω
R, G and B signal: 0.7 V_{pp} without sync, positive, impedance 75 Ω, matrixing error: < 2 %

Power supply
Voltage: 115/230 V ± 20 %, 2 positions
Frequency: 50 - 60 Hz
Consumption: 45 W

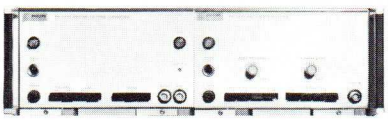
Temperature range
0 to + 45 °C

Mechanical data
Full 19" cabinet of the Philips universal cabinet system.
Height: 132 mm
Depth: 444 mm
Width: 435 mm

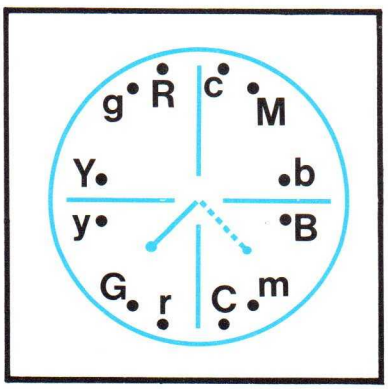
OPTIONAL ACCESSORY

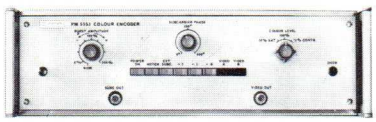
Alphanumerical Text Generator PM 5543
The PM 5543 is a sub-unit fitted to the pattern generator PM 5544 in order to insert the text for transmitter station and/or channel indication.
This text which is generated by a MOS read-only memory, can be up to a maximum of 64 different characters. It is displayed in 2 rows of about 7 to 10 characters in the allocated areas of the pattern.

Encoding and decoding
Coding can be PAL or NTSC. The PAL coder is the PM 5545 which features (Y) RGB as well as Y/R-Y/B-Y inputs. The sub-carrier phase is adjustable from 0 . . . 400°, the colour burst amplitude from 0 . . . 200%.
The various switching and control functions can be remotely controlled. Apart from the European PAL versions the instrument is also available for the Brazilian and Argentinian PAL version. The unit is used in conjunction with the colour tv sync generator PM 5532 described earlier under the "TV pulse generator" section.
The NTSC coder is the PM 5553, which combines the coder and sub-carrier oscillator in one compact unit.
The sub-carrier phase is also adjustable from 0 - 400° and the colour level switchable to 3 modes.

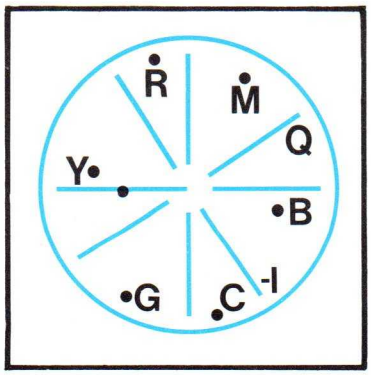


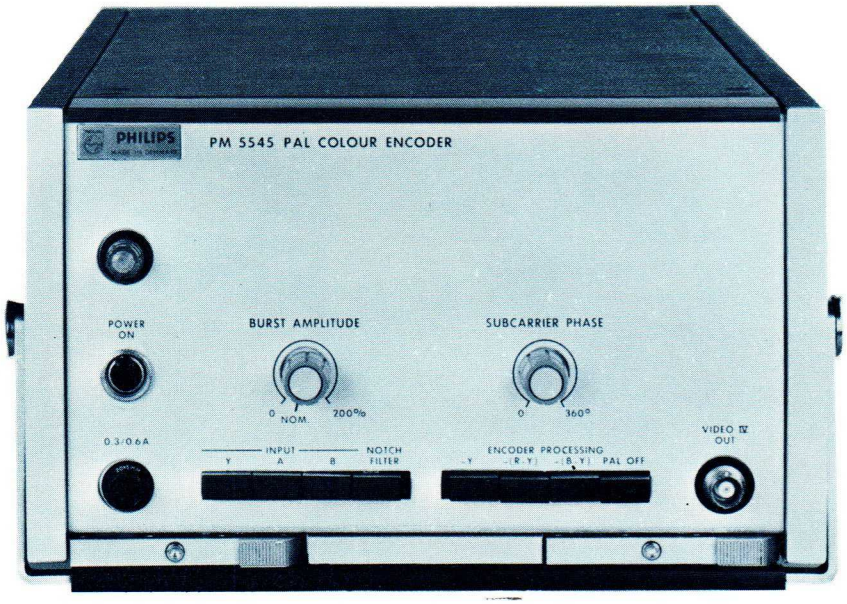
PM 5532 Colour TV Sync generator and PM 5545 PAL encoder together in one 19" housing.





NTSC compact coder PM 5553 incorporates the sub-carrier oscillator.





PAL Encoder PM 5545

(Y) RBG and Y/R - Y/B-Y inputs

Adjustable burst amplitude and subcarrier phase

Separate encoded and luminance-only outputs

Remote control facility

Brazilian and Argentinian versions available

Meets official requirements

Frame controlled burst phase

Equiband NTSC encoding facility

PAL Encoder PM 5545 is a compact, high stability, general purpose instrument for use in TV laboratories, production centres as well studios.
Of particular interest to laboratories are the separate luminance input and output, adjustable burst amplitude, and switchable Y, R-Y and B-Y signals.
The encoder PM 5545 and the TV sync generator PM 5532 together form a complete, compact colour processing unit in one 19″ rack only 13.5 cm high.

Technical data

Inputs

Level: Sync signal, Burst keying signal } 2...8 V_{pp}, max. superimposed hum 100 %

Subcarrier signal: 1...4 V_{pp}
(Y)RBG signal: 0.7 V_{pp} excl. sync. and set-up
R-Y/B-Y signal: 1.4 V_{pp} excl. sync. and set-up
N.B.: The Y/R-Y/B-Y input can be modified to a second RBG input.
Impedance: High ohmic loop-through except the Y, R-Y and B-Y inputs which are terminated by 75 Ω
Return loss: > 35 dB

Outputs

Level: 1 V_{pp} incl. sync, two pairs giving 4 independent outputs
Impedance: 75 Ω

Coding

Matrixing inaccuracy: less than 1 %
Modulator unbalance: less than 1 %
Modulator phase inaccuracy: less than 1°

Frequency response

Luminance bandwidth: 6 MHz < 1 dB
Bandwidth of chrominance signal:
at 1.3 MHz < 3 dB down
at 4 MHz > 20 dB down
Timing differences between Y, R-Y and B-Y:
< 25 ns
Notch filter:
at 4.43 MHz > 6 dB down
at 4.43 MHz ± 200 kHz < 3 dB down

Distortion in multiplex channel

Differential gain: < 0.5 %
Differential phase: < 0.5°

Remote control

Remote control of the various switching and control functions possible

Temperature range

Ambient temperature: 0°...45°C

Mains supply

Frequency: 48...62 Hz
Voltage: 115/230 V ± 20%

Cabinet

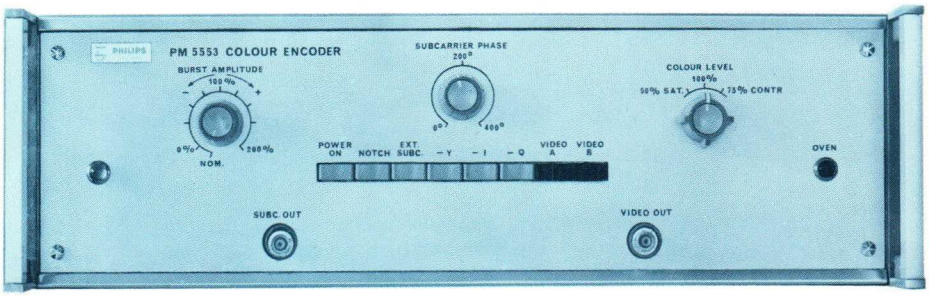
3/6 plug-in unit for Philips universal 19″ cabinet system

Dimensions

Height: 132 mm
Width: 235 mm
Depth: 400 mm

Research laboratory set-up illustrates the unique Philips ability to supply complete colour TV measurement systems, from the monitor, sync pulse and pattern generators, through to the counter and oscilloscope.

The PAL decoder has R-Y, B-Y, G-Y and Y outputs to allow vector display on conventional X-Y oscilloscopes, such as the 25 MHz: 2 mV Philips model PM 3210.



NTSC colour encoder PM 5553

Encoding and sub-carrier functions combined in one instrument

Built-in frequency divider for half-line offset

Subcarrier output as well as input for external carrier

400° phase control of subcarrier

Coding switchable to 100% contrast, 75% contrast or 50% saturation

Adjustable burst amplitude

Switchable notch filter

PM 5553 is a combined NTSC colour encoder and subcarrier generator. It makes a coded NTSC signal in full conformity with the standards from the three primary colour informations RGB. The instrument finds its application in colour studios, colour transmitters, as well as laboratories and factories dealing with colour TV.

Technical specification

SUBCARRIER GENERATOR AND DIVIDER FOR PILOT SIGNAL

Internal subcarrier oscillator
Frequency: 3.579545 MHz
Short term stability: 0.2 x 10^{-6}//day
Output voltage: 2 V_{pp} ± 10 % into 75 Ω
Long term stability: 5 x 10^{-6}/90 days

External subcarrier signal
Frequency: 3.579545 MHz ± 20 Hz
Input sensitivity: adjustable 1 ... 8 V_{pp}
Amplitude tolerance: ± 20 %

Pilot signal
Frequency: 31.469 kHz = 2 x line frequency (can internally be modified to 125.874 kHz = 8 x line frequency)
Relationship line frequency → subcarrier frequency

$$f_L = \frac{f_{SC}^2}{455}$$

Output voltage: > 1 V_{pp} into 75 Ω

Subcarrier phase control
Continuous control (0 ° ... 300 °) of subcarrier phase difference between internal/external subcarrier and the burst signal

NTSC ENCODING

Y-I-Q matrix

$Y = 0.30\ E_R + 0.59\ E_G + 0.11\ E_B$

$I = -0.27\ E_{B-Y} + 0.74\ E_{R-Y} =$
$0.599\ E_R - 0.277\ E_G - 0.322\ E_B$

$Q = 0.41\ E_{B-Y} + 0.48\ E_{R-Y} =$
$0.213\ E_R - 0.525\ E_G + 0.312\ E_B$

Matrixing accuracy ± 1 %

I and Q modulators
2 balanced modulators, unbalance < 2 %

Burst pulse
Number: 9 cycles ± 1 cycle
Amplitude:: nominal peak value 0.5 x line sync amplitude, continuous control (0 % ... 200 %)
Position: > 5.3 µs after leading edge of line pulse
Burst suppressed during equalizing and field pulse periods

Contrast and saturation
3 selectable modes:
100 % saturation - 100 % contrast
50 % saturation - 100 % contrast
75 % contrast - 100 % saturation

OVERALL RESPONSE AND DISTORTION

Y-channel
Bandwidth: 6 MHz < 1 dB
Switchable notch filter: bandwidth 3 dB; 400 kHz
Max. suppression: 6 dB at 3.58 MHz

I-channel
Equivalent bandwidth prior to modulation:
at 1.3 MHz < 2 dB down, above 3.6 MHz > 20 dB down
Double sideband output spectrum

Q-channel
Equivalent bandwidth prior to modulation:
at 400 kHz < 2 dB down
at 500 kHz < 6 dB down
at 600 kHz > 6 dB down
Double sideband output spectrum

Overall distortion
Differential gain distortion: < 0.5 %
Differential phase distortion: < 0.5 °
Transmission time difference between Y, I and Q signals: < 25 ns
Spurious harmonics of subcarrier: < 1 %

INPUT AND OUTPUT LEVELS

Sync. and blanking signal inputs
Amplitude: 2 ... 8 V_{pp} negative
Max. tolerated superimposed hum: 50 %
Impedance: high-ohmic for looping through

Subcarrier input and output
Input voltage: adjustable 1 ... 8 V_{pp}
Input impedance: high-ohmic, looped through
Amplitude tolerance: 20 %
Output voltage: 2 V_{pp} ± 10 % into 75 Ω

Pilot signal output
Frequency: 31.649 kHz (internally adjustable on 125.874 kHz)
Voltage: > 1 V_{pp}
Impedance: 75 Ω

RGB inputs
2 separate RGB inputs
Amplitude: 0.7 V_{pp} video without sync and set-up
Impedance: 75 Ω

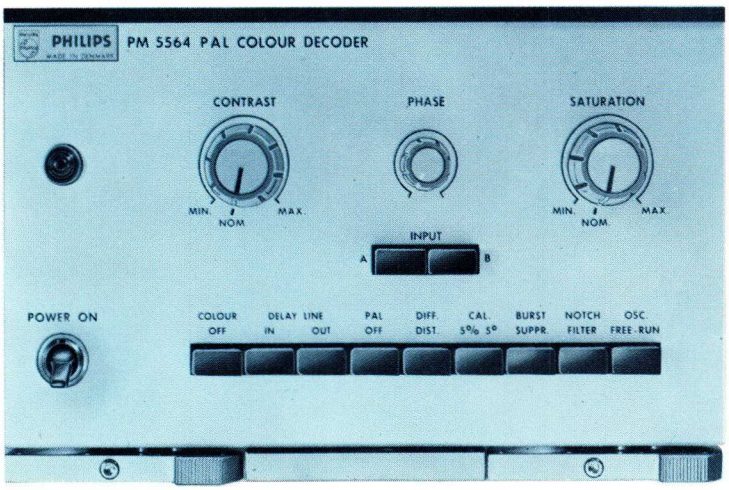
Encoded output
2 separate outputs
Amplitude: 1 V_{pp} including sync. and set-up into 75 Ω

Power supply
115 or 230 V ± 20 %, 50 ... 60 Hz, 10 W at 220 V (30 W with oven switched on)

Temperature ranges
Operating conditions: −10 ° ... + 45 °C

Cabinet
19" rack/table model
Height: 3 units = 150 mm, including feet
Depth: 420 mm including handles
Weight: 10 kg

PAL colour decoder PM 5564



Decoding modes: standard PAL; simple PAL; equiband NTSC (PAL switch inactive)

Two inputs for encoded signals

Two sets of RGB outputs

Y, R-Y, B-Y, G-Y and sync. outputs

Adjustable contrast, phase and saturation

Calibration facility for differential distortion measurements

High stability, linearity and reliability

Modular cabinet construction

The PM 5564 decodes PAL coded signals into R, G and B signals for monitor display. Additionally the unit provides R-Y, B-Y, G-Y, and Y outputs, permitting vector display on conventional X-Y oscilloscopes.
Differential phase and gain measurements can be carried out by applying a line sawtooth with superimposed subcarrier to the circuit being measured. The special calibration facility in the decoder makes it possible to measure on a normal oscilloscope the differential distortion on two separate outputs – one for differential gain and one for phase.
The combination of decoding with additional measuring facilities makes the PM 5564 an extremely useful and versatile instrument for PAL system investigations.

Technical specification

Colour TV system
PAL system (EBU specification October 1967)

Modes of decoding
Standard PAL (with 64 μsec delay line)
Simple PAL (without delay line)
"NTSC" type (R-Y switch inoperative)

Inputs
2 separate switchable inputs
Input voltage: 1 V $\pm$ 6 dB (nominal position 1 V), adjustable
Impedance: high ohmic, loop through
Return loss: better than 30 dB up to 7 MHz

Luminance channel
Bandwidth: 6 MHz $\pm$ 0.5 dB
Notch filter: B = 600 kHz (—3 dB), max. attenuation 30 dB
Linearity: $>$ 0.98 dB

Chrominance channel
Bandwidth: 1.2 MHz $\leqq$ 3 dB
Demodulator quadrature: 90 ° $\leqq \pm$ 2 °
R-Y switching: 180 ° $\leqq \pm$ 1 °
Linearity: $>$ 0.95
Demodulator unbalance: $<$ 1 %

Subcarrier generator
Catching and hold range: $\geqq \pm$ 200 Hz
The subcarrier oscillator can be made free running for adjustment purposes (vector display)

Measurement differential distortion
Differential gain calibration: 5 % $\pm$ 0.5 %
Differential phase calibration: 5 ° $\pm$ 0.5 °

Output levels
Video signals: all 1 V_{pp} pos. incl. sync
Colour difference signal: voltage corresponding to R-Y etc.
Composite sync signal: 4 V_{pp} negative
Output impedance: 75 Ω
Return loss for all outputs: better than 30 dB

Controls
Contrast: (= input sensitivity) 1 V_{pp} $\pm$ 6 dB (nominal position 1 V_{pp})
Saturation: $\pm$ 6 dB with nominal position
Subcarrier phase control: $\pm$ 10 °

Push buttons
Input switch
Black/white reproduction
Notch filter
Decoding
a) with delay line
b) without delay line
c) no switching of R-Y axis ("NTSC" type)
Differential distortion measurement
Calibration 5 % and 5 °
Burst suppression
Free-running operation of s.c. oscillator

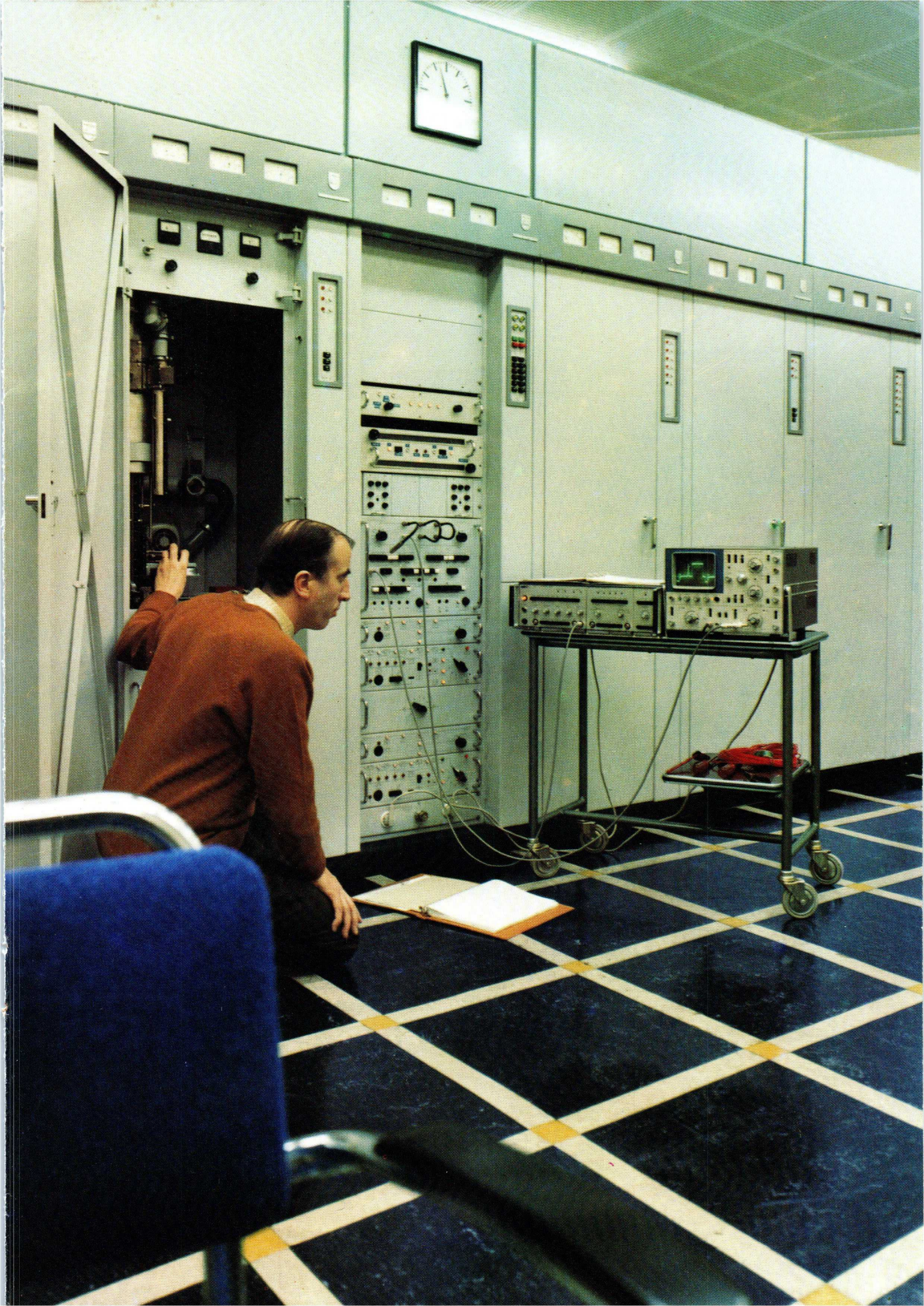
Input and output sockets
Input: 2 switchable video inputs - 2 x 2 BNC connectors (loop through)
Output: RGB - 2 x 6 BNC connectors
Colour difference signals: 3 BNC connectors
Luminance signal: 2 x 2 BNC connectors
Sync signal: 2 x 2 BNC connectors
Differential phase and gain: 2 BNC connectors

MECHANICAL
The instrument can be housed in either a table cabinet PM 9713 or a rack mounting cabinet PM 9716 with cover plate PM 9723. Both cabinets are provided with a bucket handle and a stand-up bracket. The rack-mounting cabinet is supplied with a cover plate for the non-used part; mounting brackets and a cable cover are moreover supplied with the latter cabinet.

Temperature range
—10 to + 50 °C

Mains supply
Frequency: 50/60 Hz
Voltage: 115/230 V $\pm$ 20 %
Power consumption: 25 VA approx. at 220 V

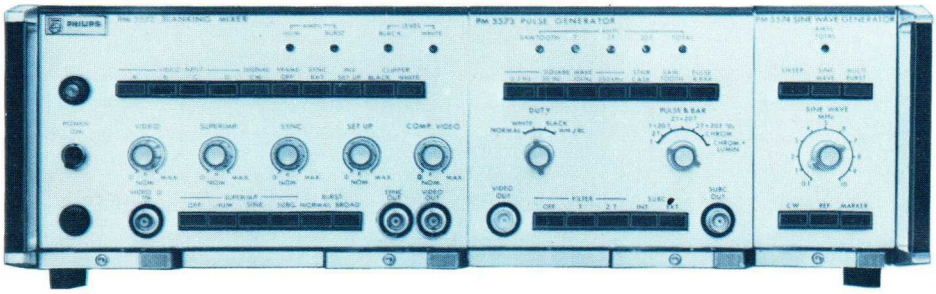
Performance checks on a transmitter being undertaken with the video test signal generator. The pulse and bar output signal is being monitored on the 50 MHz Philips oscilloscope PM 3250.



Video test signal generator PM 5572/73/74

* **Highly versatile signal source (see page 28)**
* **All CCIR, IEC and CMTT specified signals in one compact, 19″ unit**
* **CCIR 50 Hz and FCC and special Brazilian 60 Hz versions available**

The PM 5572/73/74 is currently the most versatile video test signal generator available.
Just a few of the many signals that this compact, modular unit provides can be seen on page 28. It is therefore ideally suited to the measurement of propagation characteristics on transmission links, transmitters and studio equipment.
Two such applications are shown opposite, and on the previous page.
All CCIR, IEC and CMTT specified test signals are provided by the PM 5572/73/74. The type numbers refer to the three units, namely the blanking mixer, the pulse generator and the sine wave generator.
The units are housed in a 19″ cabinet as shown above, with interconnection by cables or via a pre-wired panel.



Sine wave generator PM 5574

Fixed 100 kHz and 1-10 MHz signals in MHz steps

Swept 100 kHz - 10 MHz signals with or without 1 MHz markers and multiburst 1 - 6 MHz signals, both with or without white/black reference lines

Pulse generator PM 5573

Square wave, sawtooth, staircase and sine² signals

Square wave signals with repetition rates of 0.2 Hz and 50 Hz, and 15 and 250 kHz

Switchable T or 2T Thomson filters for standard risetimes

Line frequency sawtooth signals and staircase signals both with or without intermediate lines at black/white level

Sine² signals include:
T/2T pulse and bar
T/2T plus 20T pulse and bar

(20T can be carrierborne)
20T pulse and bar with chrominance with or without luminance

Blanking mixer PM 5572

Synchronisation by internal or external source

Adjustable video, sync, set-up and composite video controls

Four selectable inputs

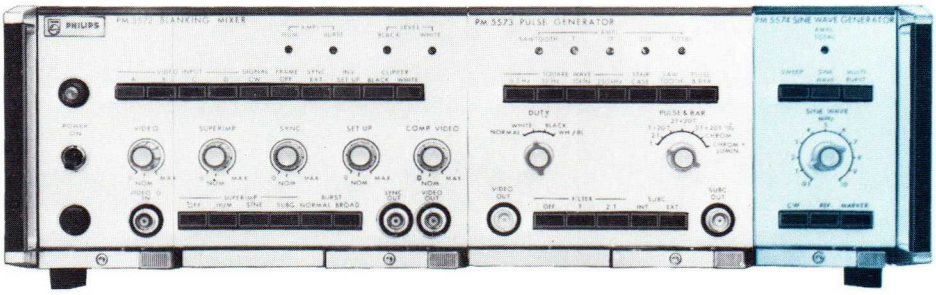
Superimposed hum, colour subcarrier or 100 kHz or 1 to 10 MHz signals

Normal colour TV or full back porch burst

Set-up level can be inverted

Black and white clippers with adjustable levels

Sine wave generator PM 5574



This unit performs following functions:
— fixed frequency signal generation
— video sweep signal generation with or without 1 MHz markers and white/black reference lines
— multi-burst signal generation with or without white/black reference lines.

Supply voltages and sync. and blanking signals are obtained from the blanking mixer unit PM 5572.

ELECTRICAL DATA (50 Hz version):

Output
Number: 3 separate outputs BNC type
Voltage: 0.7 V_{pp} adjustable ± 1 dB
Impedance: 75 Ω
Return loss: > 34 dB
Blanking: switchable on/off

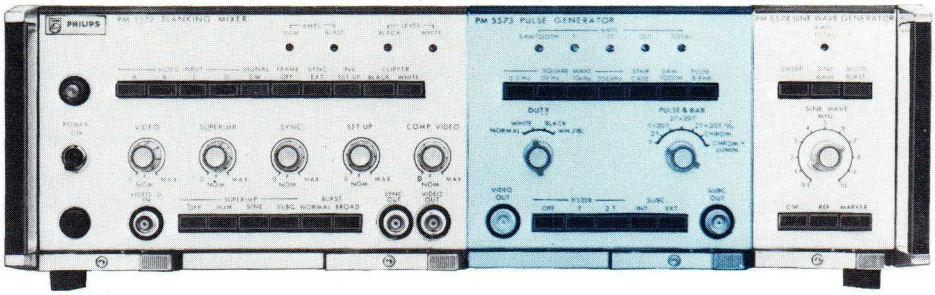
Marker signal
Output voltage: 25 V pos.
Impedance: about 5 kΩ

Input
Multipole Amphenol plug for power supply and synchronization signal from blanking mixer PM 5572

MECHANICAL DATA
1/6 plug-in unit for Philips universal 19″ cabinet system

Parameters	Sine wave signal	Line frequency multiburst	Sweep signal
Frequency	100 kHz, 1,2 . . . 10 MHz (fixed)	signal 1, 2, 3, 4, 5, and 6 MHz	100 kHz to 10 MHz at 50 Hz rep. rate
Frequency accuracy	± 3 %	± 3 %	White bar at start of each line
Reference signal	White bar at start of each line	White bar at start of each line, possibility to switch in alternating white and black lines	± 2 % (ref. = white bar)
Amplitude accuracy	± 2 % (ref. = 1 MHz)		1,2 ... 10 MHz, harmonically related, accuracy ± 2 %
Marker output			

Pulse generator PM 5573



This unit generates various types of test signals such as:

— square wave signals of 0.2 Hz, 50 Hz, 15.625 kHz and 250 kHz
— sawtooth and staircase signals on all lines or intermittent three lines black or white level; the latter manually or automatically (frequency 0.2 Hz) switched
— pulse and bar signals with T, 2T, 20T (or 10T) and white bar in various combinations.

The colour subcarrier signal is crystal controlled and the unit should be used in combination with the blanking mixer PM 5572, from whence it obtains its power supply and sync. signals.

ELECTRICAL DATA (50 Hz version):

Subcarrier signal

Frequency: 4,433619 MHz, crystal controlled
Stability: 10.10^{-6} (0 ... 50 °C)

Thomson filters

Rise time: switchable 90 ± 5 nsec or 180 ± 10 nsec (for square wave, staircase and sawtooth signals only)

Choice of signals:
(see table below)

Output

Video
Number: 3 separate outputs BNC type
Voltage: 0.7 V_{pp}, adjustable ± 1 dB
Impedance: 75 Ω
Return loss: > 34 dB up to 7 MHz
Subcarrier signal
Number: 3 outputs BNC type of which one supplies signal blanked in accordance with blanking signal and selected test signal
Voltage: 0.7 V_{pp}
Impedance: 75 Ω
Return loss: > 34 dB

Input

Subcarrier signal
Voltage: 0.5 ... 4 V_{pp}
Impedance: high ohmic, loop through
Return loss: > 34 dB up to 5 MHz
Multiple Amphenol plug for power supply and synchronization signal from blanking mixer PM 5572

MECHANICAL DATA

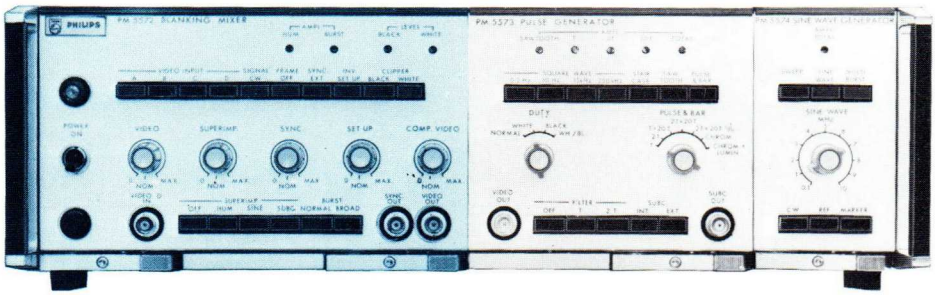
2/6 plug-in unit for Philips universal 19" cabinet system

Square wave signals	Sawtooth signals	Staircase signals	Pulse and bar signals
Frequency: 0.2 Hz 50 Hz (frame synchronous) 15625 Hz (line synchronous) 250 kHz (line synchronous) Rise time: < 60 nsec. (without Thomson filter) Overshoot: < 1 % (with 100 nsec Thomon filter) Tilt: < 1 %	Repetition rate: line frequency Signal modes: sawtooth on all lines or with three intermittent lines at white or black level; the intermittent lines can be switched manually or automatically (0.2 Hz) Linearity: > 0,98	Repetition rate: line frequency Number of steps: 10 levels (modification to 6 levels internally selectable) Rise time: < 60 nsec. (without Thomson filter) Difference between the steps: < 2 %	Repetition rate: line or half line frequenc y Signal modes: • T + white bar • 2T + white bar • T + 20T* + white bar • 2T + 20T* + white bar • 2T + 20T* carrierborne + white bar *Voltage:* 0.5 ... 4 V_{pp} * + white bar, chrominance only • 20T* + white bar, chrominance + luminance Reference: all signals can be switched line sequentially with white reference line Sine square pulses width: T: 100 nsec ± 5 % 2T: 200 nsec ± 5 % 20T: 2μsec ± 5 % 20T: 2 μsec ± 5 %

N.B. In case of the superimposed signal the subcarrier signal can either be suppressed or not during the intermittent black or white lines

* 10T on request

Blanking mixer PM 5572



This unit performs four functions.
1. The mixing of video information with the sync. and blanking signals to provide a composite signal.

2. The mixing of the composite video information with sinusoidal waveforms to obtain superimposed signals.

3. The generation of sync. and blanking signals.
4. The power supply to the pulse and sine wave generators.

ELECTRICAL DATA (50 Hz version):

Inputs

Video
Number: 4 selectable inputs, 1 loop through, 3 terminated
Impedance: 75 Ω
Return loss: > 34 dB up to 1 MHz
Voltage: 0.7 V_{pp} ± 6 dB (nominal position 0.7 V_{pp})
Cross talk: < —50 dB up to 7 MHz
Sync and blanking
Impedance: high ohmic, loop through
Return loss: > 34 dB up to 7 MHz
Voltage: 2 - 8 V_{pp} negative
Sinewave and subcarrier
Impedance: high ohmic, loop through
Return loss: > 30 dB up to 5 MHz
Voltage: 0,5 - 1,5 V_{pp} continuous or blanked sinewave signal

Outputs

Number: 3 separate outputs
Impedance: 75 Ω
Return loss: > 30 dB up to 7 MHz
Isolation between outputs: > 34 dB up to 7 MHz
Composite signal: 0.5 - 1.5 V_{pp}, 1 V_{pp} nominal, positive
Video content: 0 - 1.5 V_{pp},
Video content: 0 - 1.5 V_{pp}, 0.7 V_{pp} nominal, positive
Sync: 0 - 0.7 V_{pp}, 0.3 V_{pp} nominal, positive
Set-up:
Nominal polarity 0 - 1 V_{pp}
Inverted polarity 0 - 0.3 V_{pp}
Superimposed hum 0 - 1.5 V_{pp}
Superimposed sinewave or subcarrier: 0 - 0.2 V_{pp}, 0.1 V_{pp} nominal position, blanked by the blanking or sync signal

Burst signal

With superimposed signals it is possible to apply two different subcarrier burst signals:
- normal colour TV burst signal, adjustable between 0 and 0.5 V_{pp}
- broad full back porch burst

Black and white level

DC restorer: clamp circuit driven by line sync pulses (can be switched off)
Black level clipper: } adjustable
White level clipper: }

Response

Frequency response:
20 Hz... 5 MHz ± 0.1 dB } at nominal
10 Hz... 10 MHz ± 0.2 dB } levels

Distortion:
differential gain ≦ 1 % } at nominal
differential phase ≦ 1 ° } levels

Synchronization

Synchronization selectable either from internal generator or external source

Internal sync and blanking generator

Line frequency: 15.625 Hz ± 0,5 % (from free-running oscillator)
Field frequency: 50 Hz (mains frequency)
Duration
Line sync: 4.7 ± 0.2 μs
Field sync: 160 ± 20 μsec
Line blanking: 12 ± 0.15 μsec
Field blanking: app. 25 lines
Line front porch: 1.55 ± 0.1 μsec
Interlacing: none
N.B. The field information can be switched by means of a push button for as well the internal as external synchronization mode.

Versions

For the 525 line - 60 Hz TV system a special version is available

Power supply

115 or 230 V ± 20 %, 50 Hz

Temperature range

For all units: —10 to + 50 °C ambient temperature

MECHANICAL DATA

3/6 Plug-in unit for Philips universal 19" cabinet system
Dimensions of blanking mixer PM 5572 and complete instrument

	width	height	depth
in 3/6 unit cabinet PM 9713	235 mm	132 mm	400 mm
in 19" rack mount cabinet	444 mm	132 mm	435 mm incl. handles

N.B. If cabinet type no. not specified full 19" cabinet is supplied as standard.
Weight PM 5572/73/74: about 16 kg
The interconnection between the units PM 5572 ... 74 is done by cables with multipole connection or by a pre-mounted plug panel.

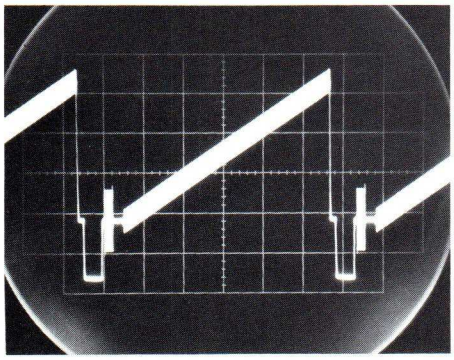


Fig. 1. Line frequency sawtooth with superimposed sub-carrier and colour TV burst

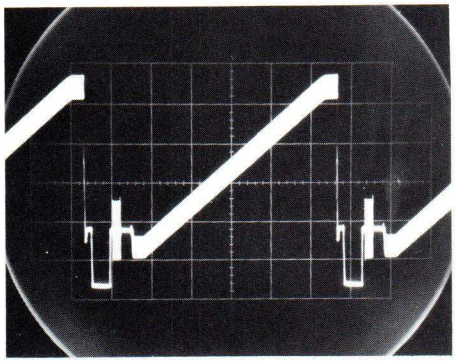


Fig. 2. Same as fig. 1 but with active white and black clipper and inverted set-up

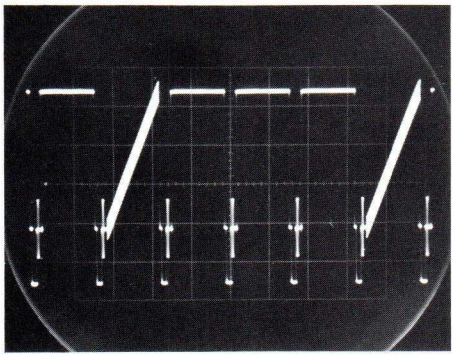


Fig. 3. Same as fig. 1 but with three intermediate lines at white level

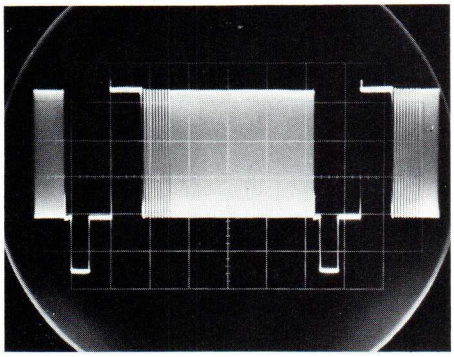


Fig. 4. Line frequency 1 - 6 MHz multiburst signal

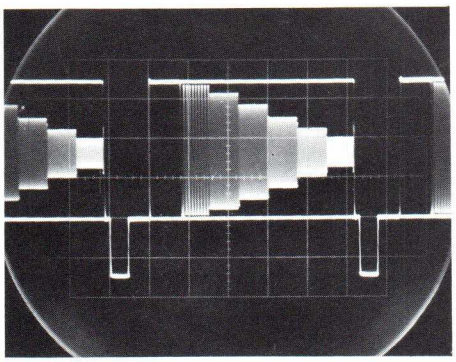


Fig. 5. Same as fig. 4 but after a 100 ns Thomson filter and with black and white reference lines

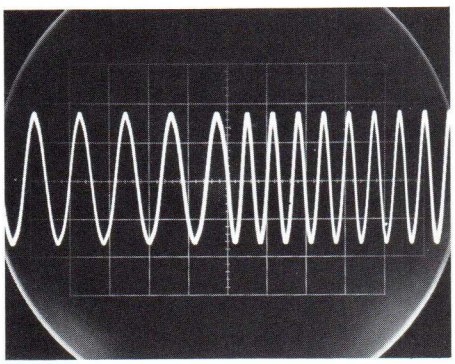


Fig. 6. Close-up of multiburst signal showing smooth fading over from one frequency into the other

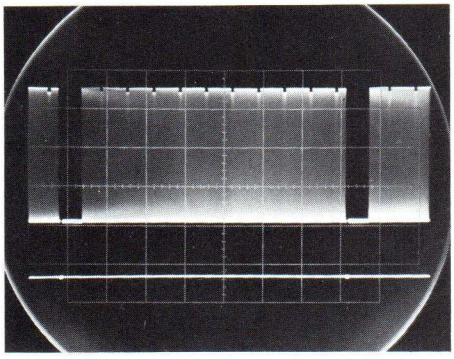


Fig. 7. Swept signal from 100 kHz - 10 MHz with 1 MHz markers (field frequency display)

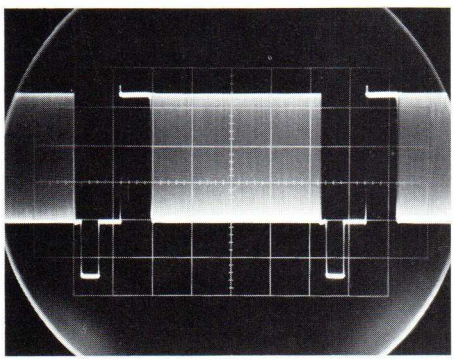


Fig. 8. Swept signal from 100 kHz - 10 MHz but with white reference (line frequency display)

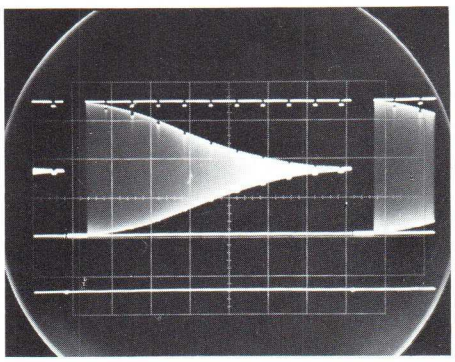


Fig. 9. Same as fig. 8 but after a 100 ns Thomson filter and with 1 MHz markers and black and white reference (field frequency display)

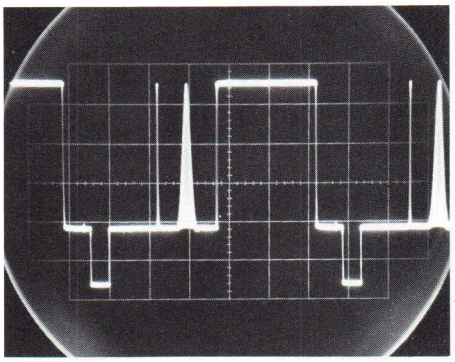


Fig. 10. 2T + 20T (carrier born) pulse and bar signal

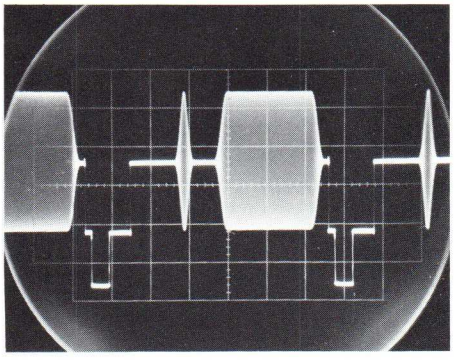


Fig. 11. 20T pulse and bar signal, chrominance

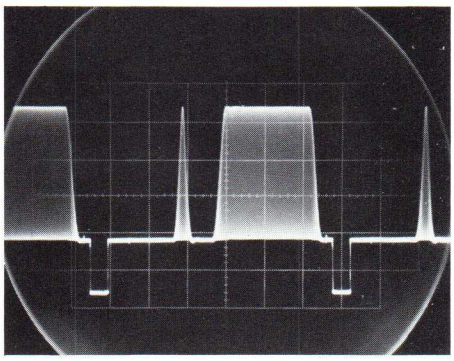


Fig. 12. 20T pulse and bar signal, chrominance and luminance

Reference List of companies and establishments using Philips TV Measuring Equipment

SPAIN
Anglo Española de Electronica S.A.
Aznarez Industrial Navarra S.Am (Sanyo)
Cahue Industrial S.A. "Vanguard"
Emerson Electronica S.A.
Euroservice S.A.
"Fercu" Electronica y Televisión Hispano-Italiana
General Electrica Española S.A.
Iberia Radio S.A.
Inter Electronica S.A.
Lavis S.A.
Marconi Española S.A.
S.E. de Lamparas Electricas "Z"
Telefunken Iberica S.A.
Inelec S.A.
Industrias Kastell S.A.

AUSTRIA
Ingelen Radiofabrik Figer und Co.
Kapsch und Söhne Teleph. und Telegr. A.G.
Körting Austria GmbH und Co. Kg.
Minerva Radio Werke Wohleber und Co.
Österreichischer Rundfunk GmbH

AUSTRALIA
Associated Telecommunications Australia Ltd.
R.C.A. of Australia Pty. Ltd.
Western Australia Institute of Technology
Amalgamated Wireless Australasia
School of Applied Electricity - New South Wales Institute of Technology
Western Australian Television Station Channel 7
Radio Corporation of Victoria
Australian Broadcasting Commission
Victorian Television Station Channel 7
Mount Lawler Technical College

SWEDEN
PTT
Luxor Industri AB
Lumalampan AB
Statens Provningsanstalt
Westerstrand Electronics AB
Nefa

ITALY
Fiar - CGE
Ultravox
Urania Fegme
Admiral
Minerva
Brion Vega
Phonola
Prandoni
Voxson
Autovox
Sinudyne
Philco
Magnadyne
Indesit
Rex-Seleco
PTT - Rome
Ates-Siemens
Italsider
Seleco

FRANCE
Thomson CSF - Clarville - Continental Edison
Ampex
Schneider
Office de Radio Télévision Française

HUNGARY
Orion Radio und F.S. Werke
Videoton
Technische Universität Budapest
Telecom. Dept.

ROUMANIA
Uzinele Electronica

YUGOSLAVIA
Elektronska Industrya
RTV - Ljubljana
RTV - Zagreb
Gorenje-Velenje

POLAND
TV - Warszawa
TEWA

SWITSERLAND
Ed. Delay
PTT Bern
RCA Laboratories

FINLAND
ASA Radio Oy
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Metalindustriens Fagskole
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P.T.T. - Brussel
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BRT - RTB

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Tesla
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TV - Bratislava

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Independent Television Authority
Granada
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