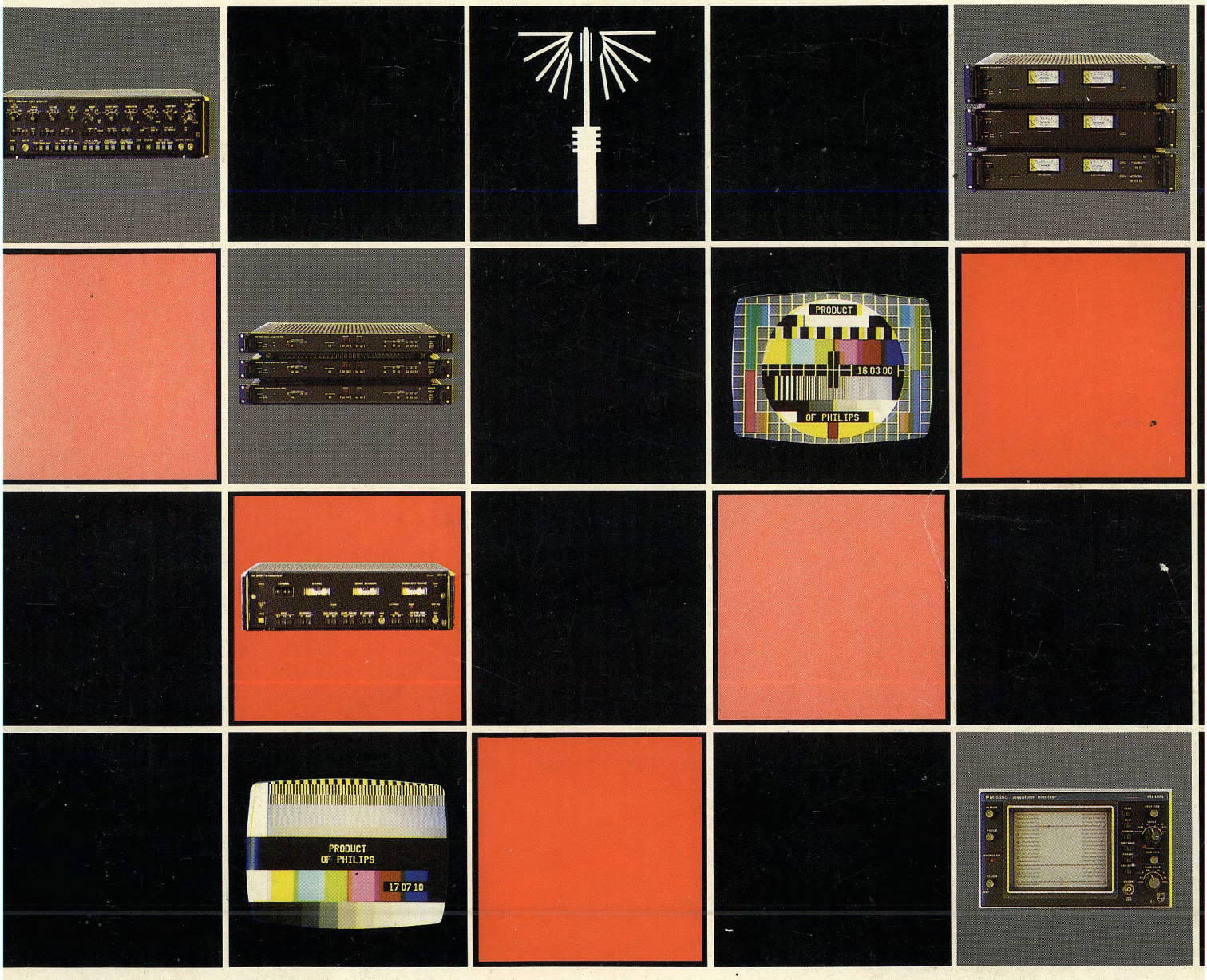
PTV Professional Television measuring equipment

Catalog 86/87



PHILIPS Test and Measuring Instruments

PHILIPS

Foreword

This catalog presents the full range of Philips Professional Television (PTV) test and measuring instruments.

Headquartered in Copenhagen, Denmark, Philips PTV belongs to N. V. Philips Gloeilampenfabrieken, Europe's largest electrical and electronics concern.

Philips PTV products are sold in most countries through the local Philips sales organization. A list of Philips national sales organizations can be found in the back of this catalog. If your country is not listed, please contact: Philips Export B.V., I&E Export, Building HBS, NL-5600 Eindhoven, The Netherlands. Telephone: +31 40 791111. Telex: 35000 PHTC NL., or contact Philips PTV, Philips Elektronik Industri A/S, Jenagade 22, DK-2300 Copenhagen S, Denmark. Telephone: +45 1 572222. Telex: 31201 PHIL DK. Telefax: +45 1 570044.

This catalog is published by PTV. All the information is believed to be correct at the time of printing. Philips PTV reserves the right to modify and improve equipment specifications without notice.

Order no. for this catalog: 9498 495 00111

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Philips, of course.



Every day,
over a billion people
watch us work.

Just about anywhere in this world, if you're a TV-viewer, then you're probably watching out Professional Television (PTV) test and measuring equipment hard at work.

For broadcasting, program production and set manufacturing in almost all countries, Philips PTV instruments are used for applying state-of-the-art technology to ensure the highest test and measuring standards. And its been this way for about as long as people have been watching TV.

For example, scarcely a colour receiver is manufactured anywhere without some Philips PTV test gear engaged in the process. The same is true for producing video recorders, television transmitters, cameras, mixers, colour monitors, and even other test gear.

Wherever TV is broadcast, Philips PTV equipment can be found maintaining the high quality levels demanded in professional TV studios, telecine and video centres, microwave and satellite link stations, and in transmitting stations. Cable TV companies and large closed-circuit TV systems use our PTV instruments to test an monitor system performance and to distribute signals.

Because we're part of Philips Test and Measuring, in the company's Science and Industry Division, Philips PTV benefits from the vast companywide technical expertise Philips is famous for.

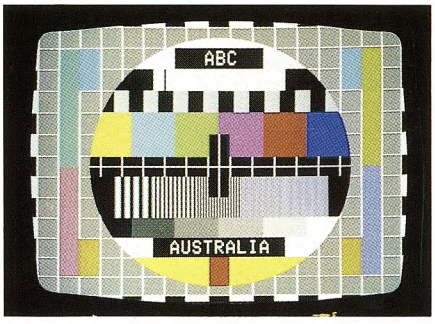
In designing state-of-the-art technology into all PTV instruments, PTV engineers draw on Philips laboratories' latest results from research and development. And then Philips Video and Electro-Acoustics Divisions keep our engineers fully informed on all advances in TV receivers and studio/transmitter requirements.

To guarantee the high performance levels experted of every Philips professional instrument, we subject our equipment to intense use and environmental testing before we release a model.

This is why a billion or so people can watch Philips PTV hard at work, every night and day, maintaining colour picture quality all over the world.

Philips PTV development, production and international marketing are all located in Copenhagen, Denmark. Also at our PTV Centre is the systems and projects group, a team of highly skilled experts who design and construct complete PTV turnkey systems to customer specifications.

And finally, after Philips PTV products and systems are installed, we go on to provide full customer support through our users' education and service department and, of course, through Philips worldwide.





Pricing and service policies

Honest pricing policy: when you buy a Philips PTV product, you get everything you need -- without any extra charges for necessary accessories. Philips PTV product prices are all-inclusive and cover, for example, user and service documentation and boards, cabinets, terminators, and the like.

And remember, Philips guarantees world wide service in the entire lifetime of your PTV equipment. Our service departments are always prepared to advise, support, repair, or even to participate actively with training and preventive maintenance.

New products in this catalog

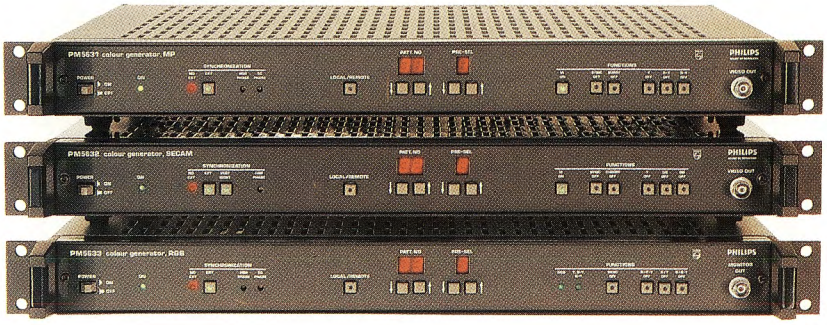
Colour generator, PO
PM 5630



Colour generator, MP
PM 5631

Colour generator, SECAM
PM 5632

Colour generator, RGB
PM 5633



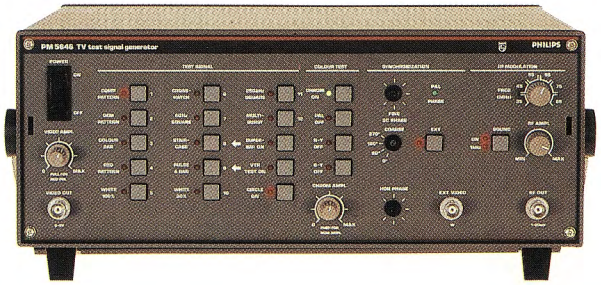
Sync test generator
PM 5634



Teletext test generator
PM 5645



TV test signal generator
PM 5646



Studio VITS generator
PM 5651

Studio VITS generator, ED
PM 5652



NEW

TV test modulator
PM 5669



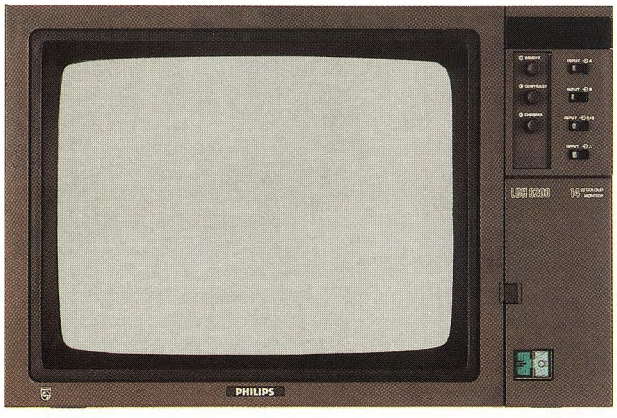
TV modulator, IF
PM 5670

TV modulator
PM 5671

TV modulator, DS
PM 5672



Colour monitor
PM 5625



Colour TV pattern generator
PM 5515/16/18



RF synthesizer
PM 5390



Colour bar pattern generator
PM 5503

Power amplifiers
PM 5691/93/94

Projects and systems

PTV project and systems group

Philips PTV instruments are generally designed to cover the needs of the average user. Sometimes different applications require different features in a particular type of equipment. In some cases, all these features can be combined in a single product, in other cases a family of products have been created, or a number of options have been made available on a basic instrument. Nevertheless, some special applications or special customers wishes cannot be met by a standard product. Consequently, Philips has a project and systems group specializing in:

- modifying standard products in accordance with customer specifications
- building complete systems to fulfil the requirements of specific custumer applications.

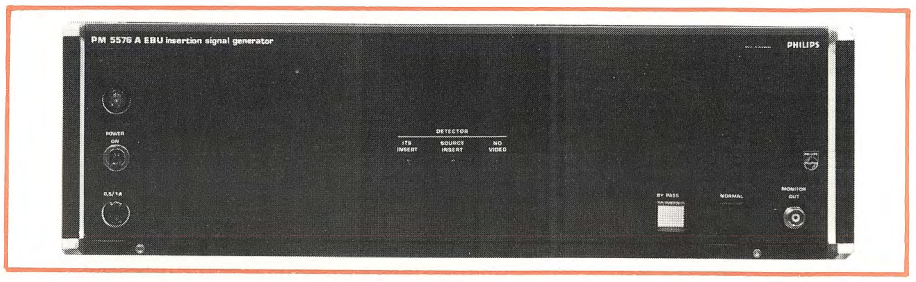
Complete systems

Modifying standard products is justified when the cost is recomped savings on auxiliary equipment, installation time or installation costs, space and weight. Or perhaps no standard product meets the desired performance specification or interface requirements.
The fee modifications is based on time and material. This fee covers: engineering (if necessary), the modification work itself, and documentation of the modification. Documentation is important for servicing or repurchasing additional modified units.

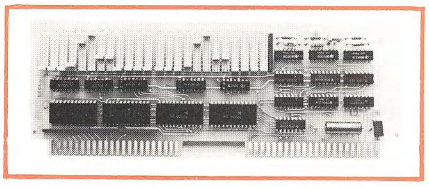
Customized modifications

The PTV Project and Systems group designs a complete systems according to customer specifications. Systems may be composed of products from the PTV range alone or combined with products from other Philips divisions and/or other companies. The fee charged for systems work covers the following (where applicable):

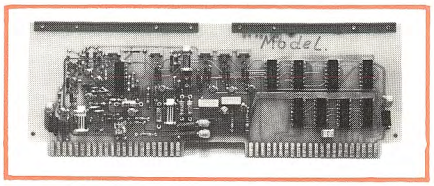
- system design
- mounting, alignment and testing the system
- modification of standard products
- documentation of the system and any modifications
- installation and commissioning on the customer's premises
- training operational and maintenance staff.



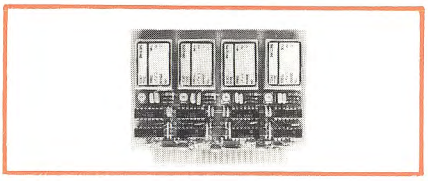
Customized version of the PM 5576A Insertion Signal Generator produced for a West German broadcasting authority. It deviates from the standard version by having such features as: automatic generation of a black burst substitution signal in case of failing programme signal, detectors for incoming insertion signals and source codes, remote control of insertion and erasure of ITS, additional inputs and outputs, etc.



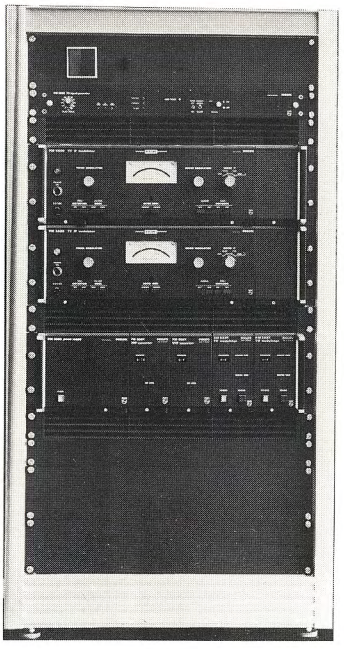
Special inserter board for the PM 5576A Insertion Signal Generator special version shown above.

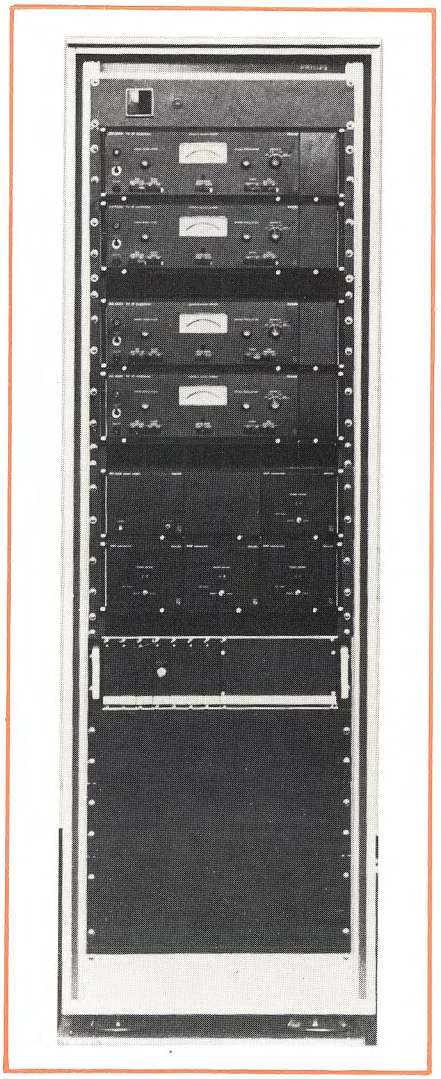


Special VIRS generator board for the PM 5576A, produced for the Philips Video Long Playing record group.



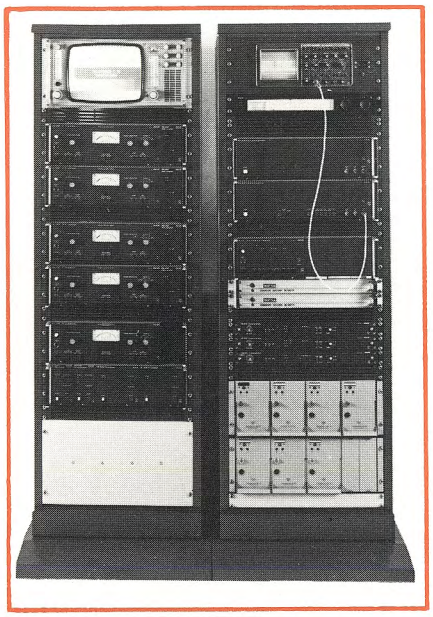
Special precision carrier oscillator board used in an advanced cable TV head-end system.

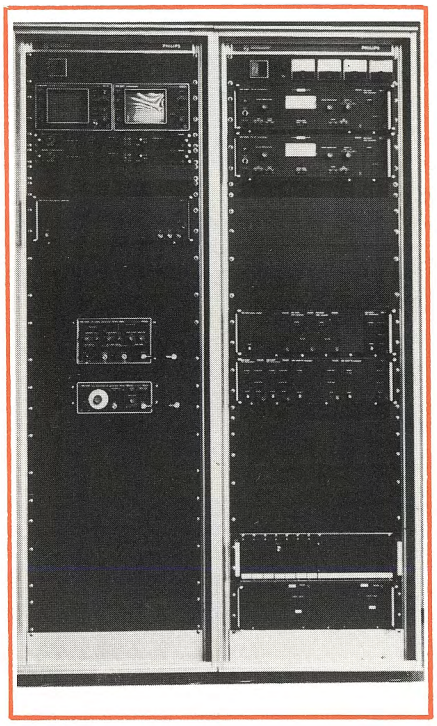




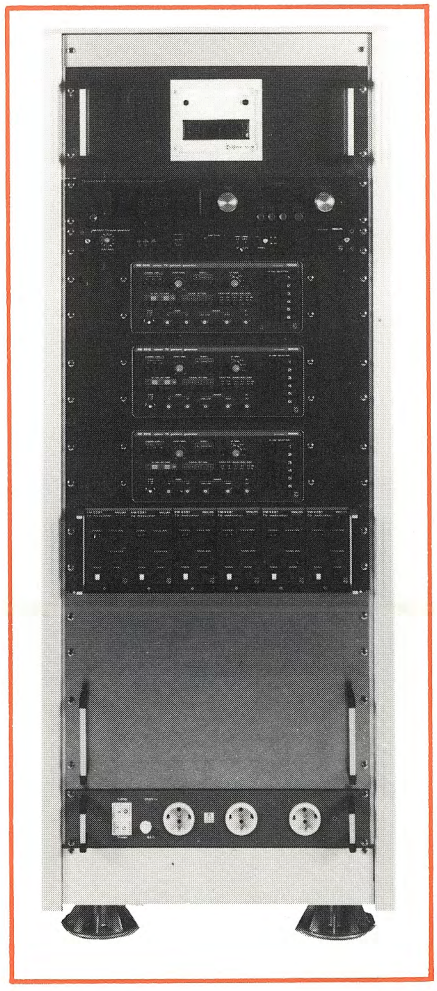
Full systems' advantages

Many PTV users prefer to order a complete system, rather than individual instruments in order to obtain certain advantages, such as: guaranteed system performance; freedom from concerns about design, mounting and testing, and only a single supplier to contact in the system specification phase and for service.
The Philips PTV project and systems group has the expertise from several years of designing systems, particularly for factories manufacturing television and video products. Drafting the specifications of a complex television measuring system requires a dialog between the user and the designer of the system. With Philips PTV, the user can design with the systems designer. This approach is advantageous because it produces the optimum solution and avoids misunderstandings.









PHILIPS television products

Philips televison products

Philips PTV benefits from its close cooperation with the other Philips divisions designing and manufacturing professional television products.

Pye TVT, a division of Philips, produces a full range of professional broadcasting equipment, from colour cameras to complete studios and even entire networks.

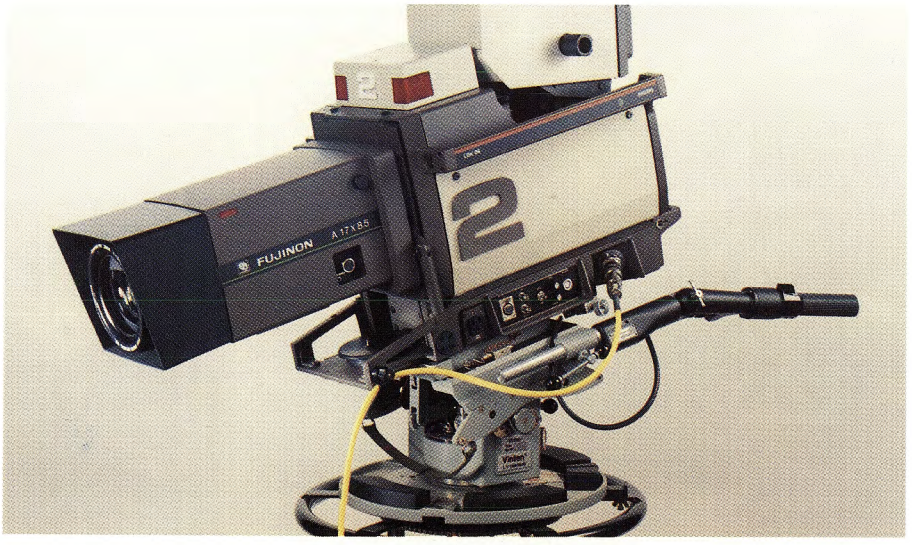
Philips Electronic Distribution Systems (EDC) cover all non-broadcast applications. EDS is particularly strong in cable TV, MATV, CCTV and security and monitoring systems.

The Philips Elcoma division produces electronic and electrical components. Philips television components from Elcoma span the entire range from typical receiver items -- such as picture tubes -- to highly sophisticated products such as deflection yokes and microwave tubes.

And of course it was Philips that developed the Plumbicon camera tube and revolutionized colour camera design.











Type no. indicator

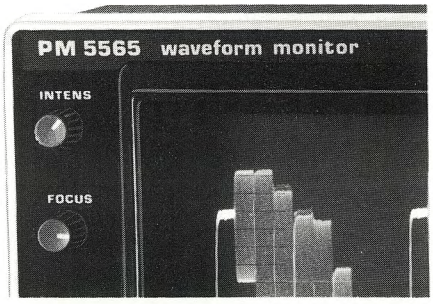
Television systems vary around the world. Systems may differ from each other in characteristics such as monochrome colour and RF. All these characteristics are detailed in the green CCIR books issued by the "Comite Consultatif International de Radio" (CCIR).

Each PTV product has a name and a type Philips number, "PM" followed by four ciphers, e.g. PM 5534. If the characteristics of the product are system dependent, the type number is followed by a letter indicating the specific television system (see table below). In a few cases, additional letters are added to define the exact characteristics of the product. Each product also has a 12-cipher code number for order processing and internal Philips identification.

Available versions

The standard versions of PTV products are noted in the specification heading for each equipment type. The 12-cipher code no. can be used for ordering the products; or the PTV sales organization can define the exact version needed for a specific application. Version not covered in these headings can often be made under special delivery terms.

Code no. PM 5534:
9449 055 34003 (G-version, 625-lines PAL)
9449 055 34005 (I-version, 625-lines PAL)
9449 055 34007 (L-version, 625-lines SECAM)
9449 055 34008 (M-version, 525-lines PAL)
9449 055 34108 (M-version, 525-lines NTSC)
9449 055 34009 (N-version, 625-lines PAL)





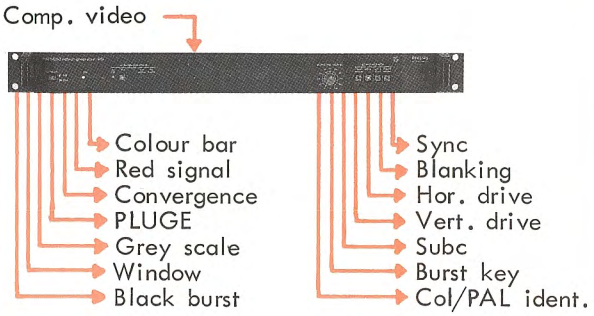
Type no. plate. This plate indicates type, version, code no. and production no. The last mentioned is important when service information is requested.

The following table indicates the versions of PTV equipment used for the various CCIR television systems:

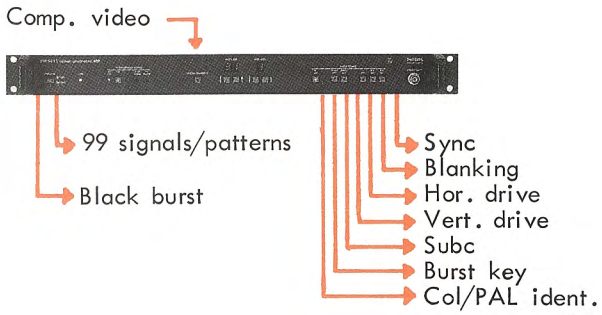
CCIR system	Philips PTV Monochrome and RGB equipment	Philips PTV Colour equipment	Philips PTV RF equipment
A	Not available	Not available	Not available
B	Use G-version equipment	Use G-version equipment	Use B-version equipment
C	Use G-version equipment	-	Not available
D	Use G-version equipment	Use G-version for PAL, use L-version for SECAM	Use D-version equipment
E + F	Not available	-	Not available
G	Use G-version equipment	Use G-version for PAL, use L-version for SECAM	Use G-version equipment
H	Use G-version equipment	Use G-version for PAL, use L-version for SECAM	If available, only on request
I	Use G-version, special I-version may be available	Use G-version, special I-version may be available	Use I-version equipment
K K_1	Use G-version equipment	Use G-version for PAL, use L-version for SECAM	Use K-version equipment K_1-version: is available only on request
L'	Use G-version equipment	Use L-version equipment (SECAM)	Use L'-version or B-version equipment
L	Use G-version equipment	Use L-version equipment	Use L-version or G-version equipment
M	Use M-version or M/PAL-version or M/NTSC-version	Use M/PAL-version or M/NTSC-version	Use M-version equipment
N	Use G-version or N/PAL-version	Use N/PAL-version equipment	Use M-version equipment

Sync and pattern generators

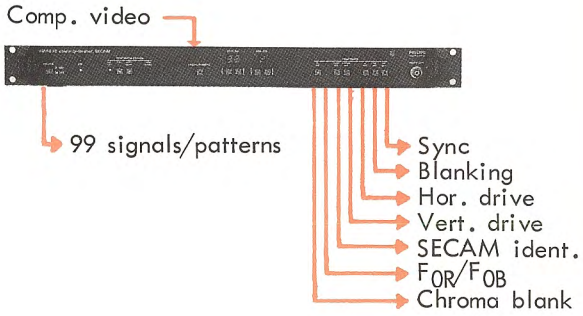
PM 5630 Colour generator, PO



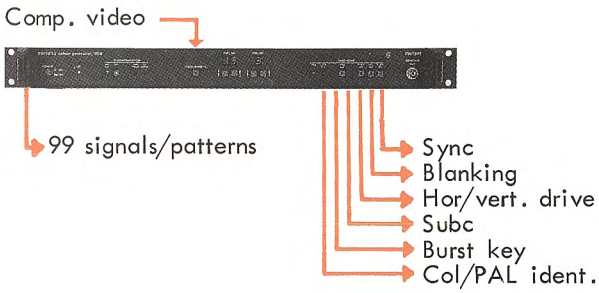
PM 5631 Colour generator, MP



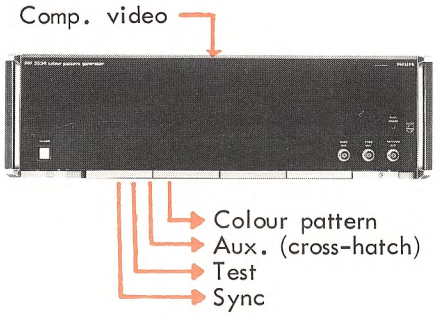
PM 5632 Colour generator, SECAM



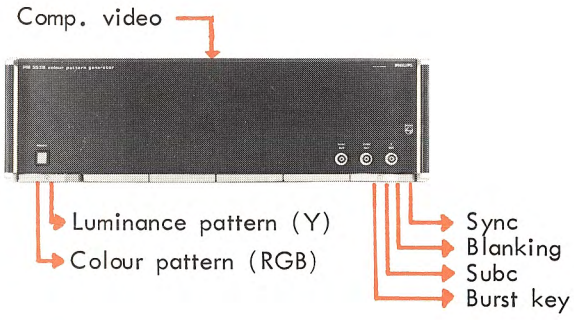
PM 5633 Colour generator, RGB



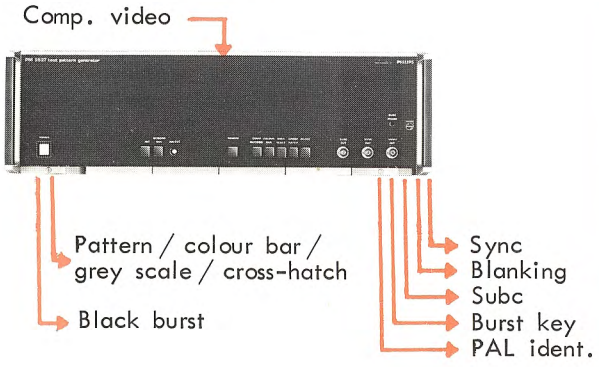
PM 5534 Colour pattern generator



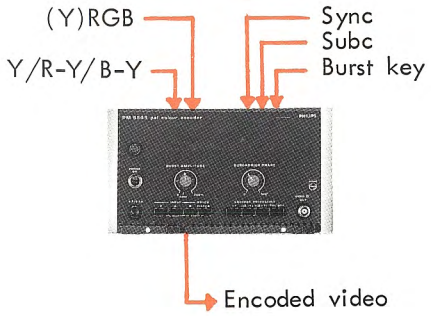
PM 5535 Colour pattern generator (RGB)



PM 5537 Test pattern generator



PM 5545 Colour encoder



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PM 5631	Colour generator, MP	28
PM 5632	Colour generator, SECAM	31
PM 5633	Colour generator, RGB	34
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PM 5534	Colour pattern generator	38
PM 5535	Colour pattern generator (RGB)	43
PM 5537	Test pattern generator	47
PM 5545	Colour encoder	51

Philips, of course.

Colour TV standards

Characteristics	TV system										
	B VHF	D VHF	G UHF	H UHF	I V/UHF	K UHF	K_1 V/UHF	L' VHF	L UHF	M V/UHF	N V/UHF
Lines per picture	625	625	625	625	625	625	625	625	625	525	625
Picture (frame) freq. (Hz)	25	25	25	25	25	25	25	25	25	29.97	25
Field frequency (Hz)	50	50	50	50	50	50	50	50	50	59.94	50
Hor. line frequency (kHz)	15.625	15.625	15.625	15.625	15.625	15.625	15.625	15.625	15.625	15.734	15.625
Video bandwidth (MHz)	5	6	5	5	5.5	6	6	6	6	4.2	4.2
Colour subcarrier NTSC 3.579 545 MHz										+	
Colour subcarrier PAL 4.433 618 75 MHz	+	+	+	+	+	+	+				
Colour subcarrier PAL 3.575 611 49 MHz										+	
Colour subcarrier PAL 3.582 056 25 MHz											+
Colour subcarriers SECAM f_{oB} = 4.250 000 MHz f_{oR} = 4.406 250 MHz	+	+	+	+		+	+	+	+		
Line sync width (µs)	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
Field pulses (lines)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	2.5
Equalizing pulses (lines)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	2.5
Equalizing pulses (µs)	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35
Serration pulses (µs)	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
Burst width (µs)	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.67	
Burst suppression (lines)	9	9	9	9	9	9	9	-	-	NTSC: 9 PAL: 11	9
Field blanking (lines)	25	25	25	25	25	25	25	25	25	20	25
Line blanking (µs)	12	12	12	12	12	12	12	12	12	10.8	12

Colour system PAL 4.433 MHz

Afghanistan
Algeria
Australia
Austria
Bahrein
Belgium
Ceuta
Peoples Rep.China
Denmark
Finland
Germany (BRD)
Hong Kong
Iceland
India
Indonesia
Ireland
Italy
Jordan
Kenya
Kuwait
Luxemburg
Malaysia
Netherlands
New Zealand
Nigeria
Norway
Oman
Pakistan
Portugal
Quatar
Singapore
South Africa
Spain
Sudan
Sweden
Switzerland
Thailand
Turkey
Uganda
Unit.Arab Em.
United Kingdom
Yugoslavia
Zanzibar

Colour system PAL 3.575 MHz

Brazil

Colour system PAL 3.582 MHz

Argentina
Uruguay

Colour system NTSC 3.579 MHz

Barbados
Bermuda
Canada
Chile
Colombia
Costa Rica
Cuba
Dominican Rep.
Equador
El Salvador
Guam
Guatemala
Haiti
Hawaii
Honduras
Japan
Korea (South)
Mexico
Panama
Peru
Philippines
Puerto Rico
Surinam
Taiwan
Trinidad
USA
Venezuela

Colour system SECAM 4 MHz

Albania
Bulgaria
Czechoslovakia
Egypt
France
Gabon
Germany (DDR)
Greece
Guadaloupe
Hungary
Iran
Iraq
Ivory coast
Lebanon
Libya
Luxemburg
Martinique
Mauritius
Monaco
Morocco
Poland
Reunion
Romania
Saudi Arabia
Tunesia
USSR
Zaire

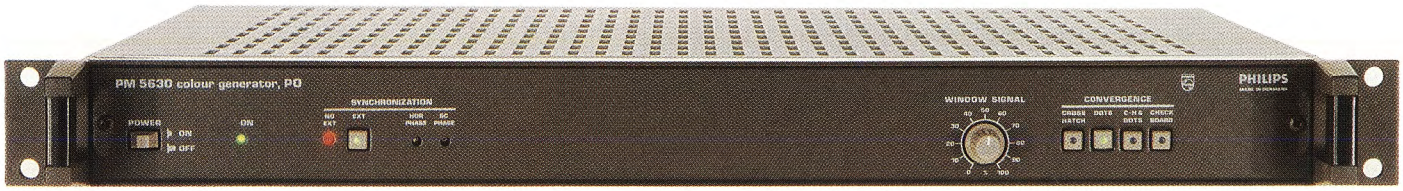
Notes

Colour generator, PO (parallel outputs)

PM 5630

NEW

Code no. PM 5630:
9449 056 30003 (G-version, 625-lines PAL)
9449 056 30008 (M/PAL-version, 525-lines PAL)
9449 056 30108 (M/NTSC-version, 525-lines NTSC)
9449 056 30009 (N-version, 625-lines PAL)



Colour sync pulse generator with genlock facilities

Sync/subcarrier phasing according to EBU and RS170A standards

Provides all necessary synchronization signals for television studios and mobile vans

Output for colour field identification

All test signals are generated digitally with PROM's and D/A converters

High stability through the use of precision TCXO and digital circuitry

Small size and low power consumption ideal for mobile applications

Easy service by use of plug-in circuit boards accessible from the front

Parallel output of all relevant receiver and colour monitor alignment signals makes this instrument ideal for TV set and monitor manufacturing

Generates six commonly used TV studio signals plus black burst on separate outputs

Colour subcarrier frequency within ± 1 Hz in limited temperature range

The PM 5630 colour generator is a combined sync pulse generator (SPG) and bl/wh/colour pattern generator. Ultra high stability of sync pulses and test signals is obtained by intensive use of digital technology. Thus timing and width of all pulses are derived from a common oscillator by means of digital and phase-lock circuitry. The oscillator is a Temperature-Compensated crystal (X-tal) Oscillator (TCXO), which free-runs at high accuracy or is genlocked to an external source.

The test signals and test patterns are generated digitally by Programmable Read-Only Memories (PROMs) and Digital-to-Analog (D/A) converters. This concept ensures superb accuracy and stability as well as high reliability.

SPG functions

The SPG part of PM 5630 forms a complete broadcast sync pulse generator, which may be genlocked to an external video signal. It generates the following important synchronizing signals for use in TV studios:
- Composite (mixed) sync
- Composite blanking
- Horizontal (line) drive
- Vertical (field) drive
- Colour subcarrier
- Burst key
- Colour or PAL identification
- Black burst

These signals are sufficient for driving large TV studios and for most measuring and calibration purposes. All timings, amplitudes and rise/fall times are in conformity with broadcast standards and practice, such as EBU and RS170A. All video signals are supplied with normalized line/subcarrier phasing (Sc-H phase).

The internal oscillator may be free-running or genlocked to an external video signal. This can either be controlled with a front panel selector (external synchronization) or by remote control. If the external sync mode is selected, but no video signal is present at the external input, the oscillator switches automatically to the free-run mode.

Colour generator functions

The generator part offers the most commonly used line-up signals for TV studios and production of TV receivers and monitors. There are six main types of signals available on the six video output connectors, most of them in several different versions. They are sufficient for routing line-up and calibration of monitors, vectorscopes, cameras, TV receivers, video cassette recorders, colour coders and decoders, etc. The main signal types are:
- Colour bar (several versions)
- Purity signal (red)
- Colour tracking signal (grey scale)
- Colour balance signal (window 0-100%)
- Convergence pattern (several versions)
- Line-up signal (PLUGE)

Some of the signals may be modified by means of front panel function controls. These are: type of convergence

signal / cross-hatch / dot pattern / cross-hatch plus dots / checker-board, and type of colour balance signals (window) / 0% / 10% / ..... / 90% / 100% of white. By internal jumpers the following is selectable: type of colour bar / full-field / split-field / monitor pattern (SMPTE). The colour balance signal (window) is used in conjunction with the PM 5539 colour analyser, which sets the colour temperature of white to a specified value (6500 degrees Kelvin).

Applications

The PM 5630 is used in all types of TV studios as master SPG and line-up generator. It supplies all necessary sync signals and may be genlocked to other video sources. In addition it supplies test signals for line-up and calibration of monitors, waveform monitors, vectorscopes, cameras, etc. Among the signals is the so-called black burst signal, which may be used both as a synchronizing signal and a video signal (programme black). In those applications where line/subcarrier phasing is important, the PM 5630 supplies a special colour field identification pulse that identifies field no.1 out of the 4 and 8 colour fields of NTSC and PAL. The video signals themselves may also carry a field identification pulse in the blanking interval of field 1.

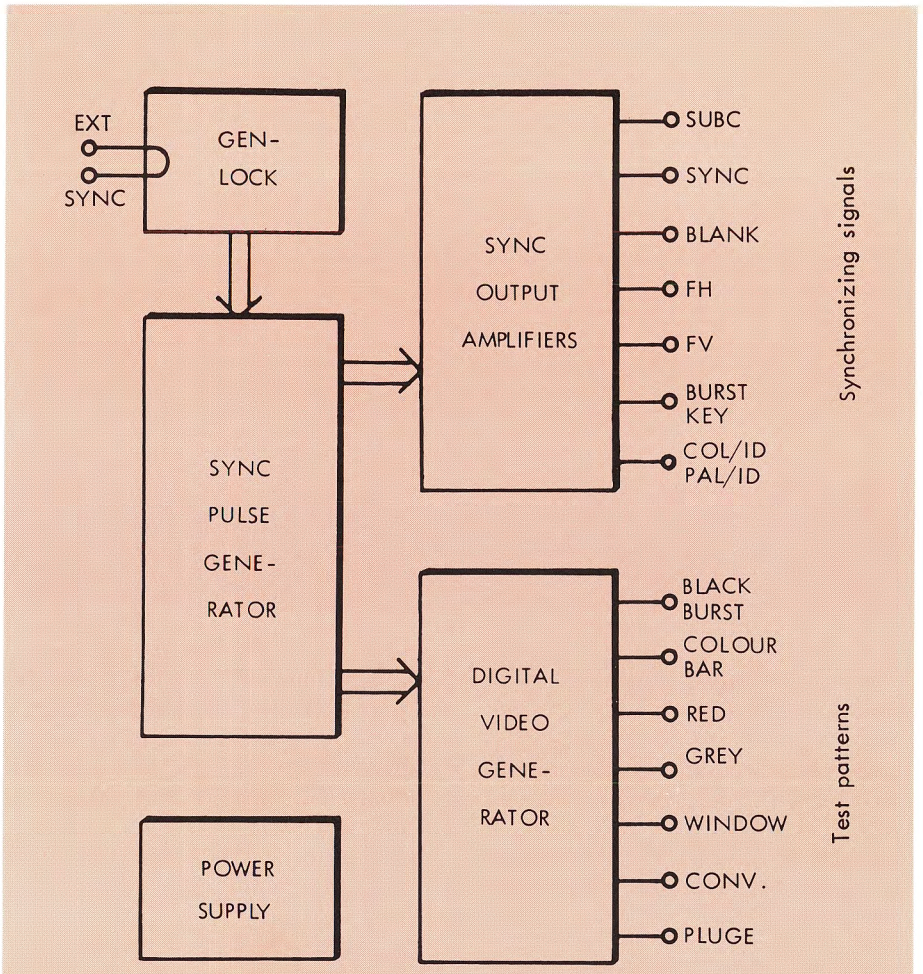
The simultaneous generation of all signals means that the PM 5630 has to be connected to the mixer via a routing switcher or to several inputs of the production mixer. In return, this set-up gives the highest possible flexibility. A similar SPG from Philips, the PM 5631 colour generator, has a single video output, but the choice of 90 different signals on that output.

For TV receiver manufacturing the PM 5630 offers all important test signals for the central transmitter, except the composite "Philips" pattern, which is generated by the PM 5534 or PM 5535 colour pattern generators, and perhaps the special sync test signals generated by the PM 5634. The signal types are shown on the next pages.

Other Philips video generators

Philips has the widest range of video generators for broadcast and industrial use:

- PM 5631 colour generator, MP generates a variety of bl/wh/colour signals on a single output, optional IEEE or TTL interface
- PM 5632 colour generator, SECAM is similar to the PM 5631, but supplies signals for SECAM systems
- PM 5633 colour generator, RGB is similar to PM 5631, but supplies signals as component video (Y/B-Y/R-Y or RGB)
- PM 5634 sync test generator supplies test signals with variable sync frequencies
- PM 5646 TV test signal generator is a low cost universal test generator for PAL and NTSC systems
- PM 5645 Teletext test generator supplies test pages for Teletext and Antiope
- PM 5534 colour pattern generator supplies the famous circle test pattern with name and clock option
- PM 5535 colour pattern generator is similar to PM 5534 but has RGB output



Functional blockdiagram PM 5630

Technical description

The SPG part of the PM 5630 is based on two special Philips integrated circuits that generate the various sync pulses and sync waveforms. Additional circuitry assists with the genlock function and line/subcarrier phasing. The timing between the external signal and the internally generated signals can be adjusted with front panel screwdriver controls (horizontal phase and subcarrier phase). The PM 5630 generates all video signals with correct line/subcarrier phasing, when it is free-running or locked to a source with correct phasing. The sync signals from the sync ICs are passed through special sync output amplifiers that amplify them to the specified level, shape the transients to the required rise/fall times and provide the power for 75 ohms output impedance. The colour subcarrier is filtered into a sine wave signal with low harmonic distortion.

The generator part makes use of a digital generation principle, i.e. the waveforms for the luminance and the two colour difference signals are stored in a digital format in PROMs. The output from the PROMs is fed to the video generators, which have D/A converters for the luminance and colour difference signals, precision

PAL or NTSC coders and various amplifiers. The coders make use switching modulators with high accuracy and high stability.

The front panel controls have access to the genlock circuit, the window signal and the cross-hatch PROMs.

TECHNICAL DATA (all versions)

Video signals

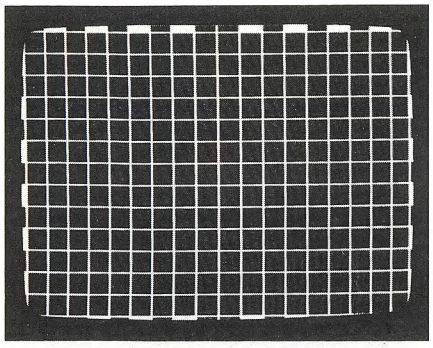
COLOUR BARS — Number of outputs: 1 BNC. Output impedance: 75 Ω. Return loss: > 34 dB up to 7 MHz. Versions (by internal selection):

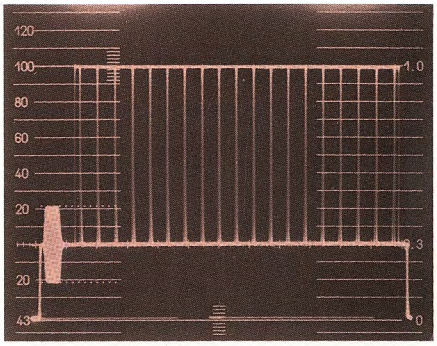
a) All but M/NTSC version:
1) 100% colour bar, full field.
2) 75% colour bar, full field.
3) 75% colour bar, 100% white (EBU).
4) 75% colour bar, 25% set-up (BBC).
5) Split-field 100% CB with red.
6) Split-field 75% CB with red.
7) Split-field EBU CB with red.
8) Split-field BBC CB with red.
9) Split-field 100% CB with 100% white.
10) Split-field 75% CB with 75% white.
11) Split-field EBU CB with 75% white.
12) Split-field BBC CB with 100% white.
13) Split-field 100% CB with - V, U and PLUGE.
14) Split-field 75% CB with - V, U and PLUGE.
15) Split-field EBU CB with - V, U and PLUGE.
16) Split-field BBC CB with - V, U and PLUGE.

b) M/NTSC version:
1) 75% colour bar, full field (EIA).
2) Blue bars.
3) Composite pattern, colour bar with blue bars, - I, Q and PLUGE (SMPTE).
4) Split-field EIA colour bar with red.

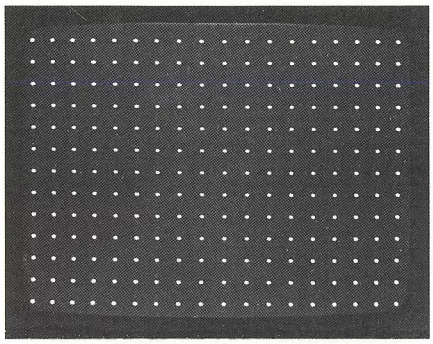
Number of bars in colour bar: 8 (all except M/NTSC-version), 7 (M/NTSC-version). Sequence of colours: falling luminance, white - yellow - cyan - green - magenta-red-blue - (black). Colour bar part of split-field signals: top 2/3 of screen. Levels: 700 mV luminance, 300 mV colour burst, 300 mV sync (G, M, N/PAL versions), 100 IRE luminance, 40 IRE colour burst, 40 IRE sync (M/NTSC version), all levels within 7 mV (1 IRE). Rise and fall times of luminance signal: 200 ns ± 20 ns (G-version), 250 ns ± 20 ns (M and N-versions). Rise and fall times of sync signal: 230 ns ± 20 ns, 140 ns ± 15 ns (M/NTSC-version). Rise and fall times of chrominance signal: 350 ns. Residual subcarrier (at black level): < 3.5 mVpp. Phase errors: < 1%. Quadrature error: < 1°.

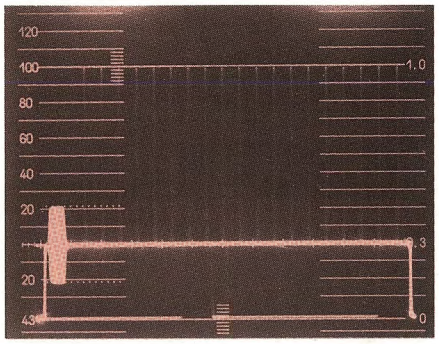
RED SIGNAL — Number of outputs: 1 BNC. Output impedance: 75 Ω. Return loss: > 34 dB up to 7 MHz. Levels: 157 mV luminance, 664 mV chrominance, 300 mV sync, 300 mV colour burst (G and N/PAL), 28 IRE luminance, 88 IRE chrominance, 40 IRE sync, 40 IRE colour burst (M/NTSC), 198 mV luminance, 614 mV chrominance, 300 mV sync, 300 mV colour burst (M/PAL). Rise and fall times of luminance signal: 300 ns (G-version), 270 ns (M and N-versions). Rise and fall times of sync signal: 230 ns ± 20 ns (PAL-versions), 140 ns ± 15 ns (M/NTSC-version).



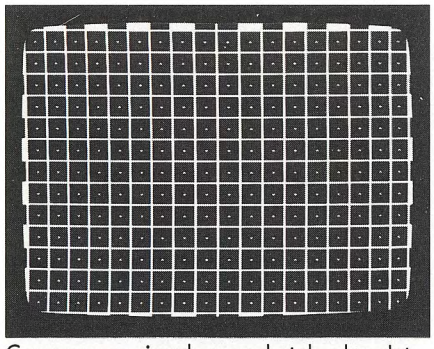


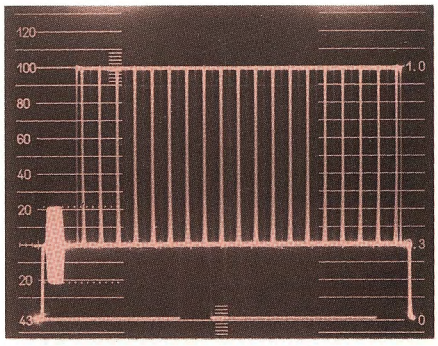
Convergence signal: cross-hatch with border castellations. The castellations can be removed by internal switching.



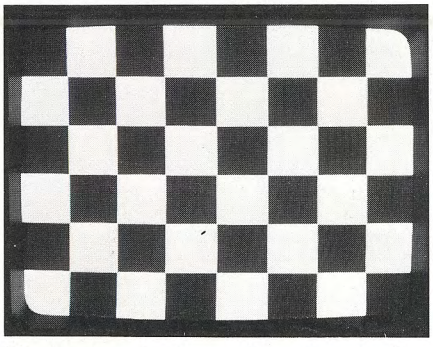


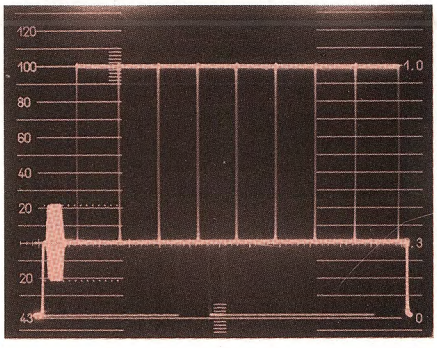
Convergence signal: dot pattern. The dots are positioned in the center of the squares formed by the above cross-hatch.



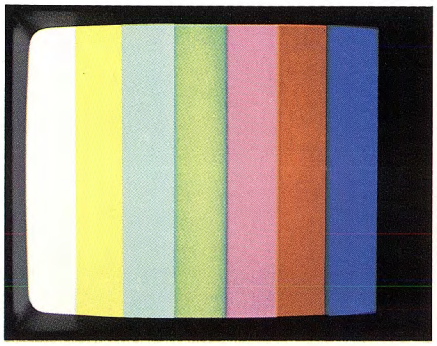


Convergence signal: cross-hatch plus dots. The pattern is the combination of the two above shown signals.

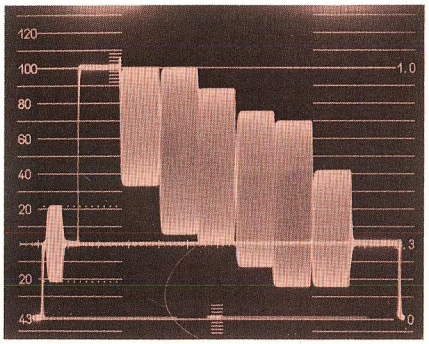


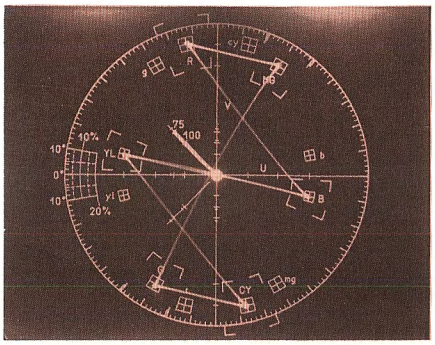


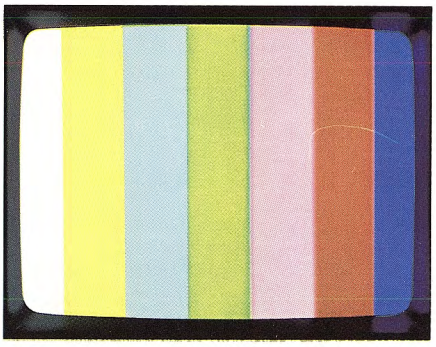
Checker-board pattern. This pattern is often used for linearity and focus adjustments.



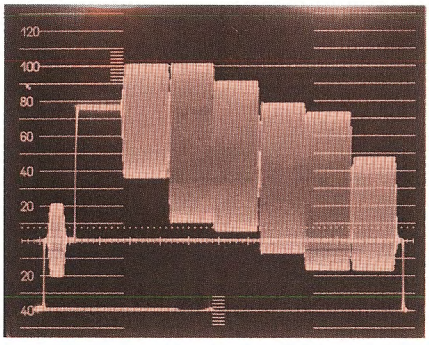
Colour bar (EBU). The instrument also generates 100% colour bar, 75% colour bar and the BBC colour bar. The desired version is selected internally.

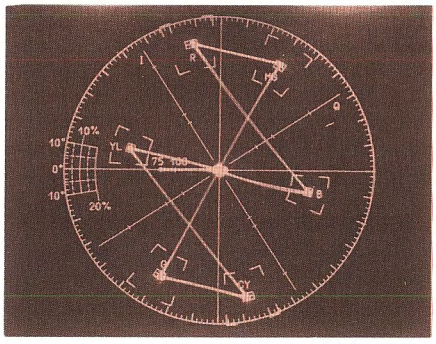


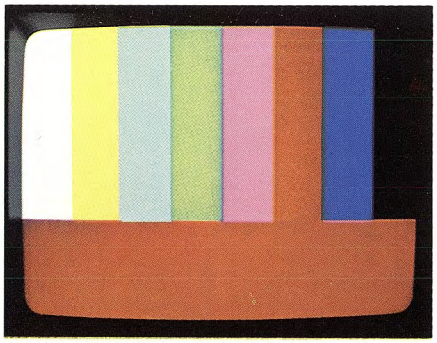




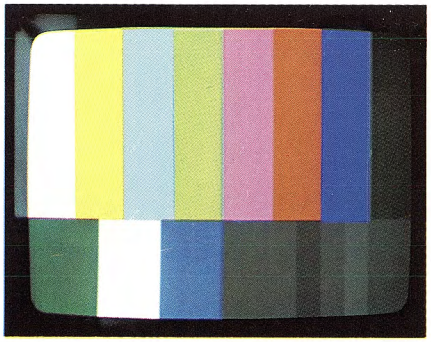
Full field colour bar of the EIA type (75 % contrast, seven bars).



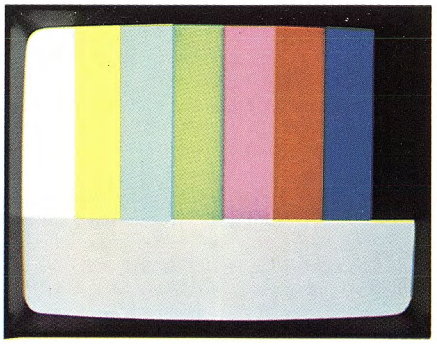




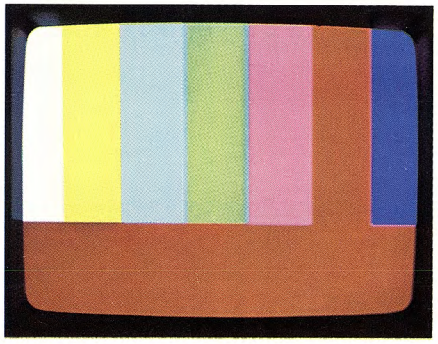
Split-field colour bar (EBU) with red signal.



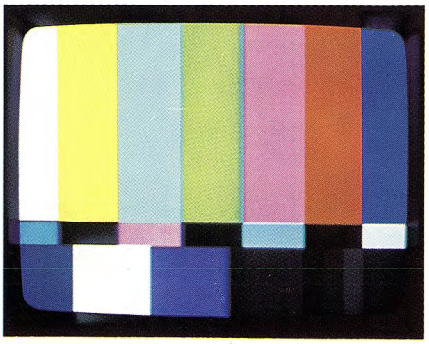
Split-field colour bar (EBU) with -V, white reference, U and PLUGE signal. This signal corresponds to the american EIA/SMPTE monitor set-up patterns.



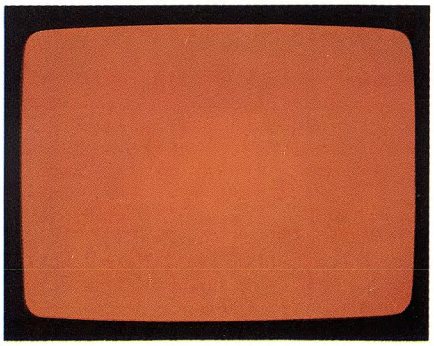
Split-field colour bar (EBU) with grey signal.



Split-field colour bar (EIA) and red signal.



Colour monitor set-up pattern (SMPTE).



Red full field signal.

Rise and fall times of chrominance signal: 330 ns. Residual subcarrier: < 3.5 mVpp. Phase error: < 2%.

CONVERGENCE SIGNAL — Number of outputs: 1 BNC. Output impedance: 75Ω. Return loss: > 34 dB up to 7 MHz. Versions (by front panel selection):
1) Cross-hatch 14 x 19 lines. Width of vertical lines: 200 ns. Border castellations by internal selection.
2) Dot pattern. The dots are positioned in the cross points of the cross-hatch.
3) Cross-hatch plus dots. The dots are positioned in the centre of the squares formed by the cross-hatch.
4) Checkerboard 6 x 8 squares.

Level of luminance signals: 700 mV ± 7 mV (100 IRE ± 1 IRE). Level of colour burst: 300 mV ± 7 mV (40 IRE ± 1 IRE). Level of sync: 300 mV ± 7 mV (40 IRE ± 1 IRE). Rise and fall times of luminance: 100 ns ± 10 ns. Rise and fall times of sync: 230 ns ± 20 ns (PAL-versions), 140 ns ± 15 ns (M/NTSC-version).

GREY SCALE — Number of outputs: 1 BNC. Output impedance: 75 Ω. Return loss: > 34 dB up to 7 MHz. Number of steps: 5 or 10 by internal selection. Levels: 700 mV luminance, 300 mV colour burst, 300 mV sync (100 IRE, 40 IRE, 40 IRE in M/NTSC-version). Rise and fall times of luminance: 200 ns ± 20 ns (G-version), 250 ns ± 25 ns (M and N-versions). Rise and fall times of sync: 230 ns ± 20 ns (PAL-versions), 140 ns ± 15 ns (M/NTSC-version).

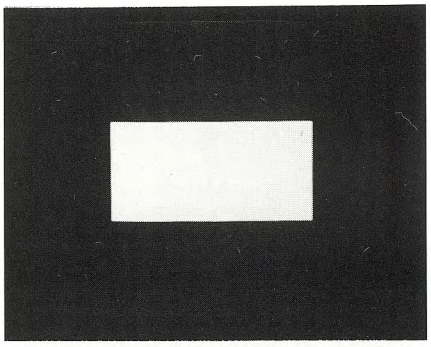
PLUGE — Number of outputs: 1 BNC. Output impedance: 75 Ω. Return loss: > 34 dB up to 7 MHz. Composition of signal (see photo): vertical bars of "ultra black", dark grey and gray scale. Level of "ultra black": -14 mV (G and N-versions), 24 mV (M/PAL-version), 3.5 IRE (M/NTSC-version). Level of background: 0 mV (G and N-version), 53 mV (M/PAL-version), 7.5 IRE (M/NTSC-version). Level of dark grey bar: 14 mV (G and N-versions), 81 mV (M/PAL-version), 11.5 IRE (M/NTSC-version). Levels of gray scale: 700 mV, 448 mV, 210 mV, 112 mV (G and N-versions), 700 mV, 467 mV, 247 mV, 156 mV (M/PAL-version), 100 IRE, 67 IRE, 35 IRE, 22 IRE (M/NTSC-version). Level of sync: 300 mV (PAL-versions), 40 IRE (M/NTSC-version). Level of colour burst (switchable by internal selection): 300 mV (PAL-versions), 40 IRE (M/NTSC-version). All levels refer to the blanking level.

WINDOW SIGNAL — Number of outputs: 1 BNC. Output impedance: 75 Ω. Return loss: > 34 dB up to 7 MHz. Versions:
1) Window signal: black-grey-white (0-100%) rectangle on black background. Size: approx. 16% of screen area.
2) Flat-field signal: black-grey-white full field signal (0-100%).

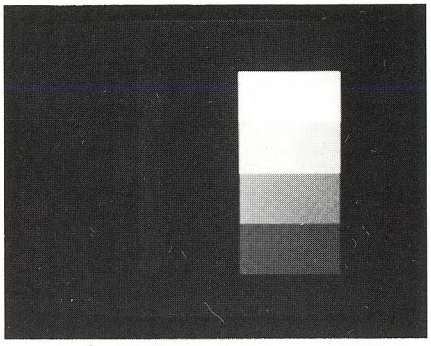
Levels for both signals: 0-100% luminance in steps of 10% by front panel rotary selector, 300 mV (40 IRE) colour burst, 300 mV (40 IRE) sync. Rise and fall times of luminance: 200 ns ± 20 ns (G-version), 250 ns ± 25 ns (M and N-versions). Rise and fall times of sync: 230 ns ± 20 ns (PAL-versions), 140 ns ± 15 ns (M/NTSC-version).

BLACK BURST (BL B) — Number of outputs: 1 BNC. Output impedance: 75 Ω. Return loss: > 34 dB up to 7 MHz. Type of signal: black composite signal (sync and colour burst). Levels: 300 mV (40 IRE) colour burst, 300 mV (40 IRE) sync. Rise and fall times: 230 ns ± 20 ns (140 ns ± 15 ns).

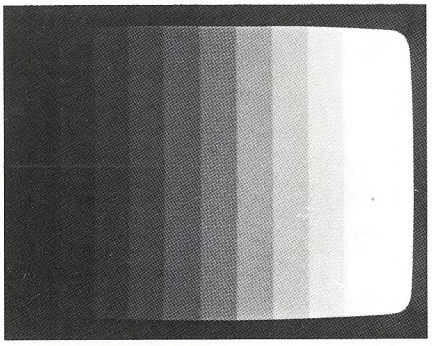
ALL SIGNALS — Line sync width: 4.7 µs ± 0.2 µs. Colour burst start (referred to sync start): 5.6 µs ± 0.1 µs (5.8 for M/PAL). Burst width: 2.25 µs ± 0.23 µs (G-version), 2.4 µs ± 0.15 µs (M/PAL), 2.5 µs ± 0.15 µs (M/NTSC), 2.4 µs ± 0.15 µs (N/PAL). Front porch: 1.5 µs ± 0.2 µs. Line blanking: 12.0 µs ± 0.2 µs (625-line systems), 11.0 µs ± 0.2 µs (525-line systems). Line/subcarrier phase stability better than 2°. Burst phase equality of all video outputs: better than 5°.



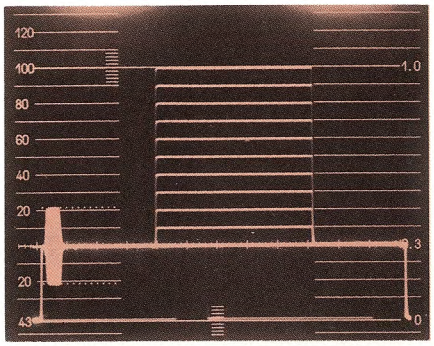
Window signal. The luminance level in the window can be varied from black (0%) to white (100) in steps of 10%. Flat field signal available by internal selection.

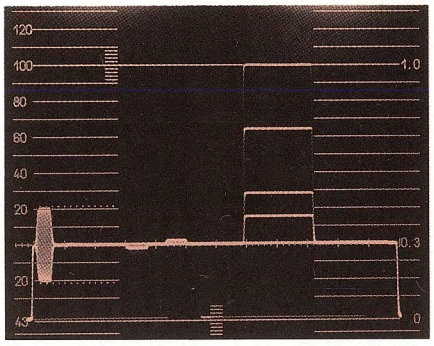


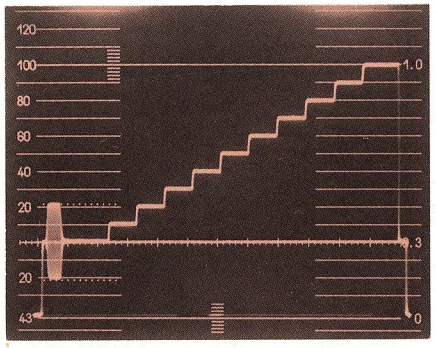
PLUGE signal (PLUGE stands for Picture Line-Up Generating Equipment).

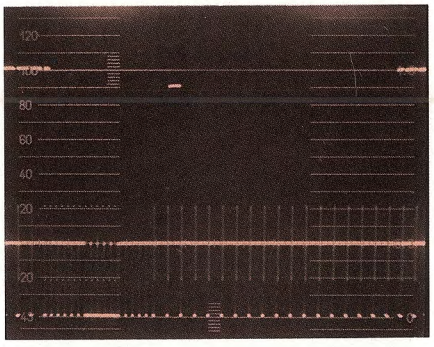


Grey scale signal. 10 riser or 5 riser are possible by internal selection.









Details of the vertical blanking interval. The pulse in line 7 is the colour identification pulse. It is present in field 1 out of 8 sequencial fields (PAL) and field 1 out of 4 sequencial fields (NTSC).

PM 5630

Sync pulse generator (SPG)

MODES OF OPERATION — Internal mode: the SPG is free-running on its own colour subcarrier master generator. All frequencies and timings are derived from this generator. External mode: the SPG genlocks to any external composite video signal or black burst signal. Mode of genlocking: slow lock (by means of miscount method).

MASTER OSCILLATOR — Type of oscillator: precision Temperature Compensated Crystal Oscillator (TCXO). Frequencies (2 x f subc):
G-version: 8.867 237 50 MHz (4.433 618 75),
M/PAL-version: 7.151 222 98 MHz (3.575 611 49),
M/NTSC-version: 7.159 090 MHz (3.579 545)
N/PAL-version: 7.164 112 50 MHz (3.582 056 25)
Accuracy (referred to 4.43 and 3.58 MHz): ± 1.25 Hz (G-version), ± 1 Hz (other versions) in temperature range 25-40°C ambient, ± 2.5 Hz/ ± 2 Hz for 10-50°C ambient. Ageing: < 0.1 ppm per month. Line/subcarrier phase stability of test signals in internal sync mode: within ± 2°.

GENLOCK MODE — Subcarrier phase adjustment: 360° by front panel screwdriver control. Horizontal phase adjustment: ± 3 µs by front panel screwdriver control. Subcarrier phase error and instability: < ± 2°.

Synchronizing signals

COLOUR SUBCARRIER — Number of outputs: 1 BNC. Output impedance: 75 Ω. Return loss: > 26 dB. Level: 2 Vpp ± 10%.

BLACK BURST — Number of outputs: 1 BNC at the rear. Output impedance: 75Ω. Return loss: > 34 dB up to 7 MHz. Type of signal: composite colour signal (sync + burst). Levels: 300 mV (40 IRE) sync and 300 mV (40 IRE) burst. Rise and fall times: 230 ns ± 20 ns (140 ns ± 15 ns).

MIXED SYNC (PAL-versions) — Line sync pulses. 4.7 µs ± 0.2 µs. Front porch: 1.5 µs ± 0.1 µs. Equalizing pulses: 2.35 µs ± 0.2 µs. Serration pulses: 4.7 µs ± 0.2 µs. Number of field pulses: 5 (M/PAL:6). Number of equalizing pulses: 5 + 5 (M/PAL: 6 + 6).

MIXED SYNC (NTSC-version) — Line sync: 4.7 µs ± 0.2 µs. Front porch: 1.5 µs ± 0.2 µs. Equalizing pulses: 2.38 µs ± 0.15 µs. Serration pulses: 4.7 µs ± 0.2 µs. Number of field pulses: 6. Number of equalizing pulses: 6 + 6.

BLANKING — Line blanking: 12.0 µs ± 0.3 µs (G and N-versions), 11.0 µs ± 0.2 µs (M-versions). Field blanking interval: 25 lines + 12 µs (G and N-versions), 21 lines + 11 µs (M-versions).

BURST KEY (BK) — Burst width: 2.25 µs ± 0.23 µs (G and N-versions), 2.4 µs ± 0.15 µs (M/PAL-version), 2.5 µs ± 0.15 µs (M/NTSC-version). Burst start: 5.6 µs ± 0.15 µs (all except M/PAL), 5.8 µs ± 0.1 µs (M/PAL-version). Burst suppression: 623-6, 310-318, 622-5 and 311-319 (G and N-versions), 523-8, 260-270, 522-7 and 259-269 (M/PAL), 1-9 both fields (264-272) (M/NTSC).

COLOUR ID/PAL ID — Types (by internal selection): 1) colour ID has 8 field sequence in PAL, 4 field sequence in NTSC, 2) PAL ID has 4 field sequence in PAL (not applicable to NTSC). Colour ID: negative pulse in line 7 field 1 (line 8 field 1 for M/PAL).
PAL ID: $F_H/2$ squarewave, positive when burst phase is positive.

HORISONTAL DRIVE (FH) — Pulse width: 7.2 µs ± 0.2 µs (625-line versions), 7.15 ± 0.2 µs (525-line versions). Timing relative to composite sync: 0.8 µs advanced.

VERTICAL DRIVE (FV) — Pulse width: 640 µs (10H) (625-line versions), 380 µs (6H, 525-line versions). Timing relative to the vertical pulse of composite sync: 1.6 µs advanced.

ALL SYNCHRONIZING PULSES — Number of outputs: 1 BNC on the rear (COL ID/PAL ID by internal selection). Levels: 4 Vpp ± 0.4 Vpp into 75Ω. Rise and fall times: 200 ns typ. Return loss: > 26 dB up to 4 MHz.

External synchronization

INPUT REQUIREMENTS — Types of signal: composite video or black burst (C) VBS, mixed syncs. Input level: 0.5 - 4 Vpp max. 100% or 1 Vpp hum. Return loss of input: > 40 dB up to 7 MHz.

SUBCARRIER LOCKING — Locking range: ± 25 Hz. Locking time: < 1 sec. Jitter referred to incoming burst: < 1°. Range of subcarrier phasing: > 360° (by front panel control). Absence of colour burst: all outputs will have nominal subcarrier frequency (free running).

SYNC LOCKING — Locking range: ± 10 ppm. Locking time: < 7 sec. Jitter referred to incoming sync: < 10 ns. Range of horizontal phasing: ± 3 µs (by front panel control).

Front panel controls and indicators

- Power on/off
- Free running/external synchr.
- Horizontal phasing (screwdriver)
- Subcarrier phasing (screwdriver)
- Window/flat-field luminance level (0-100% of black-white level)
- Convergence signal selector
- Power on indicator
- Absence of external sync signal indicator (only active when ext. sync is selected)

Power requirements

Voltage: 110/120/220/240 V +10% -15%. Frequency: 48-65 Hz. Consumption: 35 W at 220 V.

Environmental conditions

Operating temperature: 5° - 45° C ambient. Storage temperature: - 30° to + 70° C. Climatic conditions: Philips class C1. Mechanical conditions: Philips class M1. Supply conditions: Philips class S2.

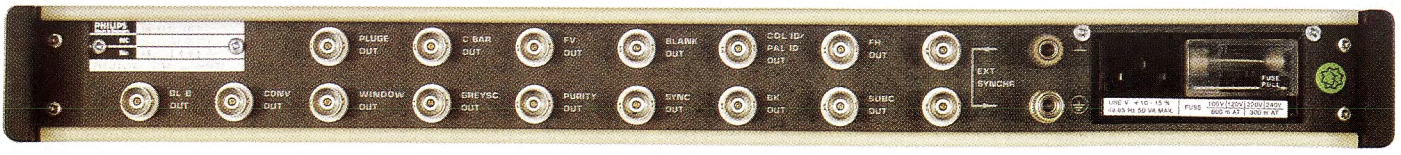
Safety and EMI

Safety: in conformity with IEC 348 class I. Electromagnetic interference (EMI): in compliance with VDE 0871/DIN 57871 class B.

Mechanical data

19" rack/table cabinet, 1 rack unit high.
Height : 44 mm
Width : 440 mm (excl. brackets)
Depth : 460 mm
Weight : 5.2 kg
The cabinet is supplied with handles and rack mount brackets (intergral part of the cabinet) plus rubber feet and a tilt bracket (both removable). When rack mounted the cabinet should be supported at the rear.

Standard accessories:
- Combined operation and service manual
- Mains cord
- Extention board (for repair)
- 75Ω termination



Colour generators

PM 5631/32/33

NEW

PM 5631: PAL and NTSC versions
PM 5632: SECAM version
PM 5633: Component/RGB versions

IEEE 488 IEC 625



Colour sync pulse generator with genlock facilities

Provides all necessary synchronization signals for television studios and mobile vans

Generates more than 80 monochrome and colour patterns used in TV studios and TV factories

All test signals are generated digitally with PROM's and D/A converters

High stability through the use of precision TCXO and digital circuitry

Small size and low power consumption ideal for mobile applications

Easy service by use of plug-in circuit boards accessible from the front

All main functions can be controlled remotely via IEEE/IEC bus interface

IEEE access to the internal line library allows pattern generation by computer control

Pattern selection by front panel up/down push-buttons and digital display

The PM 5631/32/33 colour generators are all members of a family of sync pulse generators (SPGs) and bl/wh/colour pattern generators. Ultra high stability of sync pulses and test signals is obtained by intensive use of digital technology. Thus timing and width of all pulses are derived from a common oscillator by means of digital dividers and phase-lock circuitry. The oscillator is a Temperature Compensated crystal (X-tal) Oscillator (TCXO), which free-runs at high accuracy or is genlocked to an external source.

The test signals are generated digitally with Programmable Read-Only Memories (PROMs) and Digital-to-Analog (D/A) converters. This concept ensures superb accuracy and stability as well as high reliability.

The family has the following members:
- PM 5631 (PAL and NTSC versions)
- PM 5632 (SECAM version)
- PM 5633 (RGB and Y/R-Y/B-Y version)
  (Y/R-Y/B-Y = component video)

The differences between the various versions are most significant in the SPG part and in the coding/output part. Most other functions are identical, however, a few of the test signals vary with the specific output format or television system.

SPG functions

The SPG part of the generators forms a complete broadcast sync pulse generator, which may be genlocked to an external video signal. The following fundamental synchronizing signals are generated:
- Composite (mixed) sync
- Composite (mixed) blanking
- Horizontal drive
- Vertical drive
- Colour subcarrier(s)
- Burst key (not in PM 5632)
- Colour or PAL identification (not in PM 5632)
- Black burst (PM 5631 only)
- Various SECAM signals (PM 5632

only)

These signals are sufficient for driving large and small TV studios, outside broadcast vans and TV factory test systems. All timings, amplitudes and rise/fall times are in full conformity with EBU and RS 170A broadcast standards.

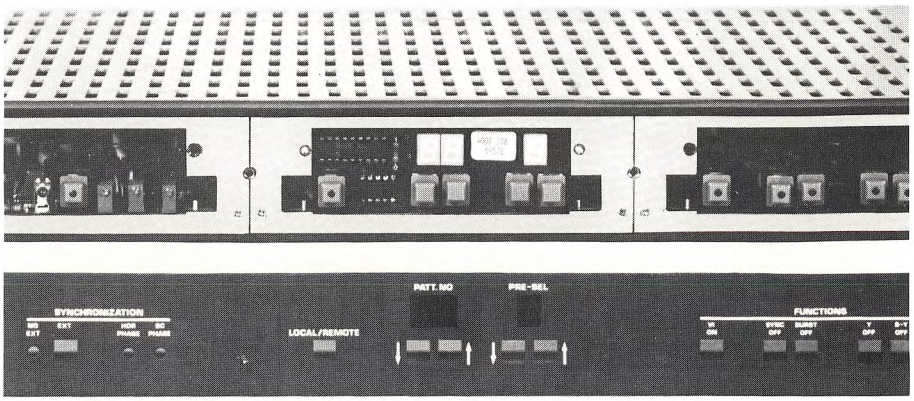
The internal master oscillator may free-run or genlock to an external video signal. This is controlled with a front panel selector or remotely via a plug at the rear of the instrument. If the external video signal fails in the genlock mode, the generator continues automatically to run in the internal (free-run) mode.

Colour generator functions

The generator part offers a wide selection of colour and monochrome test signals and patterns. The almost 90 factory programmed signals cover practically all needs for calibration and test of monitors, cameras, TV receivers, video cassette recorders, colour coders and decoders, etc. The main signal types are:
- Standard colour bars
- Split-field colour bars
- Special colour bars
- Purity signals
- Composite colour patterns
- Chrominance signals
- Colour difference signals
- Colour smearing patterns
- Convergence patterns
- Window signals
- Linearity signals
- Squarewave signals
- PLUGE signals
- and many more

In addition any of the signals may be modified by means of front panel function buttons:
- Sync on/off
- Y (luminance) on/off
- B-Y on/off
- R-Y on/off
- Burst on/off (PM 5631)
- Chroma on/off (PM 5632)
- Vertical colour sync on/off (PM 5632)

The PM 5631/32/33 family is prepared for IEEE bus control (option PM 8520) or for remote control with TTL levels (option PM 8530). The IEEE bus control has access to all the front panel controls as well as to the internal line library. The user can therefore generate other patterns from the line library than those programmed from the factory.



The Philips PM 5631/32/33 family provides excellent serviceability. When not rack mounted the component side and the soldered side of the circuit boards can be accessed after removal of the top and bottom plates of the cabinet. When rack mounted, the circuit board can be removed from the front after the text panel has been detached (2 screws). It is possible to perform repair and adjustment work on a board when it is mounted in the extention board, that is supplied with the instrument.

Applications

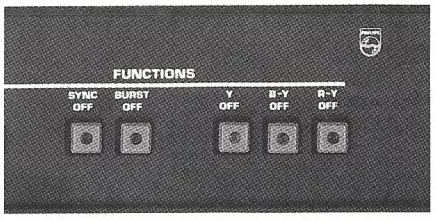
The PM 5631/32/33 family is used in all types of TV studios as master SPG and line-up generator. It supplies all necessary sync signals and may be genlocked to other video sources. In addition it supplies test signals for line-up and calibration of monitors, waveform monitors, vectorscopes, cameras, etc.

In the industrial area the PM 5631/32/33 family is used for test, repair and quality control of TV receivers, video cassette recorders and professional equipment for broadcast and industrial use. The IEEE option makes the instrument ideal for automatic and semi-automatic test systems. The great versatility, the multitude of test signals and the possibility of modifying the signals with the function buttons, make the instruments ideal for research and development of colour and monochrome television equipment.

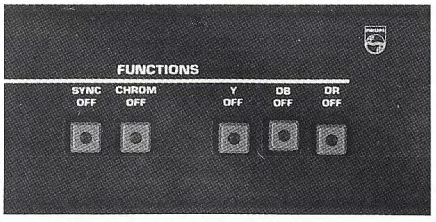
As the generators are a dedicated colour generators, they lack the generation of transmission type test signals (multiburst, pulse-and-bar, etc). The Philips PM 5570 test signal generator is the most versatile equipment in the market generating this type of signals. The combination PM 5631/32/33 and PM 5570 therefore forms the most complete test system available.

On the following pages a wide selection of the available patterns and test signals are shown. The pattern numbers correspond to the library of the PM 5631. In the PM 5632 and PM 5633 the same patterns may have a different number or the patterns are not available at all. Furthermore some patterns are only available in a specific version, as f.inst. anti-PAL signals are only available from the PAL versions of PM 5631 and PM 5633, while the VIRS is only available from the NTSC versions.

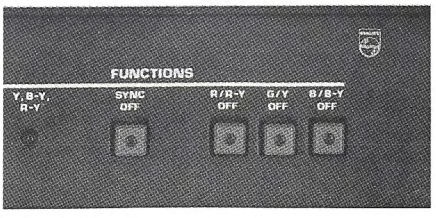
For exact information about the content of the libraries of the instruments please refer to the technical data on the pages:
- PM 5631 pages 28 - 30
- PM 5632 pages 31 - 33
- PM 5633 pages 34 - 36



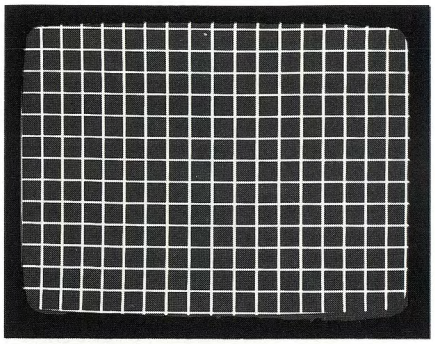
PM 5631



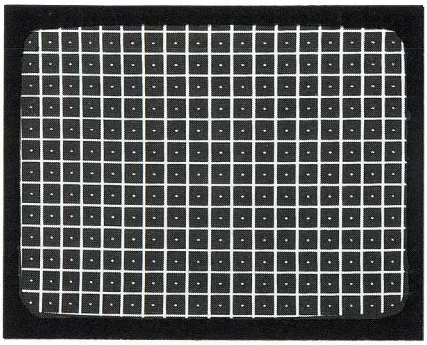
PM 5632



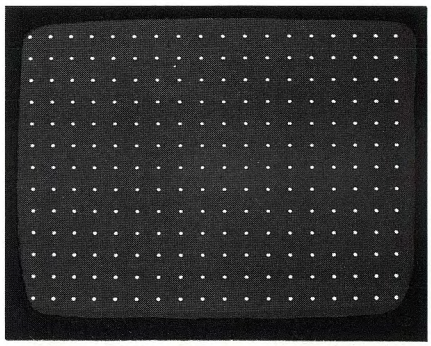
PM 5633



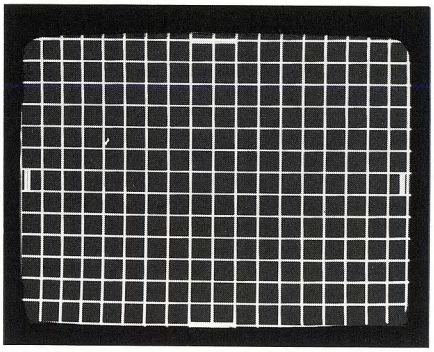
Pattern no.41: cross-hatch 14x19 lines. Patterns no. 41-46 are all convergence patterns.



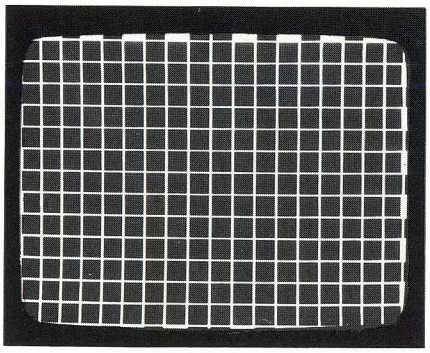
Pattern no.42: same as no.41, but with centre dots.



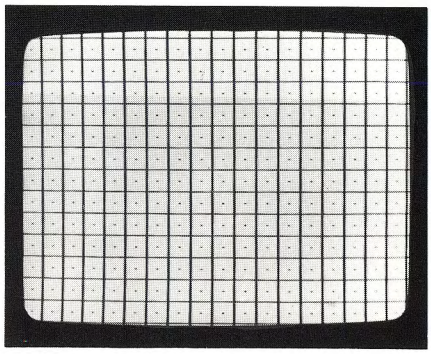
Pattern no.43: dot pattern (same dots as in no.42).



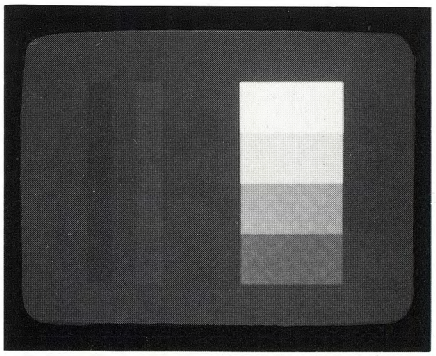
Pattern no.44: cross-hatch 14x19 with overscan marks (for adjustment of picture height and width).



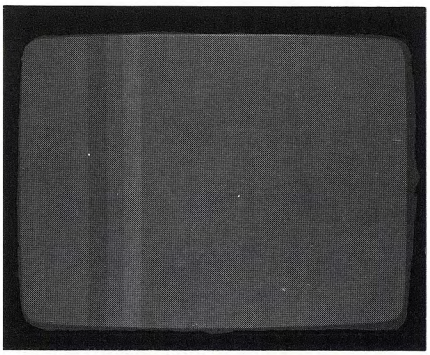
Pattern no. 45: cross-hatch 14x19 with border castellations (same applications as no.44).



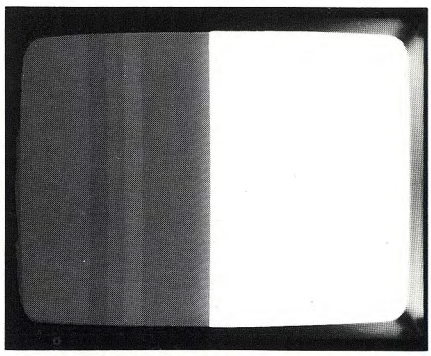
Pattern no.46: cross-hatch 14x19 with dots (same as no.42), negative polarity.



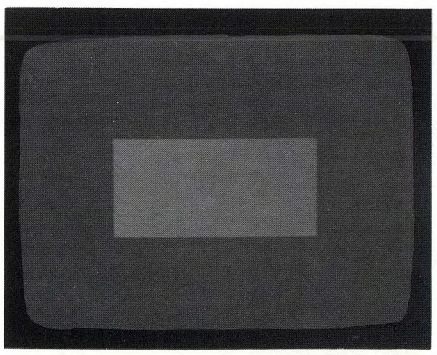
Pattern no.47: PLUGE with grey scale (used for setting brightness and contrast).



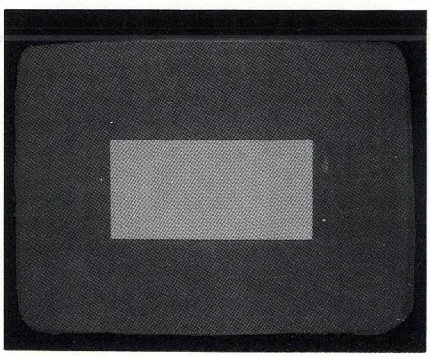
Pattern no.48: PLUGE with black signal (0% APL).



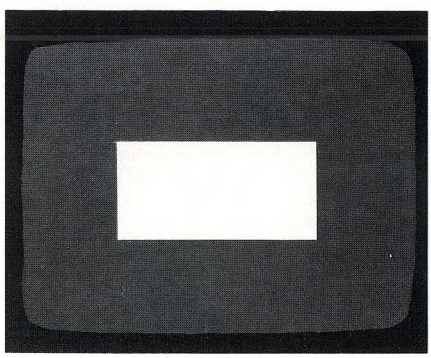
Pattern no.49: PLUGE with white (50% APL, used with no.48 for checking black level stability).



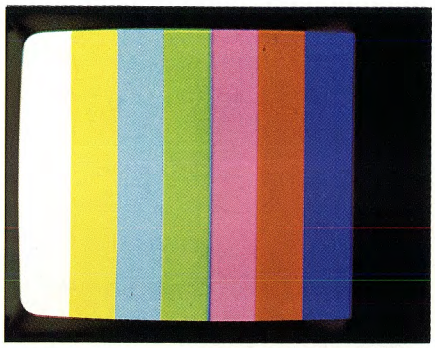
Pattern no.52: window signal, 10% white level. Pattern no.50-64 are used for check



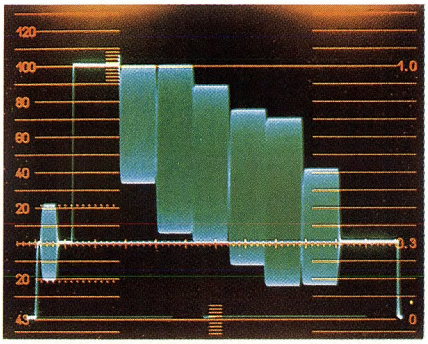
and adjustment of the colour balance (colour temperature of white).



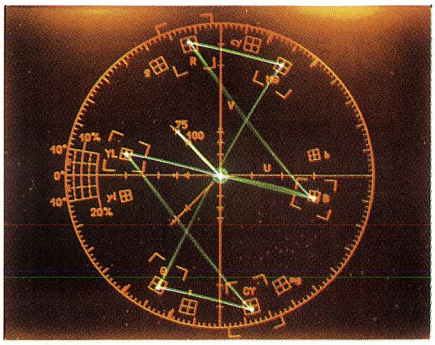
Pattern no.64: window signal, 100% white.



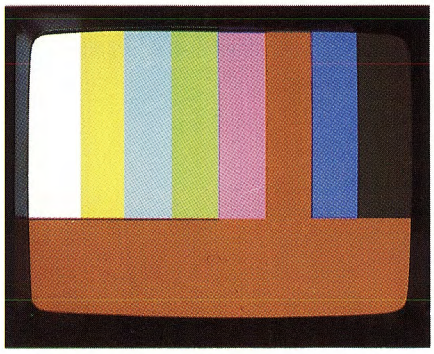
Pattern no.13: colour bar 75% contrast, 100% white (EBU, FCC).



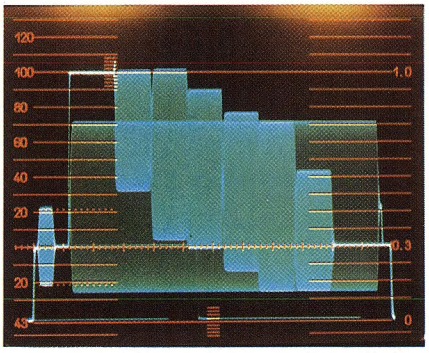
Pattern no.13: waveform monitor display (PAL).



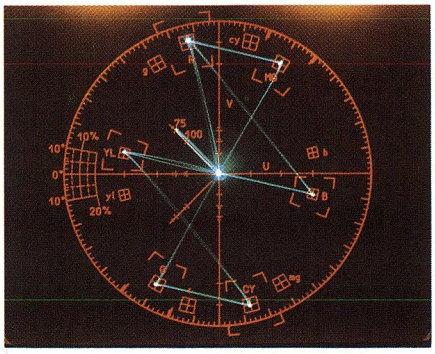
Pattern no.13: vector display (PAL).



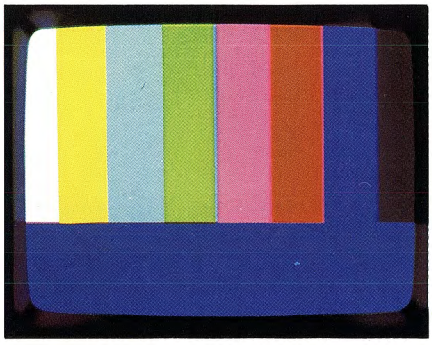
Pattern no.15: split-field EBU, FCC colour bar with red.



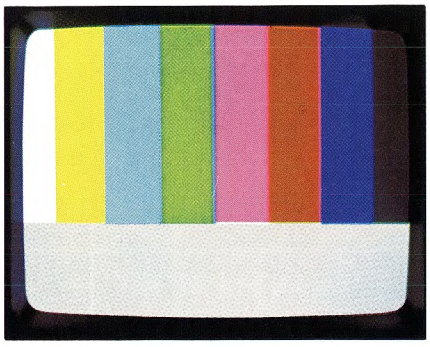
Pattern no.15: waveform monitor display (PAL).



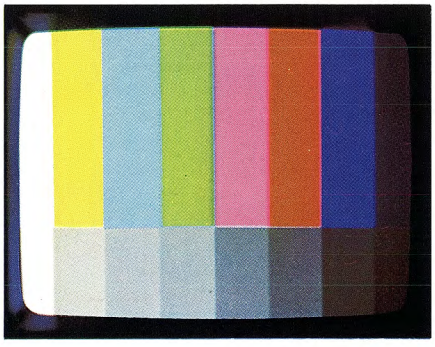
Pattern no.15: vector display (PAL).



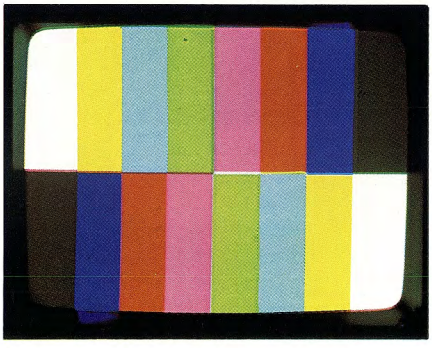
Pattern no.16: split-field EBU with blue reference.



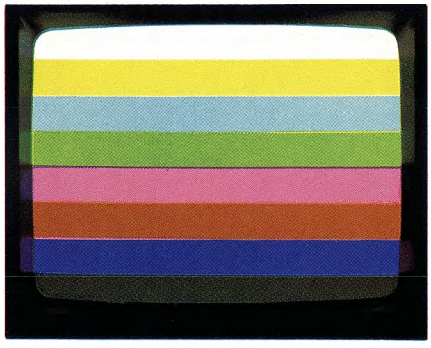
Pattern no.17: split-field colour bar with grey reference.



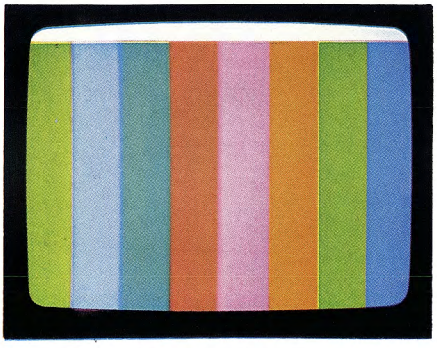
Pattern no.19: split-field colour bar with luminance reference.



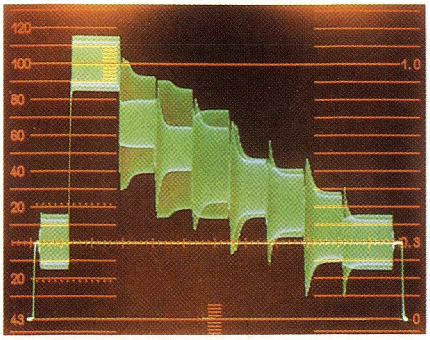
Pattern no.20: split-field EBU, FCC colour bar with reverse colour bar.



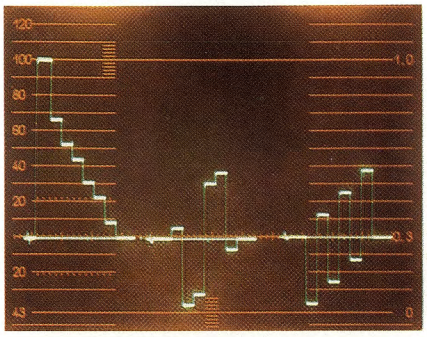
Pattern no.27: EBU, FCC type colour bar, vertical time-base.



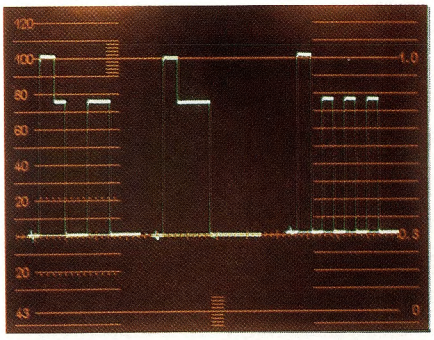
Pattern no. 28: coder test signal.



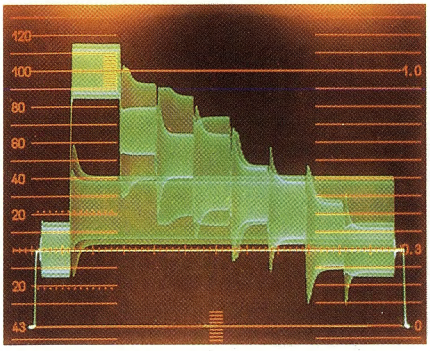
Pattern no.13: waveform monitor display (SECAM).



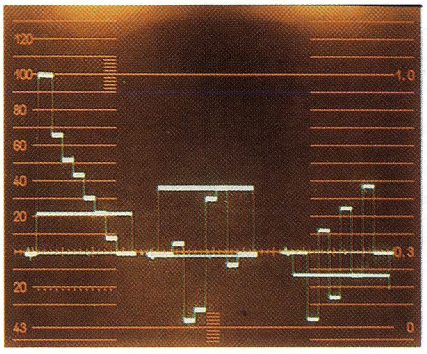
Pattern no.13: EBU, FCC colour bar, Y/R-Y/B-Y parade display.



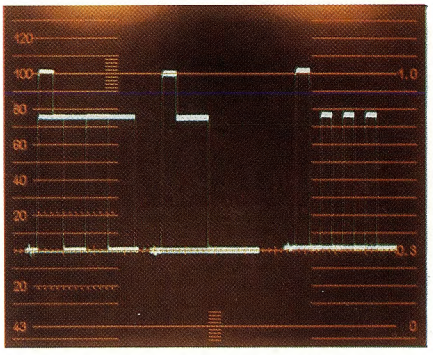
Pattern no.13: EBU, FCC colour bar, RGB parade display.



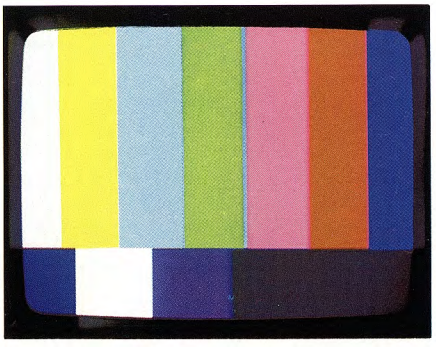
Pattern no.15: waveform monitor display (SECAM).



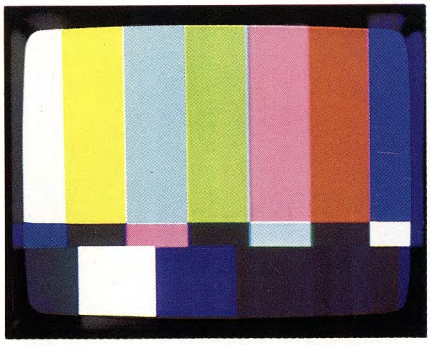
Pattern no.15: split-field EBU, FCC colour bar with red, Y/R-Y/B-Y parade display.



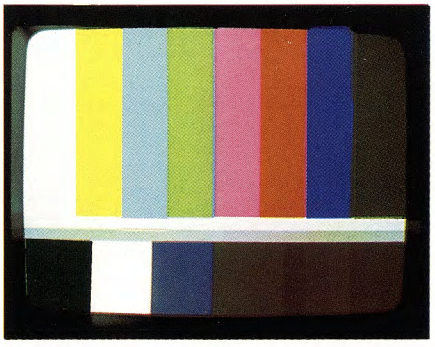
Pattern no.15: Split-field EBU, FCC colour bar with red, RGB parade display.



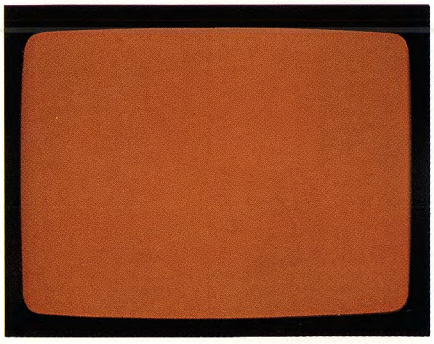
Pattern no. 14: EIA monitor pattern.



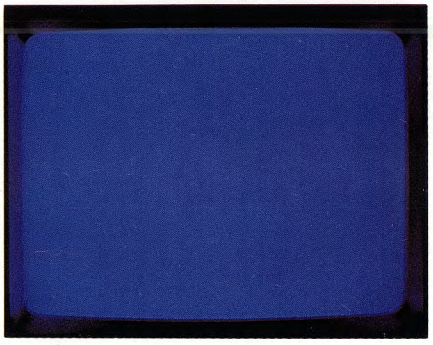
Pattern no. 22: SMPTE monitor pattern (NTSC-version).



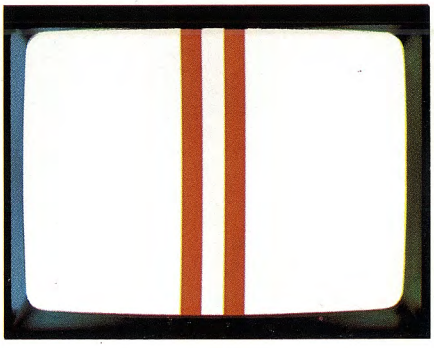
Pattern no. 22: monitor pattern (PAL-versions).



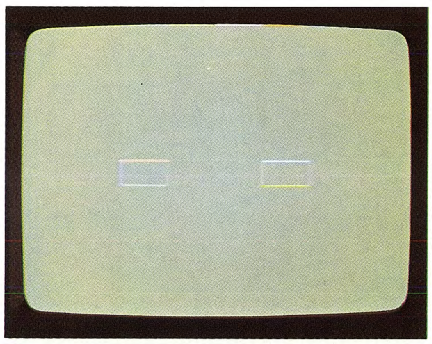
Pattern no. 29: full-field red.



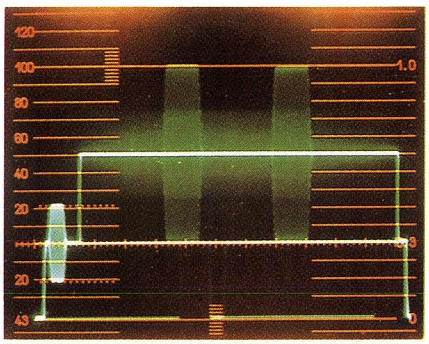
Pattern no. 31: full-field blue.



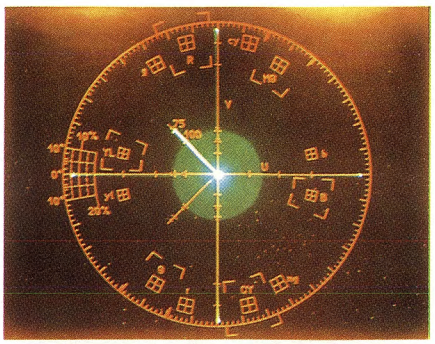
Pattern no. 40: colour smearing pattern (symbols ice hockey players on the ice).



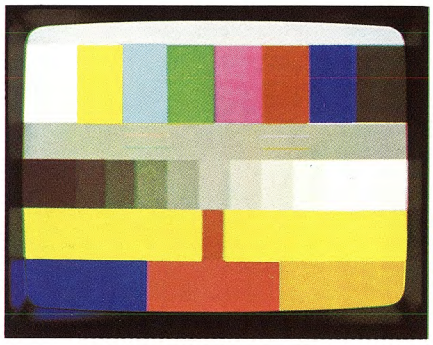
Pattern no. 38: anti-PAL pattern.



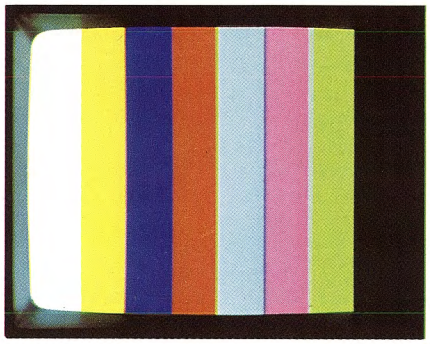
Waveform monitor display of anti-PAL pattern.



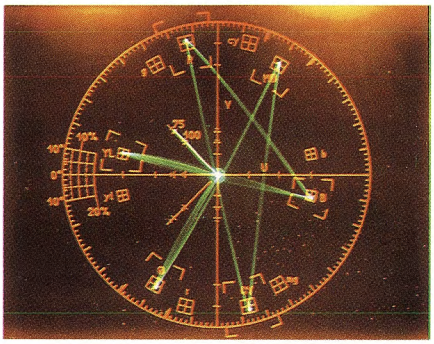
Vector display of anti-PAL pattern.



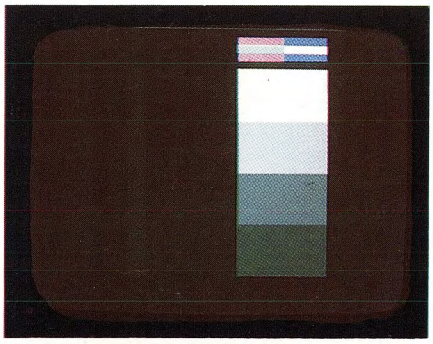
Pattern no. 39: receiver pattern.



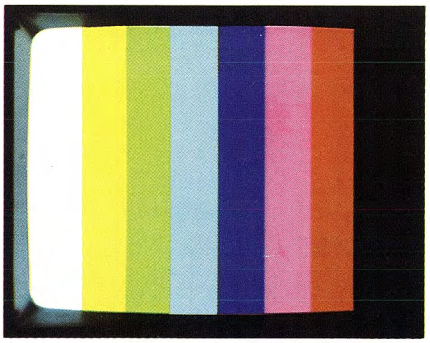
Pattern no. 25: colour bar. The colour sequence has minimum phase shift of the colour subcarrier.



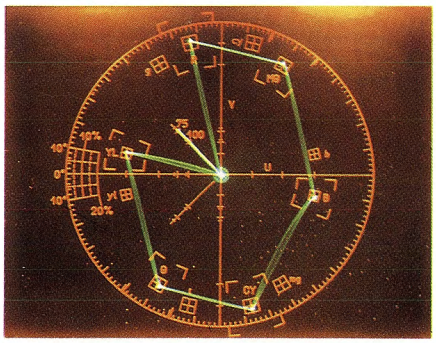
Vector display of pattern no. 25.



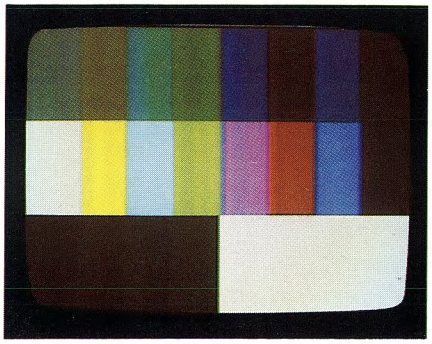
Pattern no.96: SPLUGE (monitor line-up signal (PAL versions)).



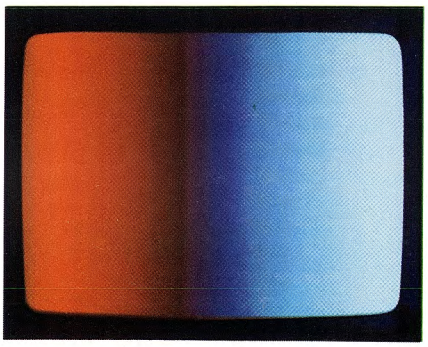
Pattern no. 26: colour bar. The colour sequence has maximum phase shift of the colour subcarrier.



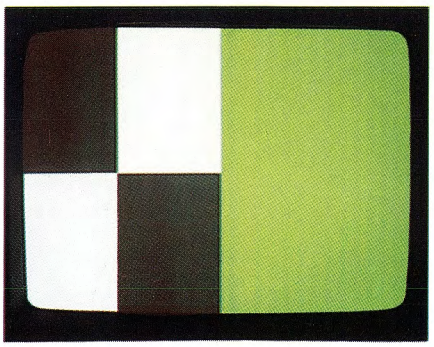
Vector display of pattern no. 26.



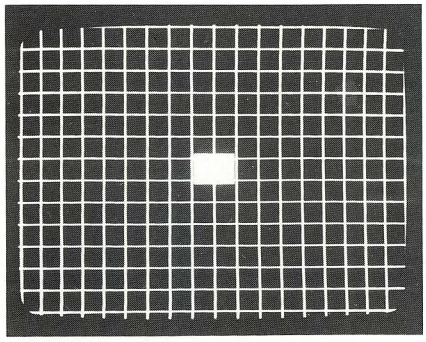
Pattern no.19: split-field colour bar 25% contrast with 75% contrast and bl/wh transient.



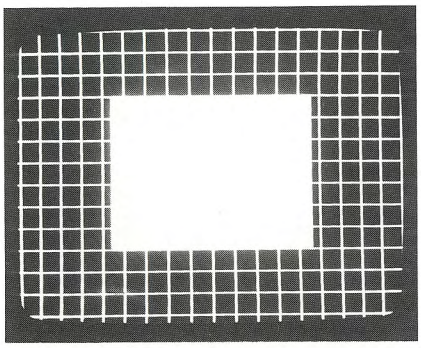
Pattern no.82: chroma sweep.



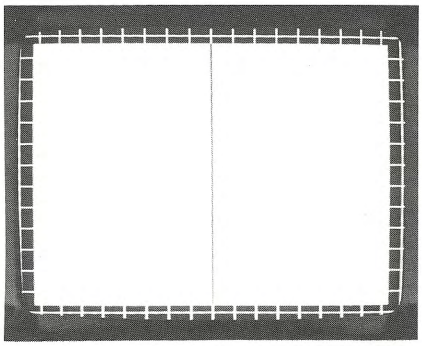
Pattern no.34: bl/wh, wh/bl, green decoder test signal.



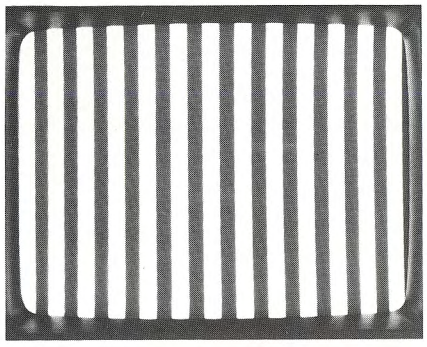
Pattern no. 65: EHT signal 10% (cross-hatch with 100% white window).



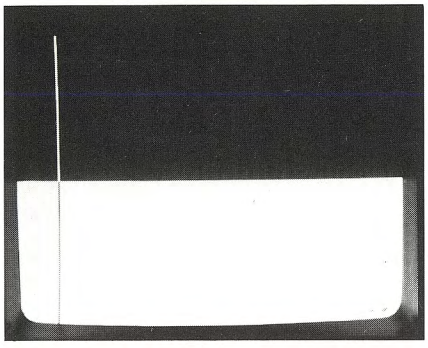
Pattern no. 67: EHT signal 50%.



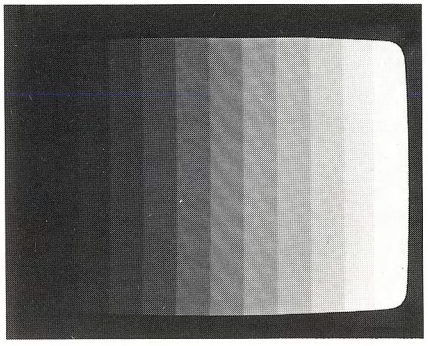
Pattern no. 69: EHT signal, maximum APL.



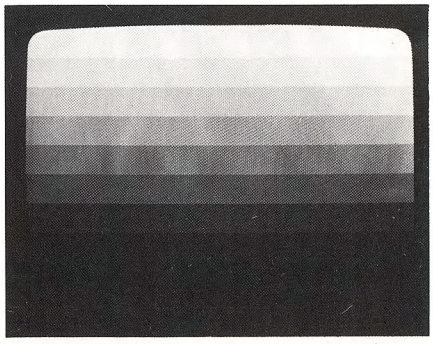
Pattern no.74: 250 kHz squarewave signal.



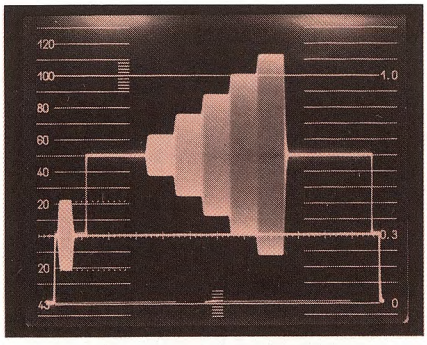
Pattern no. 76: reflection test pattern (normal and inverted 2T-pulse).



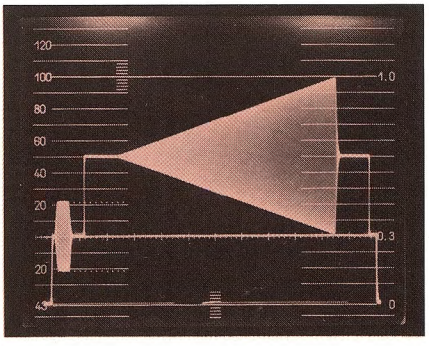
Pattern no.78: grey scale, 10-riser, positive.



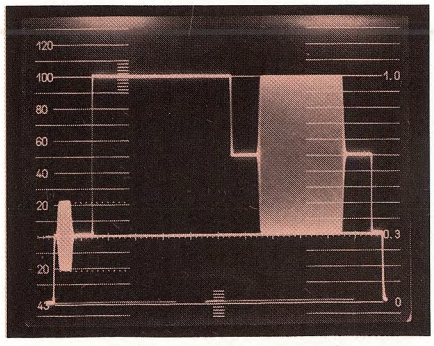
Pattern no. 87: vertical grey scale signal (CISPR).



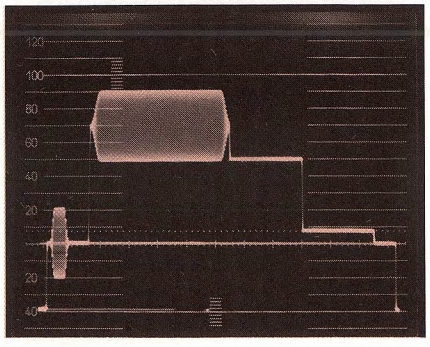
Pattern no. 88: chroma staircase, 5-riser.



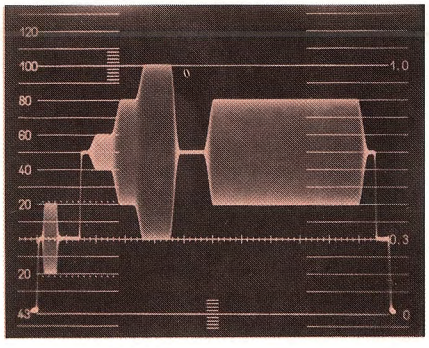
Pattern no. 85: chroma sawtooth (U).



Pattern no. 91: full-field CCIR reference signal (PAL-versions).



Pattern no. 91: full-field VIR signal (NTSC-version).



Pattern no.90: CCIR line 331 chroma signal of PAL coding (only PAL-version).

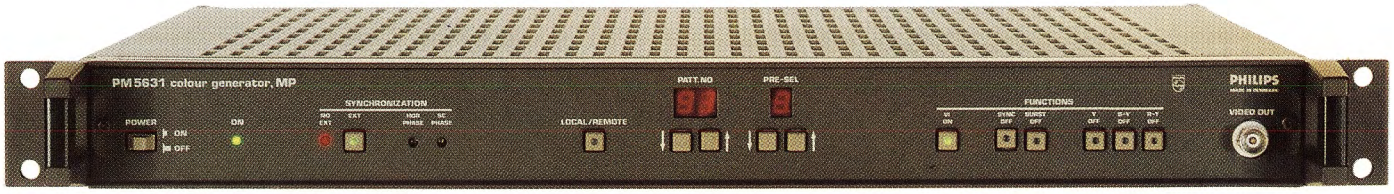
Colour generator, MP (multi pattern)

PM 5631

NEW

Code no. PM 5631:
9449 056 31003 (G-version, 625-lines PAL)
9449 056 31008 (M/PAL-version, 525-lines PAL)
9449 056 31108 (M/NTSC-version, 525-lines NTSC)
9449 056 31009 (N-version, 625-lines PAL)
SECAM version: see PM 5632

IEEE 488 IEC 625



Sync/subcarrier phasing according to EBU and RS170A standards

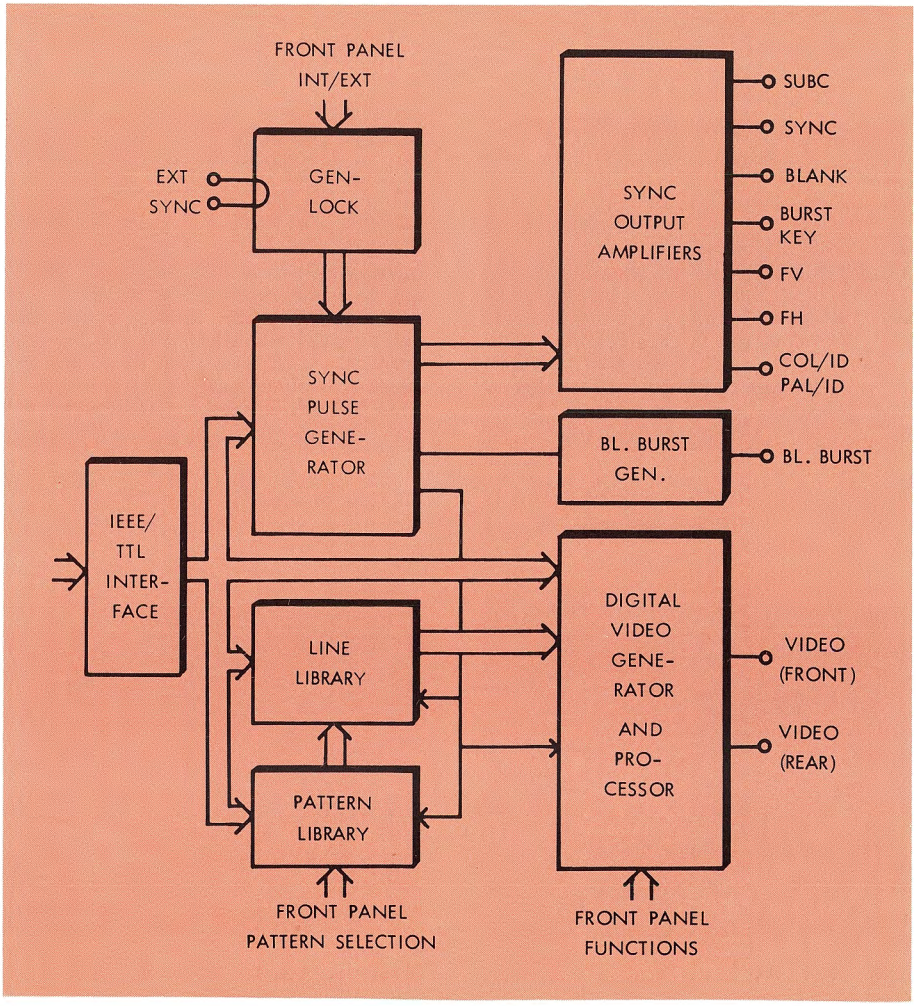
Colour subcarrier frequency within ± 1 Hz in limited temperature range

Remote control via IEEE interface or TTL levels (options)

Technical description

The SPG part of the PM 5631 is based on two special Philips integrated circuits that generate the various sync pulses and sync waveforms. Additional circuitry assists with the genlock function and line/subcarrier phasing. The timing between the external signal and the internally generated signals can be adjusted with front panel screwdriver controls (horizontal phase and subcarrier phase). The PM 5631 generates all video signals with correct line/subcarrier phasing, when it is free-running or locked to a source with correct phasing. The sync signals from the sync ICs are passed through special sync output amplifiers that amplify them to the specified level, shape the transients to the required rise/fall time and provide the power for 75 ohms output impedance. The colour subcarrier is filtered into a sine wave signal with low harmonic distortion.

The generator part makes use of a digital generation principle, i.e. the waveforms for the luminance and the two colour difference signals are stored in a digital format in PROMs. This digital "pattern" forms the so-called line library that contains the information for all lines used to compose the various test signals and patterns (horizontal information). The pattern library is a digital "pattern" stored in a PROM, that selects the



required lines across the screen to form the various patterns (vertical information). The output from the line library is fed to the video generator, which has D/A converters for the luminance and colour difference signals, a precision PAL or NTSC coder and various amplifiers. The processor part handles the special modification functions. The coder uses switching modulators with high accuracy and stability.

The front panel controls and the IEEE bus have access to the genlock circuit, the pattern library PROM and the special functions. Furthermore the IEEE bus have access to the line library. Therefore it is possible to create new patterns from the line library by computer control. The latest computer generated pattern is always available as pattern no.1, even after the computer has been disconnected. The PM 5631 has battery back-up of the internal control system, so when it is switched on, it automatically returns to the settings it had before it was switched off.

TECHNICAL DATA (all versions)

Video signals

VIDEO OUT — Number of outputs: 2 BNCs, 1 on the rear, 1 on the front. Output impedance: 75 Ω. Return loss: > 34 dB up to 7 MHz.

COLOUR BAR SIGNALS (625-line versions) — Pattern no. 11: full field 100%. No. 12: full field 75%. No. 13: full field 75%, 100% white (EBU). No. 14: full field 75%, 25% set-up (BBC). No. 15: split-field EBU and red (2 : 1). No. 16: split-field EBU and blue (2 : 1). No. 17: split-field EBU and 75% grey (2 : 1). No. 18: split-field EBU and U/V (2 : 1). No. 19: split-field EBU and EBU luminance (2 : 1). No. 20: split-field EBU and reverse EBU (1 : 1). No. 21: split-field EBU and -V/white/U/PLUGE (2 : 1). No. 22: special monitor set-up signal. No. 23: split-field BBC and red (2 : 1). No. 24: split-field BBC and grey (2 : 1). No. 25: EBU type with minimum phase shift colour sequence. No. 26: EBU type with maximum phase shift colour sequence. No. 27: EBU type vertical time-base. No. 28: coder test signal.
COLOUR BAR SIGNALS (525-line versions) — Pattern no. 11: full-field 100%. No. 12: full-field 75%. No. 13: full-field 75%, 100% white (FFC). No. 14: split-field 75% (EIA) and -I/white/Q/black (3 : 1), M/PAL: -V and U instead of -I and Q. No. 15: split-field FCC and red (2 : 1). No. 16: split-field FCC and blue (2 : 1). No. 17: split-field FCC and 75% grey (2 : 1). No. 18: split-field FCC and U/V. No. 19: split-field FCC and FCC luminance (2 : 1). No. 20: split-field FCC and reverse FCC (1 : 1). No. 21: split-field EIA and -I/white/Q/PLUGE (3 : 1), M/PAL: -V and U instead of -I and Q. No. 22: monitor set-up pattern (M/PAL as 625-line versions, M/NTSC: SMPTE). No. 23: split-field EIA and red (2 : 1). No. 24: split-field EIA and 75% grey (2 : 1). No. 25: full-field FCC type with minimum phase shift colour sequence. No. 26: full-field FCC type with maximum phase shift colour sequence. No. 27: FCC type vertical time-base. No. 28: coder test signal.

PURITY PATTERNS — Pattern no. 29: red (75%). No. 30: green (75%). No. 31: blue (75%). No. 32: yellow (75%). No. 33: cyan (75%). No. 34: magenta (75%).

OTHER COLOUR PATTERNS — Pattern no. 35: yellow/red/yellow (75%). No. 36: full-field U/V (75%). No. 37: full-field R-Y = 0/B-Y = 0/G-Y = 0 (75%). No. 38: anti-PAL pattern (PAL-versions), blue bars (NTSC-version). No. 39: composite receiver test pattern. No. 40: full-field white/red/white/red/white ("ice hockey knees").

CONVERGENCE PATTERNS — Pattern no. 41: cross-hatch (14 x 19). No. 42: cross-hatch as no. 41 and dots. No. 43: dot pattern. No. 44: cross-hatch as no. 41 with overscan marks. No. 45: cross-hatch as no. 41 with border castellations. No. 46: cross-hatch and dots inverted (black lines and dots on white background).

PLUGE SIGNALS — Pattern no. 47: PLUGE and gray scale. No. 48: PLUGE (0% APL). No. 49: PLUGE (50% APL).

COLOUR BALANCE PATTERNS — Pattern no. 50: black (black burst). No. 51: window (5% white). No. 52: window (10%). No. 53: window (15%). No. 54: window (20%). No. 55: window (30%). No. 56: window (40%). No. 57: window (50%). No. 58: window (60%). No. 59: window (70%). No. 60: window (80%). No. 61: window (85%). No. 62: window (90%). No. 63: window (95%). No. 64: window (100%).

EHT PATTERNS (Extremely High Tension) — Type of signal: white rectangle with cross-hatch. Pattern no. 65: EHT 10% beam current. No. 66: EHT (30%). No. 67: EHT (50%). No. 68: EHT (70%). No. 69: EHT (90%).

SQUARE WAVE PATTERNS — Pattern no. 70: V (field frequency) square wave (bl/wh). No. 71: V square wave (wh/bl). No. 72: H (horizontal frequency) square wave (bl/wh). No. 73: H square wave (wh/bl). No. 74: 250 kHz square wave. No. 75: checker board.

REFLECTION PATTERN — Type of signal: white needle pulse on black background (upper half of screen), black needle pulse on white background (lower half). Pattern no. 76: reflection pattern.

SAWTOOTH AND GREY SCALE PATTERNS — Pattern no. 77: sawtooth (luminance). No. 78: sawtooth with chroma (G and N-versions: 100 mVpp/0° phase, M/PAL-version: 140 mVpp/0° phase, M/NTSC-version: 20 IRE/0° phase). No. 79: grey scale, 10-riser (luminance). No. 80: grey scale, 10-riser with chroma (G and N-versions: 140 mVpp/0° phase, M/PAL-version: 280 mV/0° phase, M/NTSC-version: 40 IRE/0° phase). No. 81: grey scale, 5-riser (luminance). No. 82: grey scale, 5-riser with chroma (280 mV/40 IRE, 0° phase). No. 83: grey scale, inverted 10-riser. No. 84: grey scale, inverted 5-riser. No. 85: chroma sawtooth (0° phase). No. 86: chroma sawtooth (90° phase). No. 87: grey scale, CISPR (vertical time-base). No. 88: chroma staircase, 5-riser (60° phase, NTSC: 180° phase). No. 89: chroma staircase, inverted 8-riser (90° phase, NTSC: 180° phase).

MISCELLANEOUS (G and N-versions) — Pattern no. 90: CCIR line 331 (chroma staircase and bar). No.91: CCIR reference signal. No.92: 100% white. No.93: 50% white. No.94: 30% white. No.95: -(B-Y) 75% contrast. No.96: SPLUGE. No.97: EBU colour bar, contrast -20 dB. No.98: EBU colour bar, contrast -32 dB.

MISCELLANEOUS (M-versions) — Pattern no.90: chroma staircase (as NTC-7). No. 91: full-field VIRS. No.92: 100% white. No.93: 50% white. No.94: 30% white. No.95: -(B-Y) 75% contrast. No.96: black burst. No.97: FCC colour bar, contrast -20 dB. No.98: FCC colour bar, contrast -32 dB.

QUICK SELECT PATTERNS — Pattern numbers 1-10 consist of selected patterns from the main library 11-91. Most routine checks can be performed with these 10 patterns. Pattern no. 1: black (burst). Note. In instruments equiped with the IEEE option, pattern no. 1 is always the latest computer composed pattern. No. 2: full-field colour bar (as no. 13). No. 3: split-field colour bar and grey (as no. 17). No. 4: split-field colour bar and red (as no. 15). No. 5: monitor set-up signal (as no. 22). No. 6: PLUGE with gray scale (as no. 47). No. 7: full-field red (as no. 29). No. 8: cross-hatch with overscan marks (as no. 44). No. 9: window signal, 5% of white (as no. 51). No. 10: window signal, 100% white (as no. 64).

USER SELECT PATTERNS — The single digit pattern pre-selector allows the user to allocate the pre-select numbers to any of the 98 patterns. This means that the user can create his own quick select library.

CUSTOMER PROGRAMMED PATTERNS — Philips is prepared to program and burn PROMs with customer specified patterns for an additional fee. Such signals must be accurately specified in terms of horizontal and vertical timing as well as levels of the luminance and chrominance components.

Sync pulse generator (SPG)

MODES OF OPERATION — Internal mode: the SPG is free-running on its own colour subcarrier master generator. All frequencies and timings are derived from this generator. External mode: the SPG genlocks to any external composite video signal or black burst signal. Mode of genlocking: slow lock (by means of miscount method).

PM 5631

MASTER OSCILLATOR — Type of oscillator: precision Temperature Compensated Crystal Oscillator (TCXO). Frequencies (2 x f subc):
G-version: 8.867 237 50 MHz (4.433 618 75),
M/PAL-version: 7.151 222 98 MHz (3.575 611 49),
M/NTSC-version: 7.159 090 MHz (3.579 545)
N/PAL-version: 7.164 112 50 MHz (3.582 056 25)
Accuracy (referred to 4.43 and 3.58 MHz): ± 1.25 Hz (G-version) ± 1 Hz (other versions) in temperature range 25-40°C ambient, ± 2.5 Hz/ ± 2 Hz for 10-50°C ambient. Ageing: < 0.1 ppm per month. Line/subcarrier phase stability of test signals in internal sync mode: within ± 2°.

GENLOCK MODE — Subcarrier phase adjustment: 360° by front panel screwdriver control. Horizontal phase adjustment: ± 3 µs by front panel screwdriver control. Subcarrier phase error and instability: < ± 2°.

Synchronizing signals

COLOUR SUBCARRIER — Number of outputs: 1 BNC. Output impedance: 75 Ω. Return loss: > 26 dB. Level: 2 Vpp ± 10%.

BLACK BURST — Number of outputs: 1 BNC at the rear. Output impedance: 75Ω. Return loss: > 34 dB up to 7 MHz. Type of signal: composite colour signal (sync + burst). Levels: 300 mV (40 IRE sync and 300 mV (40 IRE) burst. Rise and fall times: 230 ns ± 20 ns (140 ns ± 15 ns).

MIXED SYNC (PAL-versions) — Line sync pulses. 4.7 µs ± 0.2 µs. Front porch: 1.5 µs ± 0.1 µs. Equalizing pulses: 2.35 µs ± 0.2 µs. Serration pulses: 4.7 µs ± 0.2 µs. Number of field pulses: 5 (M/PAL:6). Number of equalizing pulses: 5 + 5 (M/PAL: 6 + 6).

MIXED SYNC (NTSC-version) — Line sync: 4.7 µs ± 0.2 µs. Front porch: 1.5 µs ± 0.2 µs. Equalizing pulses: 2.38 µs ± 0.15 µs. Serration pulses: 4.7 µs ± 0.2 µs. Number of field pulses: 6. Number of equalizing pulses: 6 + 6.

BLANKING — Line blanking: 12.0 µs ± 0.3 µs (G and N-versions), 11.0 µs ± 0.2 µs (M-versions). Field blanking interval: 25 lines + 12 µs (G and N-versions), 21 lines + 11 µs (M-versions).

BURST KEY (BK) — Burst width: 2.25 µs ± 0.23 µs (G and N-versions), 2.4 µs ± 0.15 µs (M/PAL-version), 2.5 µs ± 0.15 µs (M/NTSC-version). Burst start: 5.6 µs ± 0.15 µs (all except M/PAL), 5.8 µs ± 0.1 µs (M/PAL-version). Burst suppression: 623-6, 310-318, 622-5 and 311-319 (G and N-versions), 523-8, 260-270, 522-7 and 259-269 (M/PAL), 1-9 both fields (264-272) (M/NTSC).

COLOUR ID/PAL ID — Types (by internal selection): 1) colour ID has 8 field sequence in PAL, 4 field sequence in NTSC, 2) PAL ID has 4 field sequence in PAL (not applicable to NTSC). Colour ID: negative pulse in line 7 field 1 (line 8 field 1 for M/PAL).
PAL ID: $F_H/2$ squarewave, positive when burst phase is positive.

HORISONTAL DRIVE (FH) — Pulse width: 7.2 µs ± 0.2 µs (625-line versions), 7.15 ± 0.2 µs (525-line versions). Timing relative to composite sync: 0.8 µs advanced.

VERTICAL DRIVE (FV) — Pulse width: 640 µs (10H) (625-line versions), 380 µs (6H, 525-line versions). Timing relative to the vertical pulse of composite sync: 1.6 µs advanced.

ALL SYNCHRONIZING PULSES — Number of outputs: 1 BNC on the rear (COL ID/PAL ID by internal selection). Levels: 4 Vpp ± 0.4 Vpp into 75Ω. Rise and fall times: 200 ns typ. Return loss: > 26 dB up to 4 MHz.

External synchronization

INPUT REQUIREMENTS — Types of signal: composite video or black burst (C) VBS, mixed syncs. Input level: 0.5 - 4 Vpp max. 100% or 1 Vpp hum. Return loss of input: > 40 dB up to 7 MHz.

SUBCARRIER LOCKING — Locking range: ± 25 Hz. Locking time: < 1 sec. Jitter referred to incoming burst: < 1°. Range of subcarrier phasing: > 360° (by front panel control). Absence of colour burst: all outputs will have nominal subcarrier frequency (free running).

SYNC LOCKING — Locking range: ± 10 ppm. Locking time: < 7 sec. Jitter referred to incoming sync: < 10 ns. Range of horizontal phasing: ± 3 µs (by front panel control).

Front panel controls and indicators

- Power on/off
- External synchr./free running (int)
- Horizontal phasing (screwdriver)
- Subcarrier phasing (screwdriver)
- Local/remote control
- Count down (pattern selection)
- Count up (pattern selection)
- Count down (pattern pre-selection)
- Count up (pattern pre-selection)
- Vertical interval (VI) signal on/off
- Sync off/on
- Colour burst off/on
- Luminance off/on (Y)
- B-Y chroma (U) off/on
- R-Y chroma (V) off/on
- Power on indicator (green LED)
- No sync indicator (red LED, - only active when EXT sync is selected)

Power requirements

Voltage: 110/120/220/240 V + 10%/ - 15%. Frequency: 48-65 Hz. Consumption: 35 W at 220 V.

Environmental conditions

Operating temperature: 5° - 45° C ambient. Storage temperature: - 30° to + 70° C. Climatic conditions: Philips class C1. Mechanical conditions: Philips class M1. Supply conditions: Philips class S2.

Safety and EMI

Safety: in conformity with IEC 348 class I. Electromagnetic interference (EMI): in compliance with VDE 0871/DIN 57871 class B.

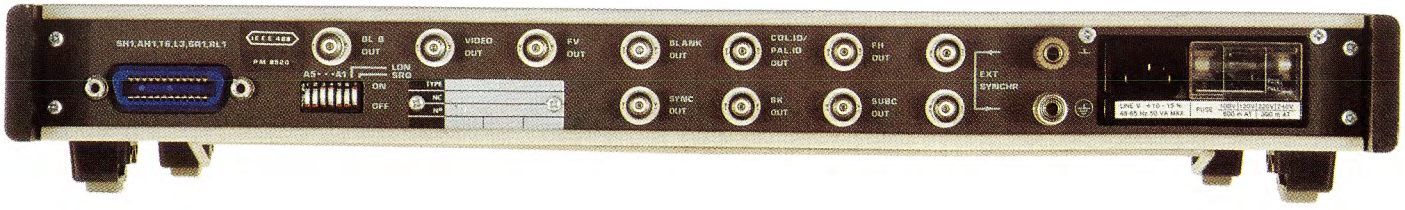
Mechanical data

19" rack/table cabinet, 1 rack unit high.
Height : 44 mm
Width : 440 mm (excl. brackets)
Depth : 460 mm
Weight : 5.2 kg
The cabinet is supplied with handles and rack mount brackets (intergral part of the cabinet) plus rubber feet and a tilt bracket (both removable). When rack mounted the cabinet should be supported at the rear.

Standard accessories:
- Combined operation and service manual
- Mains cord
- Extention board (for repair)
- 75Ω termination

Options

- PM 8520 IEEE interface bus
- PM 8530 TTL remote control



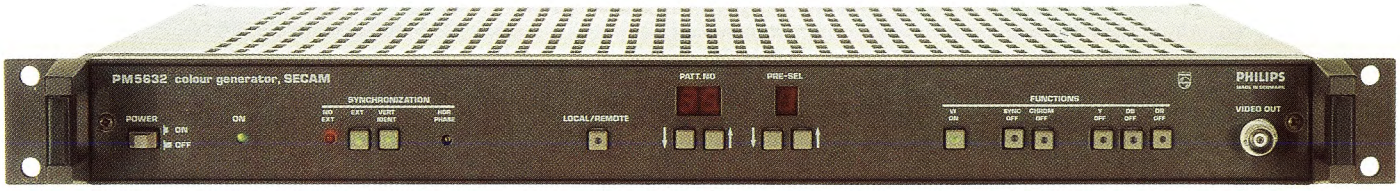
Colour generator, SECAM

PM 5632

NEW

Code no. PM 5632:
9449 056 32007 (625-lines SECAM)

IEEE 488 IEC 625



Provides all necessary synchronizing signals for television studios and mobile TV units

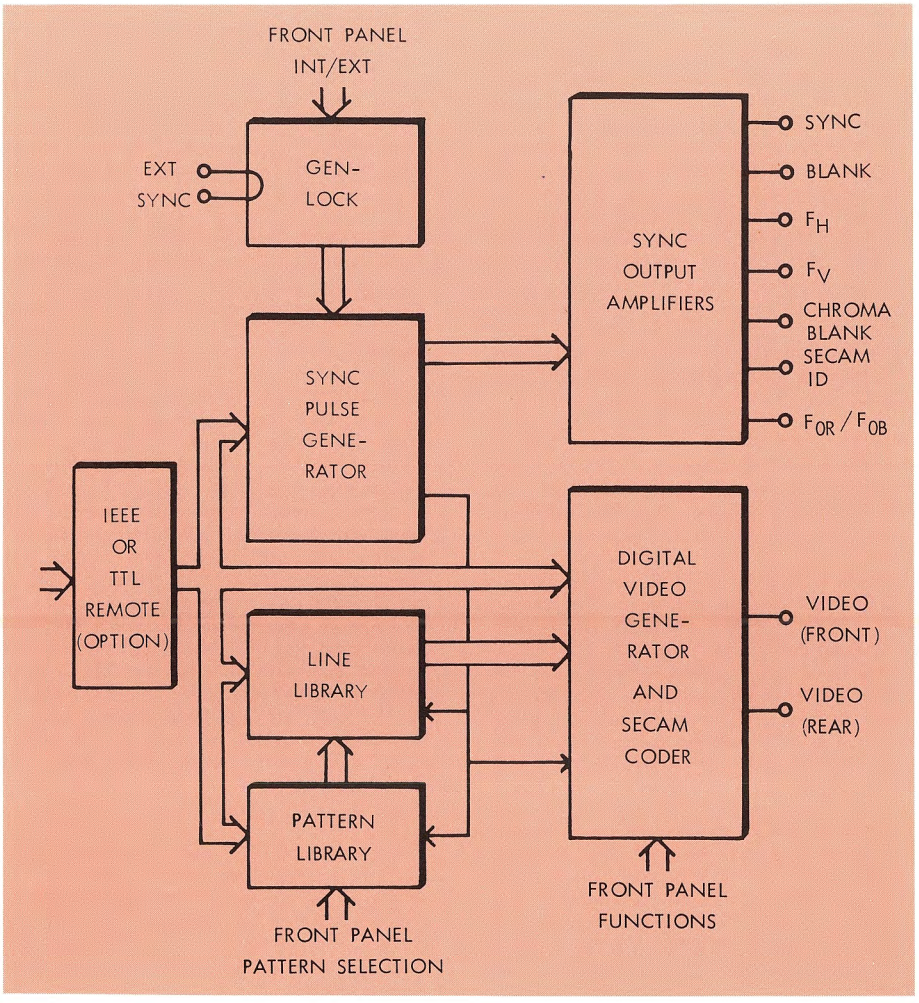
Special function buttons for test and aligment applications

Precision SECAM coder with PLL stabilized colour subcarriers (SECAM III B)

Technical description

The SPG part of the PM 5632 is based on two special Philips integrated circuits that generate the various sync pulses and sync waveforms. Additional circuitry assists with the genlock function. The timing between the external signal and the internally generated signals can be adjusted with a front panel screwdriver control. The sync signals from the sync ICs are passed through special sync output amplifiers that amplify them to the specified level, shape the transients to the required rise/fall times and provide the power for 75 Ω output impedance.

The generator part makes use of a digital generation principle, i.e. the waveforms for the luminance and the two colour difference signals are stored in a digital format in PROMs. This digital "pattern" forms the so-called line library that contains the information for all lines used to compose the various test signals and patterns (horizontal information). The pattern library is also a digital "pattern" stored in a PROM, that selects the required lines across the screen to form the various patterns (vertical information). The output from the line library is fed to the video generator, which has D/A converters for the luminance and colour difference signals, a precision SECAM coder and various amplifiers. The processor part



handled the special modification functions. Since the FM modulators of the SECAM coder are the only analog circuits in the signal path, much care has been taken to ensure accurate and stable operation. Phase-lock loops are used to stabilize the zero modulation frequencies. These frequencies can, by the way, be measured at the f_{OR}/f_{OB} output.

The front panel controls and the IEEE bus have access to the genlock circuit, the pattern library PROM and the special functions. Furthermore the IEEE bus has access to the line library. Therefore it is possible to create new patterns from the line library by computer control. The latest computer generated pattern is always available as pattern no.1, even after the computer has been disconnected. The PM 5632 has battery back-up of the internal control system, so when it is switched on, it automatically returns to the settings it had before it was switched off.

TECHNICAL DATA

Video signals

COLOUR BAR SIGNALS — Pattern no. 11: full-field 100% contrast. No.12: full-field 75%. No.13: full-field 75%, 100% white (EBU). No.14: full-field 25%. No. 15: split-field EBU and red (2 : 1). No. 16: split-field EBU and blue (2 : 1). No. 17: split-field EBU and grey (2 : 1). No. 18: split-field EBU and black/white transient (2 : 1). No.19: split-field 25% contrast, 75% contrast and bl/wh transient (1 : 1 : 1). No.20: split-field EBU and luminance reference (2 : 1). No.21: EBU and reverse EBU (1 : 1). No.22: split-field EBU, white and PLUGE (2 : 1). No. 23: monitor test signal. No.24: EBU type colour bar, vertical time-base.

PURITY PATTERNS — Pattern no. 25: full-field red 75% contrast. No.26: full-field green. No.27: full-field blue. No. 28: full-field yellow. No. 29: full-field cyan. No. 30: full-field magenta.

OTHER COLOUR PATTERNS — Pattern no. 31: yellow/red/yellow colour transients (75% contrast). No. 32: R-Y = 0/B-Y = 0 pattern (75%). No. 33: R-Y = 0/B-Y = 0/G-Y = 0 pattern (75%). No. 34: black/white/green pattern. No. 35: TV receiver pattern. No. 36: chrominance/luminance test pattern (white/red/white/red/white colour transients). No. 37 - 40: black signal.

CONVERGENCE PATTERNS — Pattern no. 41: cross-hatch 14 x 19 lines. No.42: cross-hatch with dots in the centres. No. 43: dot pattern. No. 44: cross-hatch with overscan marks. No. 45: cross-hatch with border castellations. No. 46: cross-hatch with dots, inverted (black lines on white background).

PLUGE SIGNALS — Pattern no. 47: PLUGE with gamma corrected grey scale. No. 48: PLUGE, black (APL = 0%). No. 49: PLUGE with white reference (APL = 50%).

COLOUR BALANCE PATTERNS — Pattern no.50: black signal. No.51: window 5% of white. No. 52: window 10%. No. 53: window 15%. No. 54: window 20%. No. 55: window 30%. No. 56: window 40%. No.57: window 50%. No.58: window 60%. No. 59: window 70%. No. 60: window 80%. No. 61: window 85%. No. 62: window 90%. No. 63: window 95%. No. 64: window 100%.

EHT PATTERNS (Extremely High Tension) — Pattern no. 65: EHT 10% (cross-hatch with white window, 10% APL). No. 66: EHT 30% APL. No. 67: EHT 50% APL. No. 68: EHT 70% APL. No.69: EHT 90% APL.

SQUAREWAVE PATTERNS — Pattern no. 70: 50 Hz squarewave, positive transient. No. 71: 50 Hz, negative transient. No. 72: 15.625 kHz, positive transient. No. 73: 15.625 kHz, negative transient. No. 74: 250 kHz squarewave. No.75: checkerboard.

REFLECTION PATTERN — Pattern no. 76: reflection signal. Type of signal: white needle pulse on black background (upper half of screen), black needle pulse on screen).

LINEARITY SIGNALS — Pattern no.77: sawtooth signal (luminance, line time-base). No. 78: grey scale, 10-riser, positive. No. 79: grey scale, 5-riser, positive. No.80: grey scale, 10-riser, negative. No. 81: grey scale, 5-riser, negative. No.82: chroma sweep. No.83: grey scale, CISPR (vertical time-base).

MISCELLANEOUS — Pattern no.84: full-field white 100%. No. 85: white 50% (grey). No. 86: white 30% (dark grey). No. 87: chroma signal -(B-Y), 75% contrast. No. 88: SPLUGE (monitor line-up signal).

QUICK LIBRARY — Patterns no.1 to no. 10 are the most commonly used signals from the main library (11 - 88). Most routine checks can be performed with the signals from the quick library. Pattern no. 1: black signal. Note: instruments that have the optional IEEE interface bus installed, use pattern no. 1 as address for the computer generated pattern. Pattern no. 2: EBU colour bar (as no.13). No. 3: split-field EBU colour bar with grey reference (as no.17). No.4: split-field EBU colour bar with red (as no. 15). No. 5: monitor test pattern (as no. 23). No. 6: PLUGE with grey scale (as no.47). No.7: full-field red (as no. 25). No. 8: cross-hatch with overscan marks (as no.44). No. 9: window 5% (as no. 51). No. 10: window 100% (as no. 64).

QUICK SELECTOR — The single digit pattern pre-selector allows the user to allocate the pre-select numbers to any of the 78 patterns of the main library. Together with the above quick library the selection of required patterns can be done very speedily.

CUSTOMER PROGRAMMED PATTERNS — Pattern numbers not specified are reserved for future patterns and for customer defined signals. PHILIPS is prepared to design and program PROMs with customer defined signals against a fee that will be related to the actual amount of costs involved in making these PROMs. Such signals must be accurately specified in terms of horizontal and vertical timing as well as luminance and chrominance levels.

VI SIGNAL — Type of signal: EBU colour bar (pattern no. 13). Generation: during lines 19-22 and 332-335 (by internal selection). Switchable by front panel push-button.

Video outputs

VIDEO OUT — Number of outputs: 2 BNCs, 1 on the front, 1 on the rear. Output impedance 75Ω. Return loss: > 34 dB up to 7 MHz. Nominal output level: 1 Vpp. Luminance level: 700 mV ± 0.75%. Rise/fall times of luminance: 165 ns ± 15 ns. Sync level: 300 mV ± 2%. Rise/fall times of sync: 230 ns ± 20 ns. Chroma levels: D_R = 215 mV ± 15 mV. D_B = 166 mV ± 15 mV (line reference bursts).

Sync pulse generator (SPG)

MODES OF OPERATION — Internal mode: the SPG free-runs, i.e. all internal frequencies and timings are locked to the internal master oscillator. External mode (genlock): the master oscillator locks to the incoming sync signal in such a way that the internally generated sync pulses run synchronously with the external signal. If the external signal has horizontal colour identification bursts, then the SPG locks to the incoming colour sequence. Mode of genlocking: slow.

MASTER OSCILLATOR — Type of oscillator: precision Temperature Compensated crystal (X-tal) Oscillator (TCXO). Frequency: 10.000 MHz ± 1 x 10^{-6} (0-50°C). Ageing: < 1 x 10^{-7} per month.

COLOUR SUBCARRIERS — Type of oscillators: Voltage Controlled Oscillator (VCO). Zero modulation frequencies: frequency-locked to the master oscillator. Frequency of red subcarrier: 282 x f_H = 4.406 250 MHz ± 2 kHz. Frequency of blue subcarrier: 272 x f_H = 4.250 000 MHz ± 2 kHz. Subcarrier reset sequence: 0°, 0°, 180°, 0°, 0°, 180°.

GENLOCK CHARACTERISTICS — Lock-in time: < 7 sec. Locking range: nominal frequency ± 10 ppm. Jitter: < 10 ns at nominal frequency and input level. Line phase adjustment: ± 3 µs with front panel screwdriver potentiometer. D_R/D_B lock-up level: ± 6 dB. $D_R + D_B$ drop-out level: - 12 dB. Lock-in time (subcarrier): < 1 sec.

Synchronizing signals

COMPOSITE SYNC (mixed sync) — Number of outputs: 1 BNC on the rear. Output impedance: 75Ω. Return loss: > 26 dB up to 4 MHz. Output level: 4 Vpp ±

0.4 Vpp. Rise/fall times: 200 ns. Line sync pulses: 4.7 µs ± 0.2 µs. Equalizing pulses: 2.35 µs ± 0.1 µs. Serration pulses: 4.7 µs ± 0.2 µs. Front porch: 1.5 µs ± 0.2 µs. Number of equalizing pulses: 5 + 5. Number of serration pulses: 5.

COMPOSITE BLANKING — Number of outputs: 1 BNC on the rear. Output impedance: 75Ω. Return loss: > 26 dB up to 4 MHz. Output level: 4 Vpp ± 0.4 Vpp. Rise/fall times: 200 ns. Line blanking: 12.0 µs ± 0.3 µs. Field blanking: 25 lines + 12 µs.

HORIZONTAL DRIVE (F_H) — Number of outputs: 1 BNC on the rear. Output impedance: 75 Ω. Return loss: > 26 dB up to 4 MHz. Output level: 4 Vpp ± 0.4 Vpp. Rise/fall time: 200 ns. Pulse width: 7.2 µs ± 0.2 µs.

VERTICAL DRIVE (F_V) — Number of outputs: 1 BNC on the rear. Output impedance: 75Ω. Return loss: > 26 dB up to 4 MHz. Output level: 4 Vpp ± 0.4 Vpp. Rise/fall times: 200 ns. Pulse width: 10 lines (640 µs).

CHROMA BLANKING — Number of outputs: 1 BNC on the rear. Output impedance: 75Ω. Return loss: > 26 dB up to 4 MHz. Output level: 4 Vpp ± 0.4 Vpp. Rise/fall times: 200 ns. Type of signal: line blanking 7.2 µs ± 0.2 µs and field blanking 25 lines + 7.2 µs, except during lines 7-15 and 320-328.

SECAM IDENTIFICATION — Number of outputs: 1 BNC on the rear. Output impedance: 75Ω. Return loss: > 26 dB up to 4 MHz. Output level: 4 Vpp ± 0.4 Vpp. Rise/fall times: 200 ns. Type of signal: squarewave of half the horizontal line frequency. Polarity: positive during "red" lines.

SUBCARRIER OUT (F_{OR}/F_{OB}) — Number of outputs: 1 BNC on the rear. Output impedance: 75 Ω. Output level: 1 Vpp. Type of signal: zero modulation red subcarrier, zero modulation blue subcarrier, or both alternating at horizontal line frequency (by internal selection).

External synchronization

INPUT — Number of inputs: 1 on the rear. Type of input: high-ohmic looped-through (2 BNC connectors). Return loss (when terminated with 75 Ω): > 34 dB up to 7 MHz.

EXTERNAL SIGNALS — Types: 1) composite video signal, 2) black burst signal, or 3) composite sync. Input level: 0.5 Vpp - 4 Vpp. Permissible hum: 100% (max. 1 Vpp).

Remote control (optional)

IEEE BUS — Type: PM 8520 standard general purpose interface bus (GPIB). Functions: controls all main functions (push-buttons) and has access to the internal line library. Connector: standard IEEE-488 on the rear. Instrument address: is set with DIL switch on the rear.

TTL CONTROL — Type: PM 8530 standard TTL level control option. Functions: control of the pre-selector and external synchronization. Polarity: a function is active when the corresponding line is low (grounded).

Front panel controls and indicators

- Power on/off
- External synchronization on/off
- Vertical SECAM identification pulses on/off (bottles)
- Horizontal phasing (screwdriver)
- Local/remote control
- Pattern selector (count down)
- Pattern selector (count up)
- Pre-selector (count down)
- Pre-selector (count up)
- Vertical interval (VI) signal on/off
- Sync off/on
- Chrominance off/on
- Luminance off/on
- B-Y (D_B) off/on
- R-Y (D_R) off/on
- Power on indicator (green LED)
- No external sync (red LED, only in function when EXT sync has been selected)

Power requirements

Voltage: 110/120/220/240 V + 10%/ - 15%. Frequency: 48-65 Hz. Consumption: 35 W at 220 V.

Environmental conditions

Operating temperature: 5° - 45° C ambient. Storage temperature: - 30° to + 70° C. Climatic conditions: Philips class C1. Mechanical conditions: Philips class M1. Supply conditions: Philips class S2.

Safety and EMI

Safety: in conformity with IEC 348 class I. Electromagnetic interference (EMI): in compliance with VDE 0871/DIN 57871 class B.

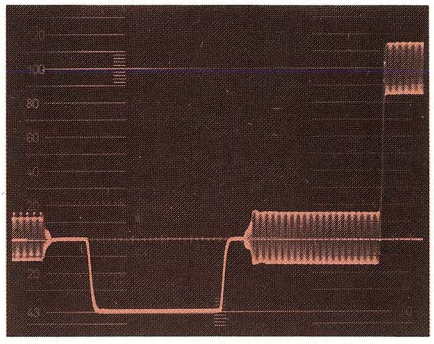
Mechanical data

19" rack/table cabinet, 1 rack unit high.
Height : 44 mm
Width : 440 mm (excl. brackets)
Depth : 460 mm
Weight : 5.2 kg
The cabinet is supplied with handles and rack mount brackets (intergral part of the cabinet) plus rubber feet and a tilt bracket (both removable). When rack mounted the cabinet should be supported at the rear.

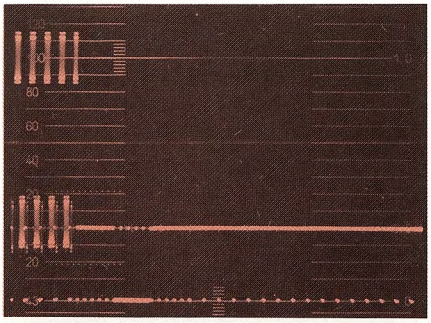
Standard accessories:
- Combined operation and service manual
- Mains cord
- Extention board (for repair)
- 75Ω termination

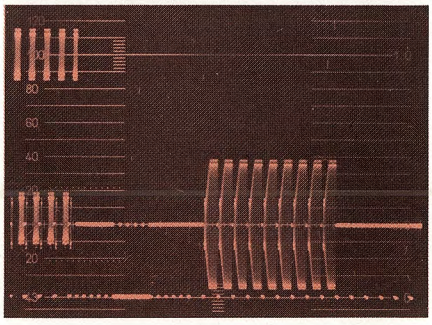
Options

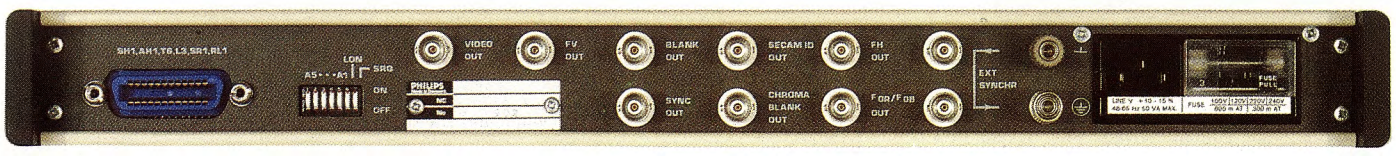
- PM 8520 IEEE interface bus
- PM 8530 TTL remote control



SECAM synchronization: above line subcarrier synchronization, below the vertical interval without and with vertical subcarrier bursts ("bottles").







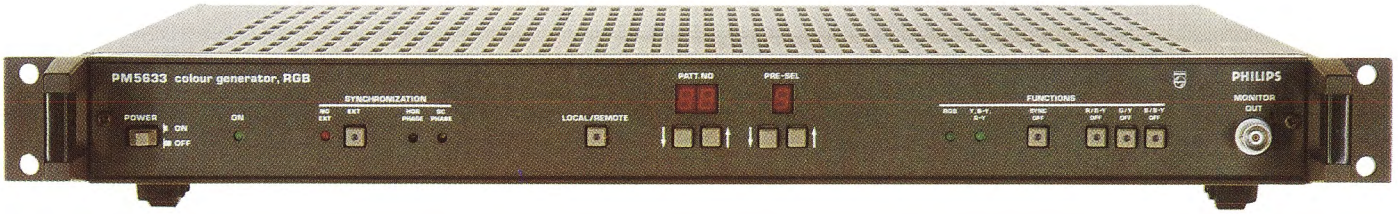
Colour generator, RGB

PM 5633

NEW

Code no. PM 5633:
9449 056 33003 (G-version, 625-lines PAL)
9449 056 33108 (M-version, 525-lines NTSC)

IEEE 488 IEC 625



Colour sync pulse generator with genlock facilities

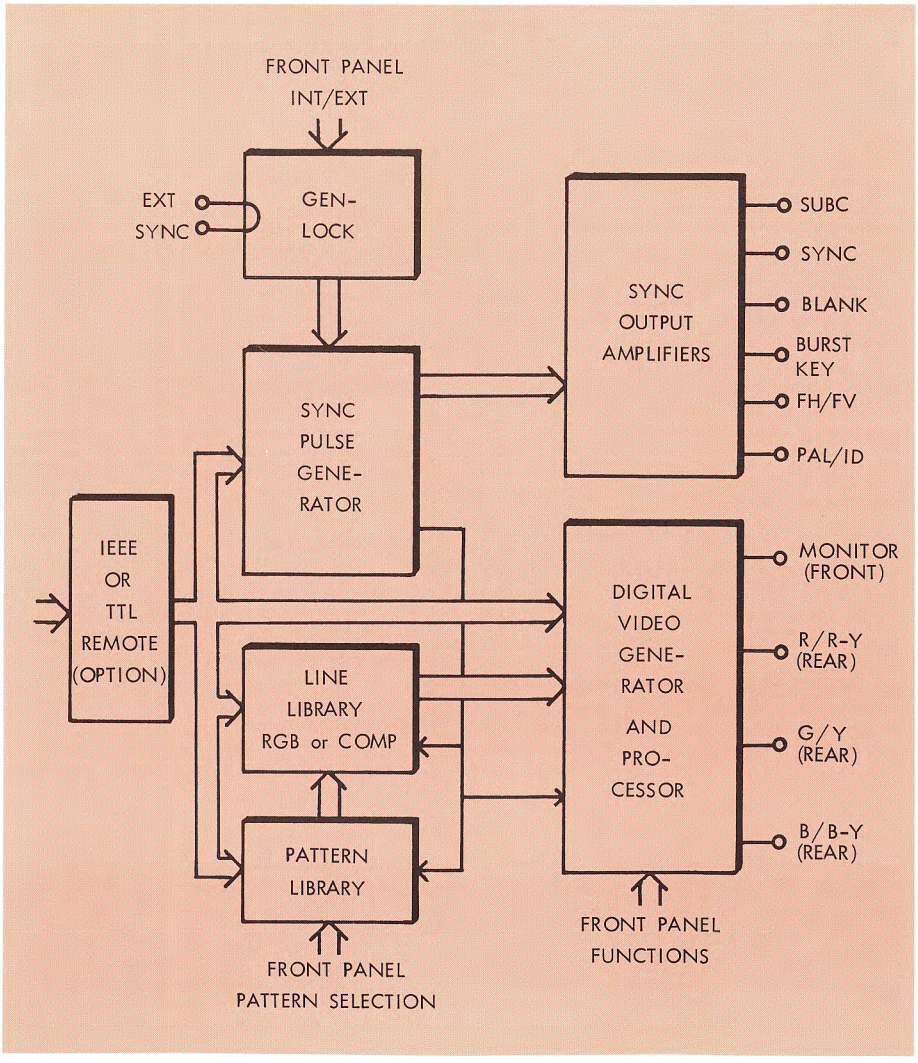
The test signals are generated digitally with PROMs and D/A converters

Supplies either RGB or component signals Y/R-Y/B-Y (internal selection)

Technical description

The SPG part of the PM 5633 is based on two special Philips integrated circuits that generate the various sync pulses and sync waveforms. Additional circuitry assists with the genlock function and line/subcarrier phasing. The timing between the external signal and the internally generated signals can be adjusted with front panel screwdriver controls (horizontal phase and subcarrier phase). The sync signals from the sync ICs are passed through special sync output amplifiers that amplify them to the specified level, shape the transients to the required rise/fall times and provide the power for 75 Ω output impedance. The colour subcarrier is filtered into a sine wave signal with low harmonic distortion.

The generator part makes use of a digital generation principle, i.e. the waveforms for the luminance and the two colour difference signals are stored in a digital format in PROMs. This digital "pattern" forms the so-called line library that contains the information for all lines used to compose the various test signals and patterns (horizontal information). The pattern library is also a digital "pattern" stored in a PROM, that selects the required lines across the screen to form the various patterns (vertical information). The output from the line library is fed to the video generator, which has D/A converters for the RGB or Y/R-Y/B-Y signals and va-



rious amplifiers. The processor part handles the special modification functions. Internal selectors programme the generator for either RGB or Y/R-Y/B-Y.

The front panel controls and the IEEE bus have access to the genlock circuit, the pattern library PROM and the special functions. Furthermore the IEEE bus has access to the line library. Therefore it is possible to create new patterns from the line library by computer control. The latest computer generated pattern is always available as pattern no.1, even after the computer has been disconnected. The PM 5633 has battery back-up of the internal control system, so when it is switched on, it automatically returns to the settings it had before it was switched off.

TECHNICAL DATA

Video signals

COLOUR BAR SIGNALS (PAL-version) — Pattern no.11: full-field colour bar, 100% contrast. No.12: full-field 75%. No.13: full-field 75%, 100% white (EBU). No. 14: full-field colour bar BBC type. No. 15: split-field EBU and red (2 : 1). No. 16: split-field EBU and blue (2 : 1). No. 17: split-field EBU and grey (2 : 1). No. 18: split-field EBU and R-Y = 0/B-Y = 0 transient (2 : 1). No.19: split-field EBU and luminance reference. No.20: split-field EBU and reverse EBU (1 : 1). No. 21: split-field EBU and -(B-Y) = 0/white/ R-Y = 0/PLUGE (2 : 1). No.22: monitor test pattern. No.23: split-field BBC and red (2 : 1). No.24: split-field BBC and grey (2 : 1). No.25: EBU type colour bar, minimum phase shift. No.26: EBU type, maximum phase shift. No.27: EBU type, vertical time-base. No.28: coder test signal.

COLOUR BAR SIGNALS (NTSC-version) — Pattern no.11: full-field colour bar, 100% contrast. No.12: full-field 75%. No.13: full-field 75%, 100% white (FCC). No.14: split-field EIA colour bar with -I/white/Q/black (3 : 1). No.15: split-field FCC and red (2 : 1). No.16: split-field FCC and blue (2 : 1). No.17: split-field FCC and grey (2 : 1). No.18: split-field FCC and R-Y = 0/B-Y = 0 (2 : 1). No.19: split-field FCC and luminance (2 : 1). No.20: split-field FCC and reverse FCC (2 : 1). No.21: split-field EIA and -I/white/Q/PLUGE (3 : 1). No.22: SMPTE pattern. No.23: split-field EIA and red (2 : 1). No.24: split-field EIA and grey (2 : 1). No.25: FCC type colour bar with minimum phase shift. No.26: FCC type with maximum phase shift. No. 27: FCC type, vertical time-base. No. 28: coder test signal.

PURITY PATTERNS — Pattern no.29: full-field red 75% contrast. No.30: full-field green. No.31: full-field blue. No. 32: full-field yellow. No.33: full-field cyan. No.34: full-field magenta.

OTHER COLOUR PATTERNS — Pattern no.35: yellow/red/yellow colour transients (75% contrast). No.36: R-Y = 0/B-Y = 0 pattern (75%). No.37: R-Y = 0/B-Y = 0/ G-Y = 0 pattern (75%). No.38: PAL-version: anti-PAL signal (grey signal with two windows of alternating B-Y and alternating R-Y). No.38: NTSC-version: blue bars. No.39: TV receiver pattern. No.40: chrominance/luminance test pattern (white/red/white/red/white colour transients).

CONVERGENCE PATTERNS — Pattern no.41: cross-hatch 14 x 19 lines. No.42: cross-hatch with dots in the centres. No. 43: dot pattern. No.44: cross-hatch with overscan marks. No.45: cross-hatch with border castellations. No.46: cross-hatch with dots, inverted (black lines on white background).

PLUGE SIGNALS — Pattern no.47: PLUGE with gamma corrected grey scale. No.48: PLUGE, black (APL = 0%). No. 49: PLUGE with white reference (APL = 50%).

COLOUR BALANCE PATTERNS — Pattern no.50: black signal. No.51: window 5% of white. No.52: window 10%. No. 53: window 15%. No.54: window 20%. No.55: window 30%. No.56: window 40%. No.57: window 50%. No.58: window 60%. No.59: window 70%. No.60: window 80%. No.61: window 86%. No. 62: window 90%. No.63: window 95%. No.64: window 100%.

EHT PATTERNS (Extremely High Tension) — Pattern no.65: EHT 10% (cross-hatch with white window, 10% APL). No.66: EHT 30% APL. No.67: EHT 50% APL. No.68: EHT 70% APL. No.69: EHT 90% APL.

SQUAREWAVE PATTERNS — Pattern no. 70: 50 (60) Hz squarewave, positive transient. No.71: 50 (60) Hz, negative transient. No.72: 15.625 (15.734) kHz, positive transient. No.73: 15.625 (15.734) kHz, negative transient. No.74: 250 kHz squarewave. No.75: checker-board.

REFLECTION PATTERN — Pattern no.76: reflection signal. Type of signal: white needle pulse on black background (upper half of screen), black needle pulse on white background (lower half of screen).

LINEARITY SIGNALS — Pattern no.77: sawtooth signal (luminance, line time-base). No.78: sawtooth with superimposed chrominance (100 mVpp (20 IRE), 60° phase). No.79: grey scale, 10-riser positive. No.80: grey scale, 10-riser with chroma (140 mVpp (20 IRE), 60°). No. 81: grey scale, 5-riser positive. No.82: grey scale, 5-riser with chroma (140 mVpp (20 IRE), 60°). No.83: grey scale, 10-riser negative. No.84: grey scale, 5-riser negative. No.85: B-Y sawtooth. No.86: R-Y sawtooth. No.87: grey scale CISPR (vertical time-base). No.88: B-Y/R-Y staircase, 5-riser positive (60°). No.89: R-Y staircase, 8-riser negative (90°).

MISCELLANEOUS (PAL-version) — Pattern no.90: CCIR line 331 signal. No.91: SPLUGE (monitor line-up signal). No.92: full-field white 100%. No.93: colour bar 25% contrast. No.94: split-field colour bar, 25% and 75% contrast (1 : 1). No. 95: SECAM sweep. No.96: white 50% (grey). No.97: white 30% (dark grey).

MISCELLANEOUS (NTSC-version) — Pattern no.90: chroma signal (pink panter). No.91: full-field VIR (Vertical Interval Reference signal). No.92: white 100%. No.93: white 50%. No.94: white 30%.

QUICK LIBRARY — Patterns no.1 to no. 10 are the most commonly used signals from the main library (11-97). Most routine checks can be performed with the signals from the quick library. Pattern no. 1: black signal. Note: instruments that have the optional IEEE interface bus installed, use pattern no.1 as address for the computer generated pattern. Pattern no.2: EBU (FCC) colour bar (as no.13). No.3: split-field EBU (FCC) colour bar with grey reference (as no.17). No.4: split-field EBU (FCC) colour bar with red (as no.15). No.5: monitor test pattern, SMPTE (as no.23). No.6: PLUGE with grey scale (as no.47). No.7: full-field red (as no.25). No.8: cross-hatch with overscan marks (as no.44). No.9: window 5% (as no.51). No.10: window 100% (as no.64).

QUICK SELECTOR — The single digit pattern pre-selector allows the user to allocate the pre-select numbers to any of the 97 patterns of the main library. Together with the above quick library the selection of required patterns can be done very speedily.

CUSTOMER PROGRAMMED PATTERNS — Pattern numbers not specified are reserved for future patterns and for customer defined signals. PHILIPS is prepared to design and program PROMs with customer defined signals against a fee that is related to cost of the actual work involved in making the PROMs. Such signals must be accurately specified in terms of horizontal and vertical timing, and in luminance and chrominance levels.

Video outputs

VIDEO OUT — Number of outputs: 1 set on the rear (3 BNCs for Red/R-Y, Green/Y and Blue/B-Y). Type of signal: RGB or component (Y/R-Y/B-Y). Output impedance 75Ω. Return loss: > 34 dB up to 7 MHz. Nominal output level: 700 mV (100 IRE = 714 mV, RGB only). Accuracy of levels: nominal ± 0.5%. Rise/fall times: 165 ns ± 15 ns. Set-up (NTSC-version only): 7.5 IRE except patterns 70-96. Sync: composite sync may be added to any of the three outputs (by internal selection). Sync level: 300 mV (40 IRE). Rise/fall times: 230 ns ± 20 ns (140 ns ± 20 ns).

MONITOR OUT — Number of outputs: 1 BNC on the front. Type of signal: luminance (with or without sync). Output impedance: 75Ω. Return loss: > 34 dB up to 7 MHz. Luminance level: 700 mV (100 IRE) ± 3%. Sync level: 300 mV (40 IRE) ± 3%. Rise/fall times luminance: 165 ns ± 15 ns. Rise/fall times sync: 230 ns (140 ns) ± 20 ns.

PM 5633

Sync pulse generator (SPG)

MODES OF OPERATION — Internal mode: the SPG free-runs, i.e. all internal frequencies and timings are locked to the internal master oscillator. External mode (genlock): the master oscillator locks to the incoming video or sync signal in such a way that the internally generated sync pulses run synchronously with the external signal. If the external signal has colour burst, then the subcarrier of the SPG locks to the that. Mode of genlocking: slow.

MASTER OSCILLATOR — Type of oscillator: precision Temperature Compensated crystal (X-tal) Oscillator (TCXO). Frequencies (2 x fsubc):
- G-version: 8.867 237 50 MHz (4.433 618 75 MHz)
- M/NTSC-version: 7.159 090 MHz (3.579 545 MHz)

Accuracy (referred to 4 MHz): ± 1.25 Hz (25-40° C ambient), ± 2.5 Hz (10-50° C ambient). Ageing: < 0.1 ppm per month.

Synchronizing signals

COLOUR SUBCARRIER — Number of outputs: 1 BNC on the rear. Output impedance: 75Ω. Return loss: > 26 dB at 4 MHz. Output level: 2 Vpp ± 0.2 Vpp.

COMPOSITE SYNC (PAL-version) — Number of outputs: 1 BNC on the rear. Output impedance: 75Ω. Return loss: > 26 dB up to 4 MHz. Output level: 4 Vpp ± 0.4 Vpp. Rise/fall times: 200 ns. Line sync pulses: 4.7 s ± 0.2 s. Equalizing pulses: 2.35 µs ± 0.1 µs. Serration pulses: 4.7 µs ± 0.2 µs. Front porch: 1.5 µs ± 0.2 µs. Number of equalizing pulses: 5 + 5. Number of serration pulses: 5.

COMPOSITE SYNC (NTSC-version) — Number of outputs: 1 BNC on the rear. Output impedance: 75Ω. Return loss: > 26 dB up to 4 MHz. Output level: 4 Vpp ± 0.4 Vpp. Rise/fall times: 200 ns. Line sync pulses: 4.7 µs ± 0.2 µs. Equalizing pulses: 2.38 µs ± 0.1 µs. Front porch: 1.5 µs ± 0.2 s. Serration pulses: 4.7 µs ± 0.2 µs. Number of equalizing pulses: 6 + 6. Number of serration pulses: 6.

COMPOSITE BLANKING — Number of outputs: 1 BNC on the rear. Output impedance: 75Ω. Return loss: > 26 dB up to 4 MHz. Output level: 4 Vpp ± 0.4 Vpp. Rise/fall times: 200 ns. Line blanking: 12.0 µs ± 0.3 µs (11.0 s ± 0.3 µs). Field blanking: 25 lines + 12 µs (21 lines + 11 µs).

HORIZONTAL DRIVE (F_H) or VERTICAL DRIVE (F_V) — Number of outputs: 1 BNC on the rear. Output impedance: 75Ω. Return loss: > 26 dB up to 4 MHz. Output level: 4 Vpp ± 0.4 Vpp. Rise/fall time: 200 ns. Pulse width: 7.2 µs ± 0.2 µs (F_H) or 10 lines (6 lines) in case of F_V).

BURST KEY (BK) — Number of outputs: 1 BNC on the rear. Output impedance: 75Ω. Return loss: > 26 dB up to 4 MHz. Output level: 4 Vpp ± 0.4 Vpp. Rise/fall times: 200 ns. Burst width: 2.25 s ± 0.23 s (2.5 s ± 0.15 s). Burst start relative to line sync: 5.6 s ± 0.15 s. Burst suppression (PAL-version): 623-6, 310-318, 622-5 and 311-319. Burst suppression (NTSC-version): 1-9 both fields.

PAL IDENTIFICATION (not used in NTSC) — Number of outputs: 1 BNC on the rear. Output impedance: 75Ω. Return loss: > 26 dB up to 4 MHz. Output level: 4 Vpp ± 0.4 Vpp. Rise/fall times: 200 ns. Type of signal: squarewave of half the horizontal line frequency. Polarity: positive during lines with positive R-Y phase.

External synchronization

INPUT — Number of inputs: 1 on the rear. Type of input: high ohmic looped-through (2 BNC connectors). Return loss (when terminated with 75Ω): > 34 dB up to 7 MHz.

EXTERNAL SIGNALS — Types: 1) composite video signal, 2) black burst signal, or 3) composite sync. Input level: 0.5 Vpp - 4 Vpp. Permissible hum: 100% (max. 1 Vpp).

SUBCARRIER LOCKING — Locking range: ± 25 Hz from nominal frequency. Locking time: < 1 sec. Phase jitter: < 10. Range or phase adjustment: > 360° (front panel screwdriver control.

SYNC LOCKING — Locking range: ± 10 ppm from nominal frequency. Locking time: < 7 sec. Timing jitter: < 10 ns (25 ns with 100% hum). Range of timing adjustment: > ± 3 µs (by front panel screwdriver control.

Remote control (optional)

IEEE BUS — Type: PM 8520 standard general purpose interface bus (GPIB). Functions: controls all main functions (push-buttons) and has access to the internal line library. Connector: Standard IEEE-488 on the rear. Instrument address: is set with DIL switch on the rear.

TTL CONTROL — Type: PM 8530 standard TTL level control option. Functions: control of the pre-selector and external synchronization. Polarity: a function is active when the corresponding line is low (grounded).

Front panel controls and indicators

- Power on/off
- External synchronization on/off
- Horizontal phasing (screwdriver)
- Subcarrier phasing (screwdriver)
- Local/remote control
- Pattern selector (count down)
- Pattern selector (count up)
- Pre-selector (count down)
- Pre-selector (count up)
- Sync off/on
- R/R-Y off/on
- G/Y off/on
- B/B-Y off/on
- Power on indicator (green LED)
- No external sync (red LED, only in function when EXT sync has been selected)
- RGB out (green LED)
- Y/B-Y/R-Y out (green LED)

Power requirements

Voltage: 110/120/220/240 V + 10%/ - 15 %. Frequency: 48-65 Hz. Consumption: 35 W at 220 V.

Environmental conditions

Operating temperature: 50-45° C ambient. Storage temperature: - 30° to + 70° C. Climatic conditions: Philips class C1. Mechanical conditions: Philips class M1. Supply conditions: Philips class S2.

Safety and EMI

Safety: in conformity with IEC 348 class I. Electromagnetic interference (EMI): in compliance with VDE 0871/DIN 57871 class B.

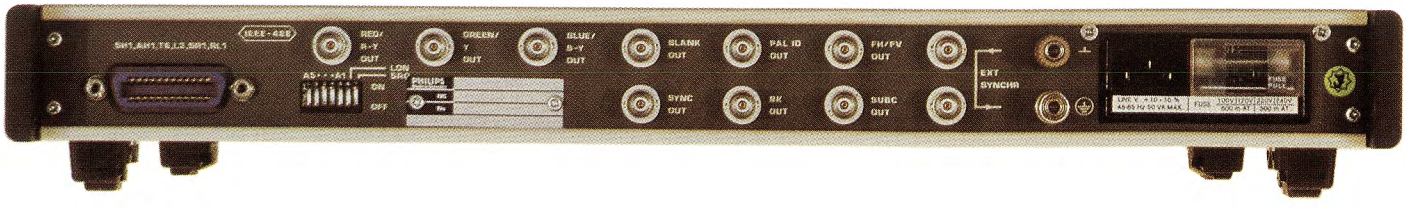
Mechanical data

19" rack/table cabinet, 1 rack unit high.
Height : 44 mm
Width : 440 mm (excl. brackets)
Depth : 460 mm
Weight : 5.2 kg

The cabinet is supplied with handles and rack mount brackets (intergral part of the cabinet) plus rubber feet and a tilt bracket (both removable). When rack mounted the cabinet should be supported at the rear.
Standard accessories:
- Combined operation and service manual
- Mains cord
- Extention board (for repair)
- 75Ω termination

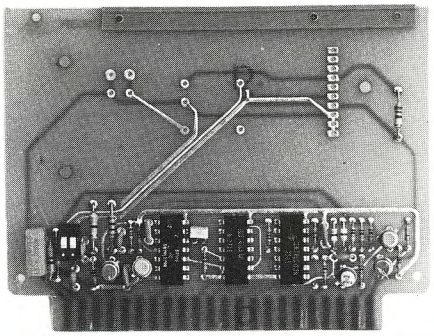
Options

- PM 8520 IEEE interface bus
- PM 8530 TTL remote control



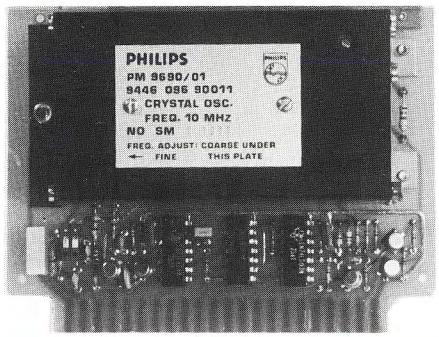
Options for PM 5534, PM 5535 and PM 5537

PM 8501 Interface card



PM 8501 Interface card is a print card that allows the PM 5534/37 to be controlled via a 10 MHz reference signal from for instance an atomic frequency standard. This may be required for such applications of the test pattern as using the colour subcarrier as a frequency standard and/or for displaying the local time in the test pattern (see clock option).
Technical data — Input level: 100 mVrms-2 Vrms. Input impedance: 75 Ω.
(Only usable with the PM 5535 when an extra input socket is mounted).

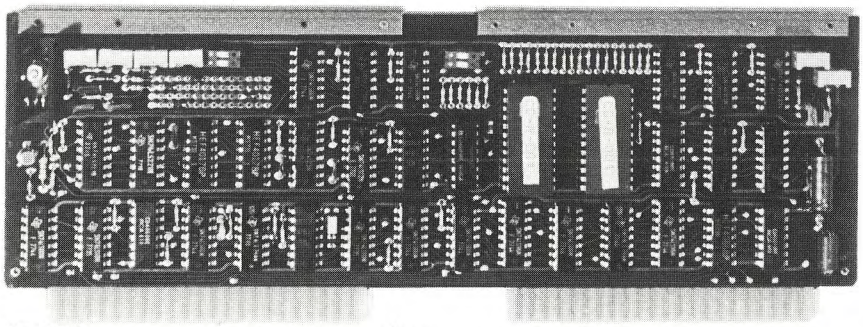
PM 8502 Oven-controlled crystal oscillator



PM 8502 Oven-controlled crystal oscillator consists of a print card with a 10 MHz crystal oscillator identical to the ones used in the PHILIPS range of precision counters. Due to very tight temperature control of the crystal and the oscillator combined with selection and ageing of the crystals, the accuracy and stability is extremely good, in fact only surpassed by atomic frequency standards.
The PM 8502 is used where the standard stability of the PM 5534/37 (± 5 Hz on the colour subcarrier) is considered insufficient.

Technical data — Frequency: 10.000 000 MHz. Accuracy: better than ± 1 Hz. Stability: better than 3×10^{-8}. Ageing: < 1×10^{-7} /month. The PM 8502 can only be used in G, I and N-versions of the PM 5534 and PM 5537.

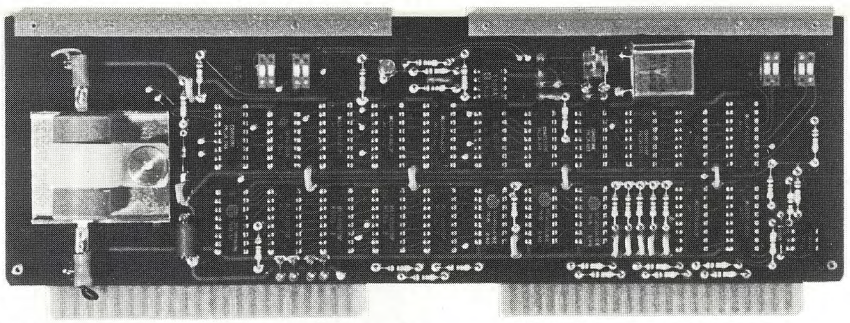
PM 8503 Text generator



PM 8503 Text generator provides two lines of text (caption) in the test pattern. The maximum number of characters per line is 14, however, the text areas in the PM 5534 and PM 5535 patterns only have space for 8 characters in the upper part and 13 characters in the lower text area.

The text facilities are used for displaying authority and source identifications, and may include name and channel of the transmitting station.
The actual wording of the caption is programmed in an integrated circuit, which is socket-mounted (Programmable Read-Only Memory). This PROM is factory programmed according to user specification, however a new PROM can be programmed and inserted in the text generator at any later time.
Together with the PM 8504 clock generator the text generator can also display the time in the test pattern.
Technical data — Number of lines: 2. Number of characters per line: max. 14. Characters: 14 x 32 dot matrix. Programming: PROM (code no. 4008 108 90180 for PM 5534, 4008 108 90190 for PM 5537.

PM 8504 Clock generator

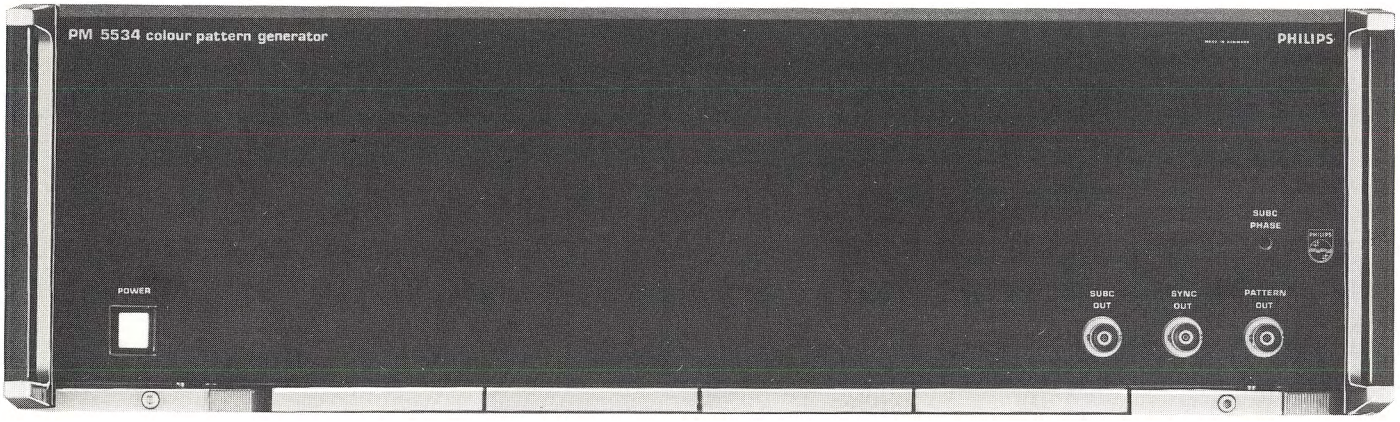


PM 8504 Clock generator produces the necessary control signals for the text generator to display the time in hours-minutes-seconds. In the normal mode the clock is controlled by the field frequency, which is derived from the 10 MHz crystal oscillator or the external 10 MHz frequency standard (in case of genlocking by the incoming colour subcarrier).
In case of mains failure the standby battery and crystal oscillator of the clock generator print card keep the clock going, so at return of the mains, the time is still correct. By means of controls that are accessible when the PM 5534/37 is pulled slightly out of the cabinet, the clock generator can be set for the correct time.
Technical data — Time: displayed in hours, minutes and seconds (0-24 or 0-12 hours). Capacity of standby battery: > 24 hours at fully charged battery. Accuracy of standby oscillator: keeps the time within 2 sec. for 24 hours.

Colour pattern generator

PM 5534

Code no. PM 5534:
9449 055 34002 (D-version, 625-lines PAL)
9449 055 34003 (G-version, 625-lines PAL)
9449 055 34005 (I-version, 625-lines PAL)
9449 055 34007 (L-version, 625-lines SECAM)
9449 055 34008 (M/PAL-version, 525-lines PAL)
9449 055 34108 (M/NTSC-version, 525-lines NTSC)
9449 055 34009 (N-version, 625-lines PAL)



Most recognized receiver test pattern in the world.

Used intensively by broadcasting authorities and TV setmakers.

Extended performance by optional text generator and/or clock.

Ultra stability obtainable with optional oven-controlled crystal oscillator or external frequency standard.

Digital circuitry ensures stable and lasting function without regular checks and alignments.

Unique pattern composition allows off-screen checking and adjusting of all important parameters of both colour and monochrome TV sets and monitors.

Built-in coder and sync pulse generator for all colour systems.

The colour pattern generator PM 5534 is a selfcontained instrument generating the well-know PHILIPS circle pattern. This pattern, recognized all over the world, offers the unique feature that most important characteristics of a TV receiver can be visually checked on the screen. The pattern of the PM 5534 is identical with the pattern produced by its predecessor PM 5544.

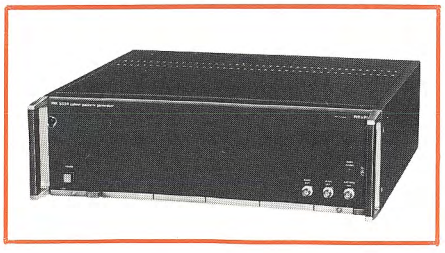
This test pattern has been adopted by the television authorities in more than 25 countries in all parts of the world as the test pattern to be transmitted outside the programme hours. Therefore the PM 5534 pattern has been made identical to that of the PM 5544, so that compatibility between the two instruments is ensured.

By using highly integrated components and customized integrated circuits it has been possible to incorporate both a colour sync pulse generator (SPG) and a colour encoder in the PM 5534. The instrument consequently only needs a main power connection to produce the composite encoded colour pattern.

In addition the PM 5534 has room for optional circuit boards to extend the performance of the instrument:
- 10 MHz input board for locking the SPG to an external frequency standard.
- text generator, giving two lines of text in the black bars inside the circle for transmitter and/or authority identification.
- clock generator, giving the time in hours, minutes and seconds in digital display.
- oven-controlled crystal oscillator for the SPG to keep the colour subcarrier within ± 1 Hz.

The PHILIPS pattern has proved to fulfil the needs of broadcasting authorities so well that broadcasters all over the world have chosen the pattern for their daily "test card" transmissions. All important TV setmakers in the world are using this pattern for the final check and alignment of their TV sets.

The PM 5534 offers very large operational savings compared with optical sources of test patterns. Being mainly a "digital" instrument, most of the circuitry consists of integrated logical circuits. These circuits have high re-



liability and stable performance that neither need frequent adjustments nor suffer from drift caused by ageing of critical components.

Pattern composition

The basic pattern outside the circle consists of a cross-hatch surrounded by border castellations. The cross-hatch is used to check geometric distortion (horizontal and vertical linearity) as well as convergence of colour receivers. Part of a cross-hatch is also available inside the circle. The centre-cross can be applied for static convergence checks, while the two mentioned areas of cross-hatch are used for checking the dynamic convergence.

The border castellations help to center the picture on the screen, and exposes insufficiency or malfunction of the sync separator of the set.

The two coloured areas beside the circle (may be switched off) are the colour difference signals. Outside these two coloured areas two vertical bars may be added to the picture. These two bars, only of importance for PAL, contain alternating B-Y and non-alternating R-Y signals and they should remain colourless, provided the colour decoder of the TV set/monitor is correctly aligned.

Inside the circle various Bl/wh steps, rectangles and needle pulses are used for checking step and pulse response of the set as well as reflections in the antenna and feeder system.

The colour bar and the grey scale signals allow easy setting of the brilliance, contrast, hue and saturation controls. The definition lines can expose lack of high frequency response and are very helpful too, when fine tuning the set to the selected channel.

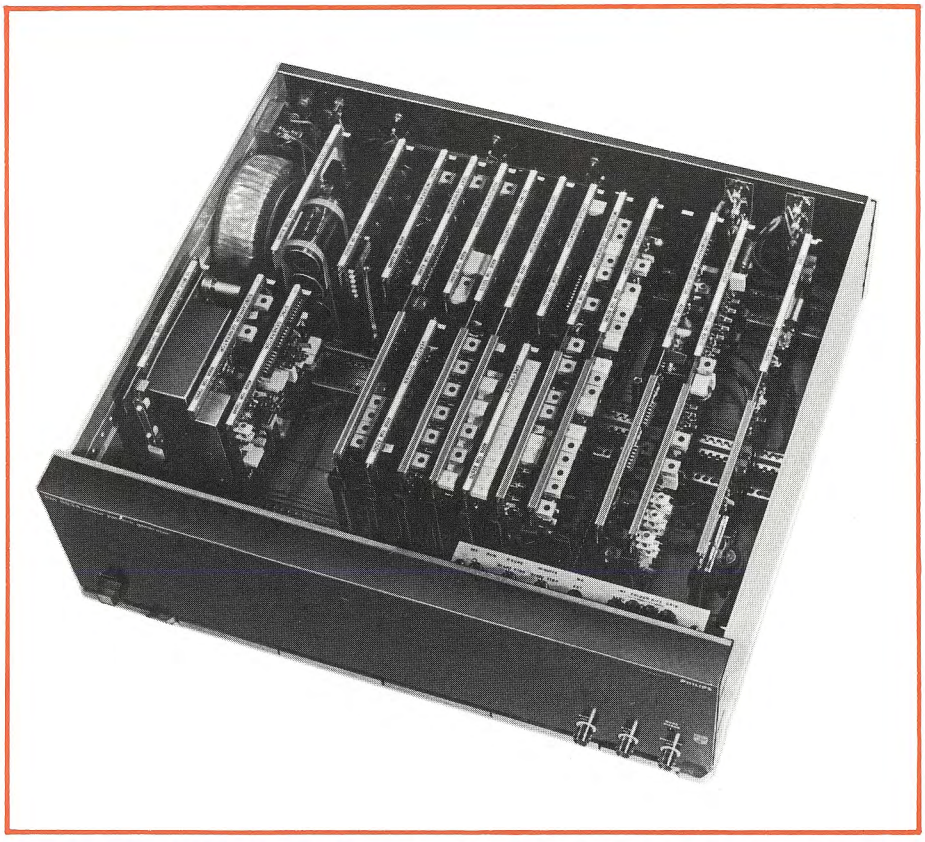
The yellow-red-yellow colour step shows clearly, when there is a delay error between the bl/wh component and the colour component of the picture.

As it can be seen the PHILIPS pattern contains many important test signals. The service technician or engineer, who is familiar with the various signals and the interpretation of them, can consequently do a very thorough check on a TV receiver, by just looking at the picture on the screen.

The circle

The circle is the dominating element of the pattern. This has been incorporated, because the eye is very sensitive to any deviations from the exact circle. Only a TV set with good horizontal and vertical linearity can reproduce the circle in an acceptable way. The circle represents in fact an extra sensitive way of checking the geometric distortion.

A circle is included in most test patterns, however PHILIPS was the first to generate a circle without inherent geometric distortion. The circle in the PM 5534 is generated by means of digital circuitry, which is controlled by a ROM (read-only-memory). In the ROM information is stored about the shape of the circle. In practice this means that any visible distortion of the circle can be allocated fully to the TV receiver or monitor under test.



The PM 5534 without circuit. It can be seen that all circuitry is mounted on printed circuit boards of plug-in type, which can easily be exchanged in case of malfunction. Repair of boards is easy by means of special extention boards, which are delivered with the PM 5534. Optional boards need only insertion in the proper print connector to work, without any modification of the instrument itself. By moving the instrument slightly out of the cabinet, access to internal switch panel is easily optained. The vertical position of the circuit boards allows good ventilation and cooling, which is important for a long, trouble-free life of the instrument.

TECHNICAL DATA (all versions)

Pattern composition

SIGNALS INSIDE THE CIRCLE, FROM TOP TO BOTTOM —

1) Black rectangle on white background. Width of rectangle: 11.4 µs. Part of rectangle is 5% below black level in order to allow precision setting of the brightness control (PLUGE signal).
2) Black/white step and white/black step with needle pulse in the white part. Width of pulse: 225 ns ± 5% (G-version), 280 ns ± 5% (other versions).
3) Squarewave signal. Repetition frequency: 250 kHz. Amplitude: 75% of white amplitude (same amplitude as R, G and B signals of the colour bar and colour step).
4) Colour bar signal. Colour: Yellow, cyan, green, magenta, red and blue. Saturation: 100%. Contrast: 75%. By internal selection also 100% bar (100/100) and BBC colour bar can be obtained. Factory adjusted: EBU colour bar 100/0/75/0 (G and L-versions), BBC colour bar (I-version), NTSC bar 77/7.5/77/7.5 (M and N-versions).
5) Crossed lines. Width vertical lines: 225 ns ± 5% (G-version), 280 ns ± 5% (other versions). Structure of the horizontal center line: 2 lines, one in each field, reversed in sequence with lines of background (check of interlace). A convergence cross is placed in the centre of the pattern.
6) Definition lines (sinusoidal). Frequen-

cies: 0.8 - 1.8 - 2.8 - 3.8 - 4.8 MHz (G-version, 1.5 - 2.5 - 3.5 - 4.0 - 4.5 - 5.25 MHz (I-version), 0.8 - 1.8 - 2.8 - 3.8 - 4.8 - 5.63 MHz (D-version), 0.8 - 1.8 - 2.8 - 1.8 - 0.8 MHz (L-version), 0.5 - 1.0 - 2.0 - 3.0 - 4.0 MHz (M and N-versions). Accuracy: ±3%. Harmonic content: < 3%.
7) Staircase. Number of levels: 6 (modification to 11 levels easy possible).
8) White/black step and black/white step with needle pulse in the black part. Width of pulse: 225 ns ± 5% (280 ns ± 5%).
9) Colour step. Colour: Red on yellow background. Width: 2.6 μs. Saturation: 100%. Contrast: 75%.
10) Circle. Mode of generation: digitally generated circle with read-only-memory. Diameter: 88% of active picture height (625-line versions), 84% for 525-line versions).

SIGNALS OUTSIDE THE CIRCLE — Left hand side of circle.
1) Vertical bar with non-alternating R-Y signals 90°/90° and B-Y = 0.
2) Vertical bar with positive and negative R-Y signals 90°/270° and B-Y = 0.
3) Two rectangles with signal G-Y = 0 (phase 326°/146°).
Right hand of circle:
1) Vertical bar with line alternating B-Y signals 0°/180° and R-Y = 0.
2) Vertical bar with positive and negative B-Y signals 0°/180° and R-Y = 0.
3) Two rectangles with signals G-Y = 0 (phase 320°/146°).
Any of chroma signals can be switched off with switches mounted behind the front plate. Level of chroma signals: ∼ 330 mV pp.

BACKGROUND SIGNALS —
1) Cross-hatch. Number: 14 horizontal x 18 vertical lines (congruent to standard 14 x 19 lines pattern). Width of vertical lines: 225 ns ± 5% (280 ns ± 5%).
2) Background level. Level: adjustable 25 -75% of white. Factory adjusted to ∼48%.
3) Black/white border castellations.

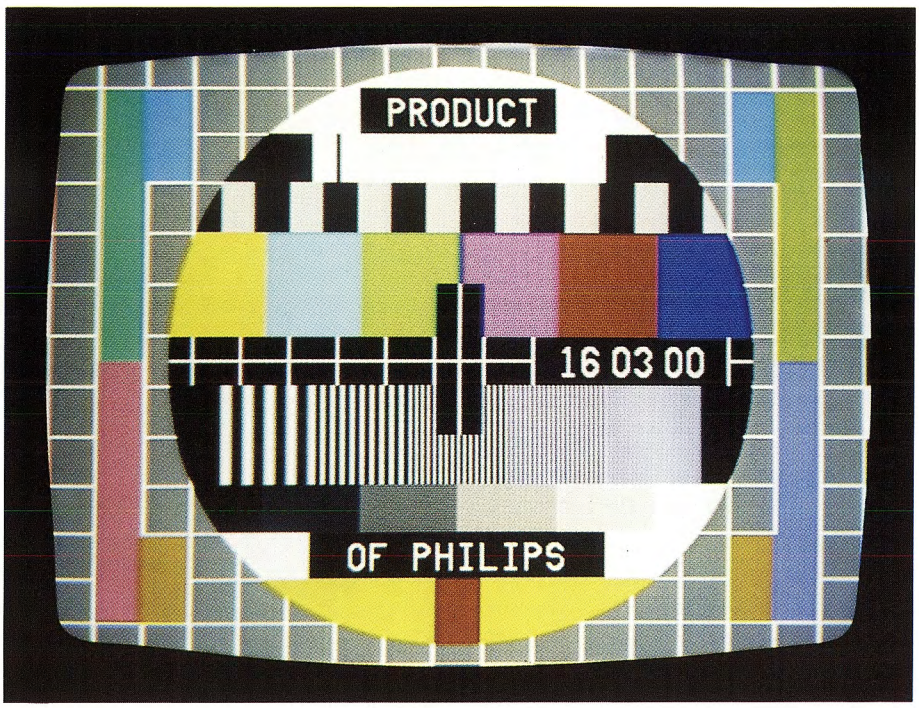
Outputs

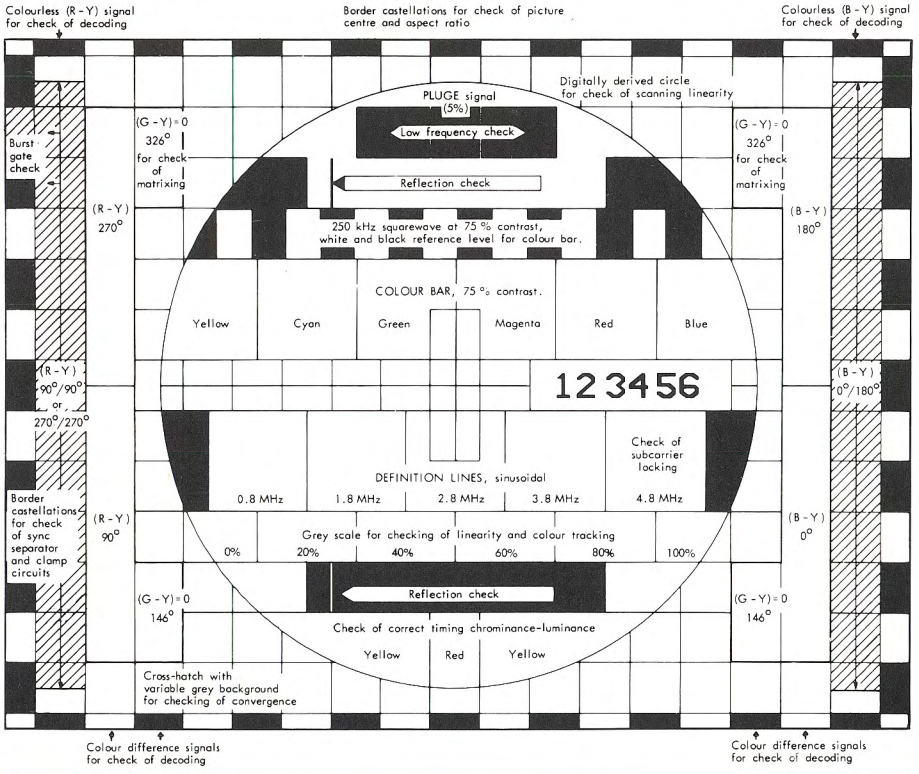
PATTERN — Number of outputs: 1 at the front, 2 at the rear. Impedance: 75 Ω ± 1%. Return loss: > 34 dB up to 7 MHz. Isolation between outputs: > 30 dB up to 4.43 MHz. Signal: composite video signal. Amplitude video: 700 mVpp ± 1%. Amplitude sync: 300 mVpp ± 1%. Amplitude colour burst: 300 mVpp ± 2% (M/NTSC: 714 mV video, 286 mV sync and colour burst). M and N-versions have 7.5% set-up.

AUXILIARY — Cross-hatch pattern with border castellations. Amplitude video: 700 mVpp ± 3% (714). Amplitude sync: 300 mVpp ± 3% (286). Width vertical lines: 225 ns ± 5% (280 ns). Rise and fall time: 100 ns ± 5%. Impedance: 75 Ω.

COMPOSITE SYNC — Number of outputs: 1 at the front, 1 at the rear. Amplitude: 4 Vpp ± 0.4 V. Impedance: 75 Ω. Return loss: > 30 dB up to 4 MHz. Rise and fall time: 200 ns ± 5%.

SUBCARRIER — Amplitude: 1 Vpp ± 0.2 V. Impedance: 75 Ω. Return loss: > 30 dB at 4.43 MHz.





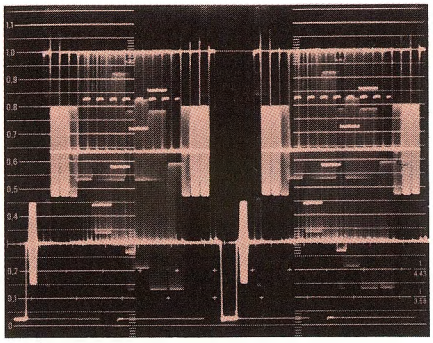
TEST OUTPUT — Can be used for service work to make the pulse pattern on the pwb's visible on a monitor. Impedance: 75 Ω. Rise and fall time: 100 ns ± 5% (125 ns).

Input

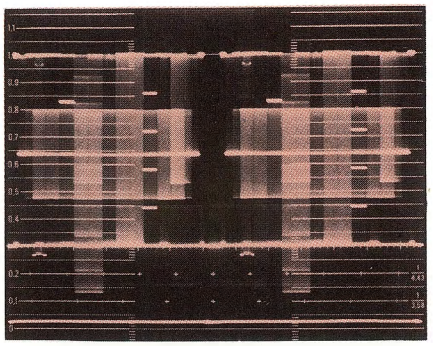
SYNCHRONIZATION — The instrument may be genlocked to a composite video signal or a black burst signal. Amplitude: 0.5 - 4 Vpp, high ohmic looped-through. Return loss: > 34 dB up to 7 MHz. Synchronization with a composite sync signal will only give bl/wh genlock[illegible]g.

SPG characteristics

GENLOCK (all versions) — The PM 5534 can genlock to an external video signal, (C)VBS, or a composite sync signal. The scanning frequencies lock to the incoming sync by phase-lock/miscount circuitry (locking time less than 7 sec). The colour subcarrier locks to the incoming colour burst, if any. Catching range: ± 25 Hz at 4.43 MHz, ± 20 Hz at 3.58 MHz. Jitter of subcarrier: < 1°.



Waveform monitor display of the PM 5534 pattern (horizontal time base).

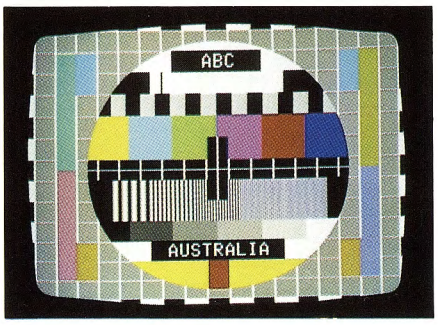


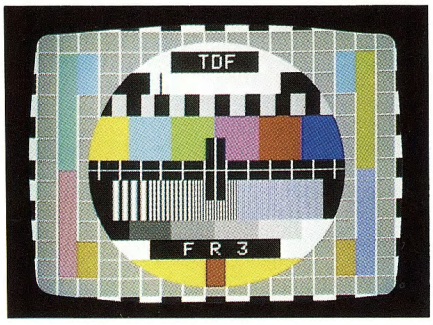
Waveform monitor display of the PM 5534 pattern (vertical time base).

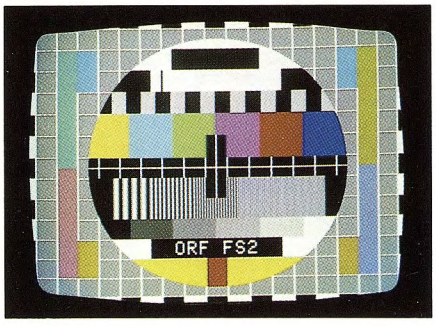
EXTERNAL FREQUENCY STANDARD (optional) — Via the 10 MHz interface card (optional) the PM 5534 can be controlled from an external frequency standard (i.e. atomic frequency standard). Amplitude: 0.1 - 2 Vrms. Impedance: 75 Ω. Return loss: > 26 dB at 10 MHz.

625 LINES SYSTEMS — Horizontal line frequency: 15 625 Hz (locked to the colour subcarrier). Line sync pulses: 4.7 µs ± 0.2 µs. Equalizing pulses: 2.35 µs ± 0.1 µs. Serrations of field pulses: 4.7 µs ± 0.2 µs. Number of equalizing pulses: 5 + 5. Front porch: 1.3 - 1.8 µs. Line blanking: 11.8 - 12.3 µs (G, I and L-versions), 10.3 - 11.4 µs (N-version). Vertical blanking interval: 25 lines + 12 µs (G, I and L-versions), 25 lines + 11 µs (N-version). Colour burst width: 2.03 - 2.48 µs (not valid for L-version). Colour burst position: 5.6 µs ± 0.2 µs referred to line sync pulses. Burst suppression: 9 lines per field. Type of burst: alternating 135°/225°. Frequency of colour subcarrier: 4.433 618 75 MHz ± 5 Hz (G and I-versions), 3.582 056 25 MHz ± 4 Hz (N-version). L-version: see coding characteristics.

525 LINES SYSTEMS — Horizontal line frequency: 15 734 Hz (locked to the colour subcarrier). Line sync pulses: 4.8 µs ± 0.3 µs. Equalizing pulses: 2.4 µs ± 0.15 µs. Serrations of field pulses: 4.5 µs ± 0.6 µs. Number of equalizing pulses: 6 + 6. Front porch: 1.3 - 2.0 µs. Line blanking: 10.5 - 11.4 µs. Vertical blanking interval: 21 lines + 11 µs. Colour burst width: 2.1 - 2.7 µs (M/NTSC), 2.3 - 2.7 µs (M/PAL). Colour burst position: 5.5 µs ± 0.2 µs referred to line sync pulses. Burst





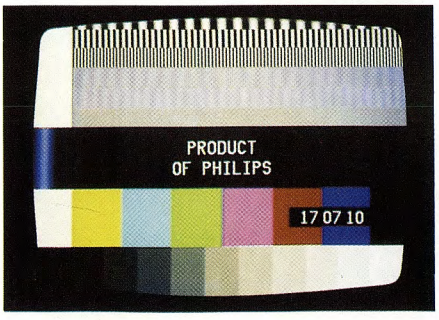


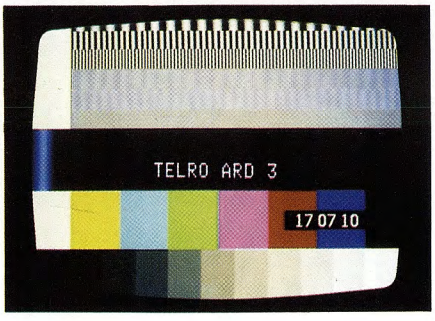
Philips patterns

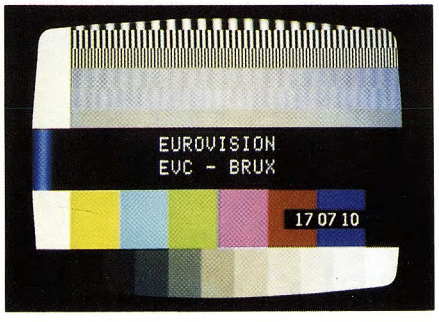
are used intensively on all continents of the world for testing TV receivers and broadcast networks.
The PHILIPS colour pattern (with the digital circle) was originally designed for final testing of TV receivers in TV factories. However it was soon discovered by the broadcasting authorities that this pattern is ideal for transmission outside the programme hours, the purpose being of course to provide testing facilities for the audience as well as the TV trade and service business.

Over the past years so many broadcasters have purchased the PHILIPS colour pattern generator (PM 5544) that we dare to state that this pattern is by far the most commonly radiated test pattern of the world.

The other PHILIPS pattern was designed for testing transmission links and broadcast systems, so the pattern was based on the same signal elements as those composing most insertion test signals (ITS or VITS). The fact that also an electronic authority identification caption can be included in the pattern, makes this pattern a natural successor to simple colour bar signals and old monochrome test patterns. Apart from being used in international networks, like the Eurovision network, and in national networks, this pattern has also become popular in large cable TV systems as a standby pattern (substitution pattern).







PM 5534

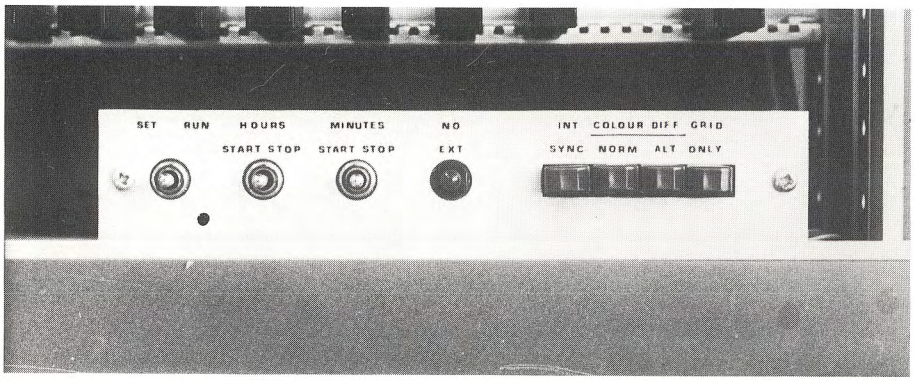


Photo showing the text panel of the internal controls. These are selectors for internal-external synchronization, modifications of the pattern (colour difference signals off), and grid with border castellations instead of the composite pattern. The LED indicates abscence of signal in the external sync mode (the generator switches in this case automatically to the internally sync mode).
Also controls for setting the clock are situated on this panel.

suppression: 9 lines (M/NTSC), 11 lines (M/PAL). Type of burst: non-alternating 180° (M/NTSC), alternating 135°/225° (M/PAL). Frequency of colour subcarrier: 3.579 545 MHz ± 4 Hz (M/NTSC), 3.575 611 49 MHz ± 4 Hz (M/PAL).

PAL SYSTEMS — Residual subcarrier: < 0.5%. R-Y, B-Y quadrature error: < 0.5°. R-Y phase switch error: < 0.5°. Luminance/chrominance time difference: < 20 ns. Colour subcarrier phase control: > 360°.

NTSC SYSTEM — Identical to PAL, however without R-Y switching.

SECAM SYSTEM — Subcarrier frequencies: 4.406 250 MHz ± 2.000 kHz (R-Y), 4.250 000 MHz ± 2.000 kHz (B-Y). Frequency deviations: 280 kHz ± 9 kHz (nom. R-Y), 230 kHz ± 7 kHz (nom. B-Y). Maximum deviations: + 350 kHz ± 18 kHz to - 506 kHz ± 25 kHz (R-Y), + 506 kHz ± 18 kHz to - 350 kHz ± 18 kHz (B-Y). HF pre-emphasis (bell filtre). Centre frequency: 4.286 MHz ± 20 kHz, response: ± 0.5 dB from nominal. Blanking of subcarrier: a) during field blanking excluding colour synchronization lines, b) from leading edge of line-blanking to 5.6 ± 0.2 µs after leading edge of sync pulse. Suppression > 50 dB. Identification lines: a) lines 7 to 15 in field 1 and 3 lines 320 to 328 in field 2 and 4, b) amplitude: D(B) = 500 mVpp ± 50 mVpp, D(R) = 540 mVpp ± 40 mVpp, c) frequency deviation for D(R): + 350 kHz ± 18 kHz and frequency deviation for D(B): - 350 kHz ± 18 kHz. Chrominance/luminance delay: < 50 ns. Subcarrier amplitude: 23% ± 2.5% of white amplitude. Colour bar signal: 75% amplitude, 100% saturation with 100% white bar. Frequency tolerance: ± (2.5% of deviation + 2 kHz).

Power supply

Voltage: 230 V (115 V) ± 20% (Internal selection). Frequency: 48 - 65 Hz. Consumption: 55 W at 220 V.

Temperature range

Operating: 0° - 45° C ambient.

Mechanical data

6/6 plug-in unit for the PHILIPS 19" rack/table cabinet.
Height : 132 mm
Width : 444 mm
Depth : 435 mm
Weight : 13.6 kg (incl. cabinet)

Cabinet

The PM 9716 A cabinet is supplied with PM 5534.

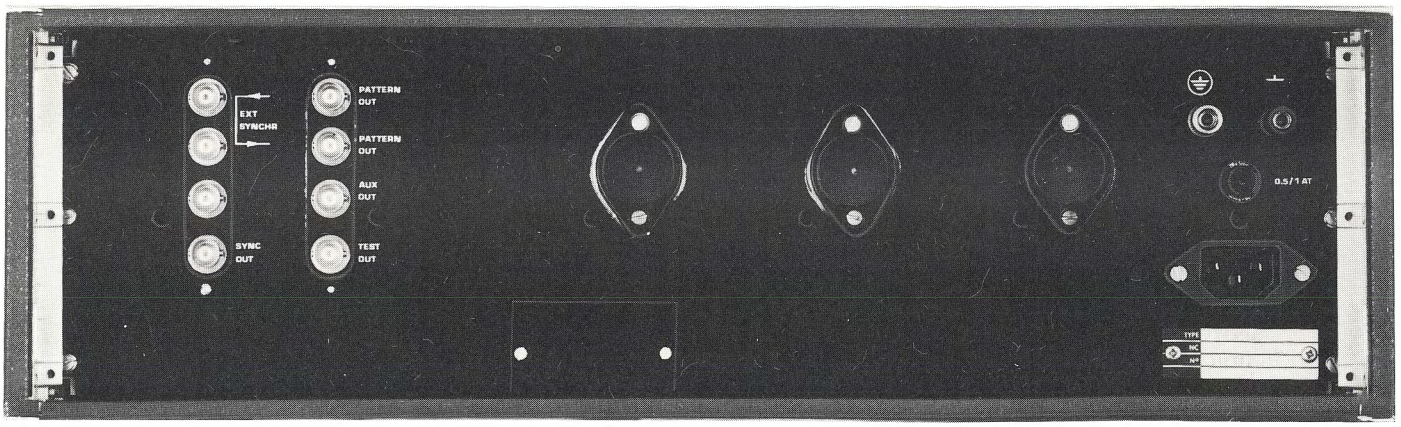
Options

PM 8501 Interface card is a print board that allows the PM 5534 to be controlled via a 10 MHz (5 MHz) reference signal from for instance an atomic frequency standard. This may be required for such applications of the test pattern as using the colour subcarrier as a frequency standard and/or for displaying the local time in the test pattern (see clock option).

PM 8502 Oven-controlled crystal oscillator consists of a print board with a 10 MHz crystal oscillator identical to the ones used in the PHILIPS range of precision counters. Due to a very tight temperature control of the crystal and the oscillator, combined with selection and ageing of crystals, the accuracy and stability is extremely good, in fact only surpassed by atomic frequency standards.

PM 8503 Text generator provides two lines of text (caption) in the colour pattern. The maximum number of characters per line is 7-8 in the upper line and 12-14 in the lower line (see photo on page 40). The text facility is used for displaying authority and source identifications, such as for instance the name and channel no. of the transmitting station.

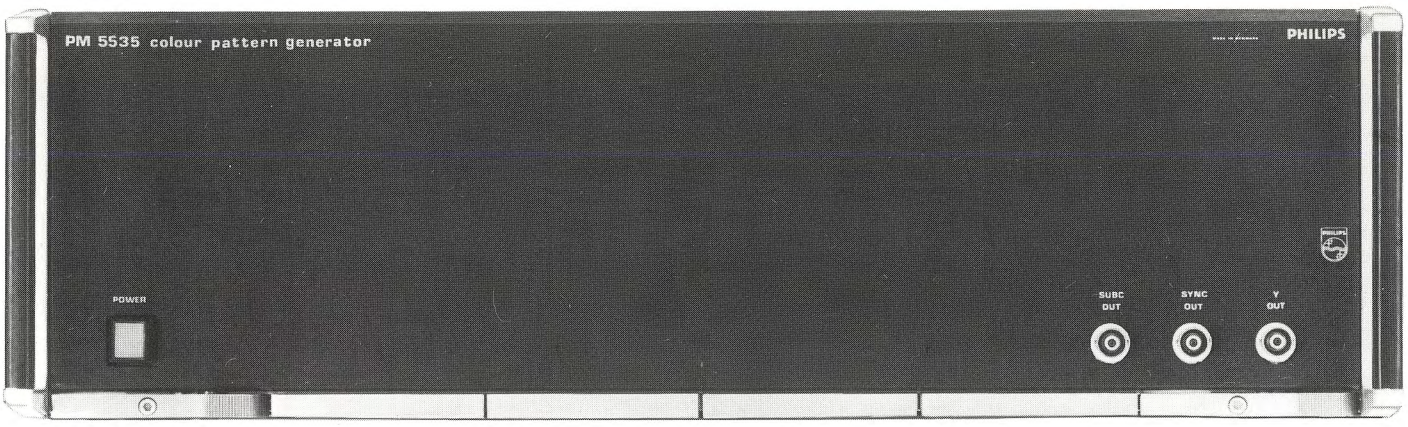
PM 8504 Clock generator produces the necessary control signals for the text generator (PM 8503) to display the time in hours-minutes-seconds. The clock is controlled by the field pulses of the sync pulse generator, which are derived from the 10 MHz master oscillator or an external 10 MHz reference signal (PM 8501). In case of genlocking to an external video signal, the SPG is synchronized to the incoming colour burst. During mains failure the standby battery and a simple crystal oscillator (both situated on the very clock generator board) keep the clock going, so at return of the mains, the time is still correct.



Colour pattern generator

PM 5535

Code no. PM 5535:
9449 055 35003 (G-version, 625-lines PAL)
9449 055 35005 (I-version, 625-lines PAL)
9449 055 35007 (L-version, 625-lines SECAM)
9449 055 35008 (M-version, 525-lines PAL)
9449 055 35108 (M-version, 525-lines NTSC)
9449 055 35009 (N-version, 625-lines PAL)



Most recognized receiver test pattern in the world.

The pattern is identical with the pattern produced by PM 5534.

Used intensively by broadcasting authorities and television manufacturers.

Unique pattern composition allows off-screen checks and alignments of all important parameters of colour and monochrome TV receiver and monitors.

Digital circuitry ensure stable and lasting performance without regular checks and alignments.

Built-in full specification sync pulse generator with genlock facility and outputs for synchronizing signals.

Optional text generator for source identification and real time clock.

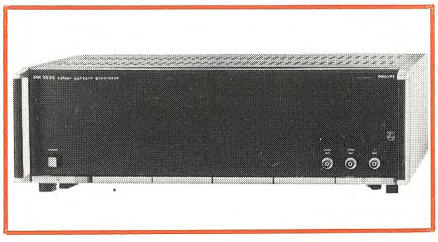
Ideal for high resolution television and multi-standard systems.

Colour pattern generator PM 5535 is a Y-R-G-B version of the well-known PHILIPS pattern generator PM 5534. The PM 5535 contains a fully specified sync pulse generator in addition to the pattern generator generating the Y-R-G-B signals. If encoded colour signals are requested, one or more external colour encoders must be applied. For PAL and NTSC the PHILIPS PM 5545 colour encoder can be used. For colour encoding either the Y-R-G-B outputs or just the R-G-B outputs can be utilized. Synchronization signals to encoder(s) are also available from the PM 5535.

Originally the PHILIPS pattern was developed for testing television receivers in TV factories, however, the pattern is so well suited for transmission as an electronic "test card" that the broadcasting authorities of some 25 countries have now selected the PHILIPS pattern for their test card transmission hours. The pattern is composed in such a way that almost all relevant characteristics for the displayed signal can be checked by observation of the various signal elements of the pattern, right from the screen of the receiver or TV monitor.

All optional circuit boards available for extention of the performance of the PM 5534 also fit into the PM 5535. These are:
- PM 8501 Interface card which allows the sync pulse generator of PM 5535 to be locked to an external 10 MHz frequency standard.
- PM 8502 Oven controlled crystal oscillator which is five times more accurate than the standard built-in TCXO (temperature compensated crystal oscillator) (not available for M-versions).
- PM 8503 Text generator, providing two lines of programmable text in the black bars of the pattern. The text can be used for source identification of the transmitting authority or station.
- PM 8504 Clock generator driving the text generator in such a way that the time is displayed in hours, minutes and seconds in a third black bar of the pattern (see photo next page).

The PM 5535 is to a high degree made from digital circuits, a fact that en-



sures the instrument a long trouble-free life without frequent checks and adjustments. Great care has been taken to guarantee that all signal levels are accurate and stable and that transients have normalized rise and fall times. This is to restrict the frequency content to the nominal video bandwidth.

The PM 5535 delivers the following output signals (see also photo of the front and the rear panels):
- Synchronizarion signals: composite sync, composite blanking, colour subcarrier, burst key and PAL identification, plus composite sync and subcarrier at the front.
- Video signals: Y-R-G-B pattern and composite cross-hatch signal with border castellations plus Y composite at the front.

Pattern composition

The basic pattern outside the circle consists of a cross-hatch surrounded by border castellations. The cross-hatch is used to check geometric distortion (horizontal and vertical linearity) as well as convergence of colour receivers. Part of a cross-hatch is also available inside the circle. The centre-cross can be applied for static convergence checks, while the two mentioned areas of cross-hatch are used for checking the dynamic convergence.

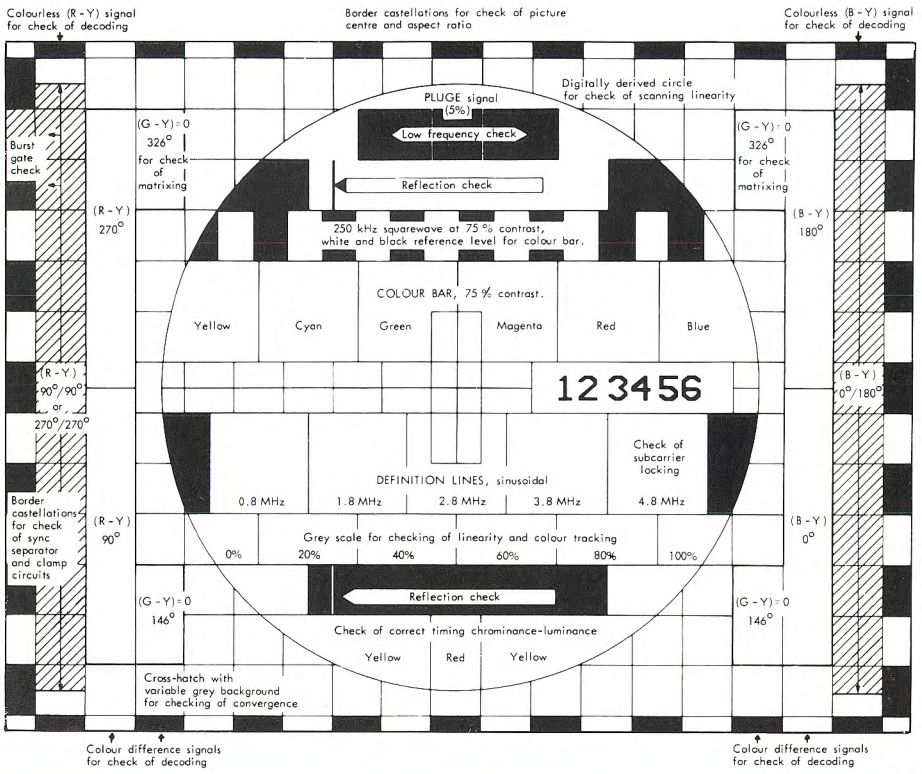
The border castellations help to center the picture on the screen, and exposes insufficiency or malfunction of the sync separator of the set.

The two coloured areas beside the circle (may be switched off) are the colour difference signals. Outside these two coloured areas two vertical bars may be added to the picture. These two bars (only of importance for PAL) contain alternating B-Y and alternating R-Y signals and they should remain colourless, provided the colour decoder of the TV set/monitor is correctly aligned.

Inside the circle various bl/wh steps, rectangles and needle pulses are used for checking step and pulse response of the set as well as reflections in the antenna and feeder system.

The colour bar and the grey scale signals allow easy setting of the brilliance, contrast, hue and saturation controls. The definition lines can expose lack of high frequency response and are very helpful when tuning the set to the selected channel.

The yellow-red-yellow colour step



shows clearly any timing error between the black/white component and the colour component of the picture.

As it can be seen the PHILIPS pattern contains many important test signals. The service technician or engineer, who is familiar with the various signals and the interpretation of them, can consequently do a very thorough check on a TV receiver, by just looking at the picture on the screen.

The circle

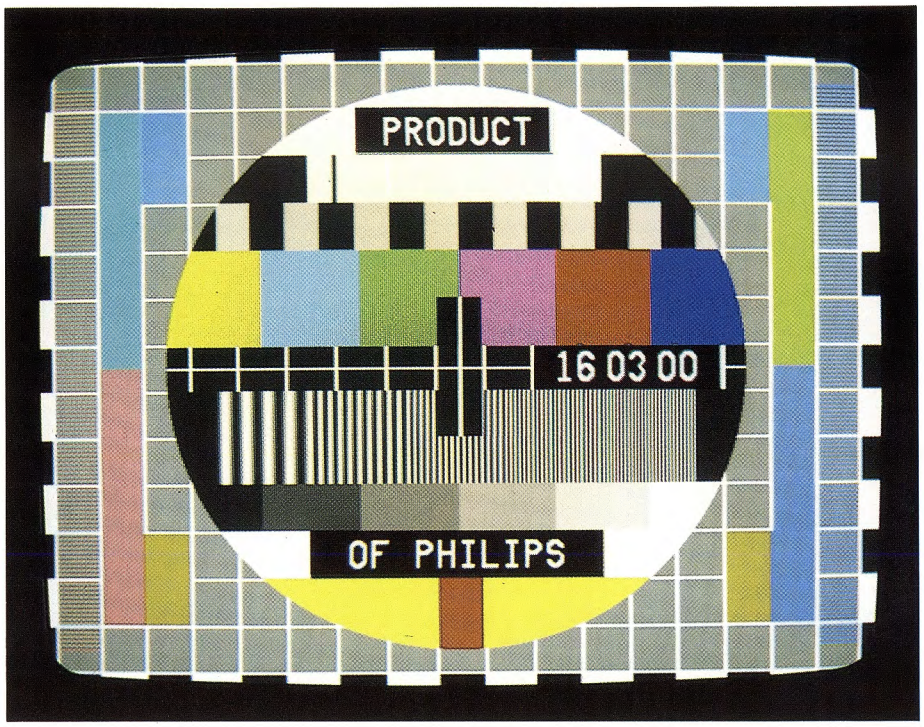
The dominating "signal" of the pattern is the circle. This has been incorporated, because the eye is very sensitive to any deviations from the exact circle. Only a TV set with good horizontal and vertical linearity can reproduce the circle in an acceptable way, so the circle presents in fact an extra sensitive way of checking the geometric distortion.

A circle pattern is included in most existing "test cards", however, Philips was the first to generate a circle without inherent geometric distortion. The circle in the PM 5535 is generated by means of digital circuitry, which is controlled by a ROM (read-only-memory). In the ROM information is stored about the shape of the circle. In practice this means that any visible distortion of the circle can be allocated fully to the TV receiver or monitor under test.

TECHNICAL DATA (all versions)

Pattern composition

SIGNALS INSIDE THE CIRCLE, FROM TOP TO BOTTOM —
1) Black rectangle on white background. Width of rectangle: 11.3 µs. Part of rectangle is 5% below black level in order to allow precision setting of the brightness control (PLUGE signal).
2) Black/white step and white/black step with needle pulse in the white part. Width of pulse: 225 ns ± 5% (G, I and L-versions), 280 ns ± 5% (other versions).
3) Squarewave signal. Repetition frequency: 250 kHz. Amplitude: 75% of white amplitude (same amplitude as R, G and B signals of the colour bar and colour step).
4) Colour bar signal. Colour: Yellow, cyan, green, magenta, red and blue. Saturation: 100%. Contrast: 75%. By internal selection also 100% bar (100/100) and BBC colour bar can be obtained. Factory adjusted: EBU colour bar 100/0/75/0 (G and L-versions, note: BBC colour bar is only available from PM 5534, NTSC colour bar (M and N-versions).
5) Crossed lines. Width of vertical lines: 225 ns ± 5% (G, I and L-versions), 280 ns ± 5% (other versions). Structure of the horizontal centre line: 2 lines, one per field, sequence reversed compared to the lines of the background cross-hatch (for check of the interlacing). A convergence cross is placed in the centre of the pattern.
6) Definition lines (sinusoidal). Frequencies: 0.8 - 1.8 - 2.8 - 3.8 and 4.8 MHz (G-version), 1.5 - 2.5 - 3.5 - 4.0 - 4.5 - 5.25 MHz (I-version), 0.8 - 1.8 -



The pattern of the PM 5535 displayed on a RGB colour monitor.

2.8 - 1.8 - 0.8 MHz (L-version), 0.5 - 1.0 - 2.0 - 3.0 - 4.0 MHz (M and N versions). Accuracy: ± 3%. Harmonic content: < 3%.
7) Staircase. Number of levels: 6 (modification to 11 levels easily possible).
8) White/black step and black/white step with needle pulse in the black part. Width of pulse: 225 ns ± 5% (280 ns ± 5%).
9) Colour step. Colour: Red on yellow background. Width: 2.6 µs. Saturation: 100%. Contrast: 75%.
10) Circle. Mode of generation: Digitally generated circle with read-only-memory. Diameter: 88% of active picture height (625-line versions), 84% for 525-line versions).

SIGNALS OUTSIDE THE CIRCLE — Left hand side of circle:
1) Vertical bar of alternating R-Y signal (B-Y = 0). Levels: R = 147/523 mV, G = 431/239 mV, B = 0.
2) Vertical bar with positive and negative R-Y signals (B-Y = 0). Levels: R = 147 mV, B = 431 mV, B = 335 mV (upper half of bar), R = 523 mV, G = 239 mV, B = 335 (lower half).
3) Two rectangles with signal G-Y = 0. Levels: R = 227 mV, G = 335 mV, B = 612 mV (upper rectangle), R = 441 mV, G = 335 mV, B = 58 mV (lower).
Right hand side of circle (from left to right):
1) Two rectangles with signal G-Y = 0. Levels: same as 3) above.
2) Vertical bar with positive and negative B-Y signals (R-Y = 0). Levels: R = 335 mV, G = 400 mV, B = 0 (upper half), R = 335 mV, G = 270 mV, B = 670 mV (lower).
3) Vertical bar of alternating B-Y signal (R-Y = 0). Levels: R = 0, G = 400/270 mV, B = 0/670 mV.
Note. The levels given are valid for the G-version, which has a nominal video level of 700 mV and no set-up.
The signals above can be switched off with push-buttons inside the instrument.

BACKGROUND SIGNALS —
1) Cross-hatch. Number: 14 horizontal x 18 vertical lines (congruent to standard 14 x 19 lines pattern). Width of vertical lines: 225 ns ± 5% (280 ns ± 5%).
2) Background level. Level: adjustable 25 -75% of white. Factory adjusted to ~48%.
3) Black/white border castellations.

Output signals

PATTERN — Number of outputs: 1 set of Y-R-G-B at the rear and Y at the front. Impedance: 75 Ω ± 1%. Return loss: > 34 dB up to 7 MHz. Isolation between outputs: > 30 dB up to 5 MHz. Signal type: video signal with blanking (VB). Amplitude: 700 mVpp ± 1% (M/NTSC: 100 IRE = 714 mV). M and N versions have 7.5% set-up.

AUXILIARY — Cross-hatch pattern with border castellations. Amplitude video: 700 mVpp ± 3% (714). Amplitude sync: 300 mVpp ± 3% (286). Width vertical lines: 225 ns ± 5% (280 ns). Rise and fall time: 100 ns ± 5% (125 ns). Impedance: 75 Ω.

COMPOSITE SYNC — Number of outputs: 1 at the rear. Amplitude: 4 Vpp ± 0.4 V. Impedance: 75 Ω. Return loss: > 30 dB up to 4 MHz. Rise and fall time: 200 ns ± 5%.

COMPOSITE BLANKING — Number of outputs: 1 at the rear. Amplitude: 4 Vpp ± 0.4 V. Impedance: 75 Ω. Return loss: > 30 dB up to 4 MHz. Rise and fall time: 200 ns ± 5%.

BURST KEY — Number of outputs: 1 at the rear. Amplitude: 4 Vpp ± 0.4 V. Impedance: 75 Ω. Return loss: > 30 dB up to 4 MHz. Rise and fall time: 200 ns ± 5%.

PAL IDENT — Number of outputs: 1 at the rear. Amplitude: 4 Vpp ± 0.4 V. Impedance: 75 Ω. Return loss: > 30 dB up to 4 MHz. Rise and fall time: 200 ns ± 5%.

SUBCARRIER — Amplitude: 1 Vpp ± 0.2 V. Impedance: 75 Ω. Return loss: > 30 dB at 4.43 MHz.

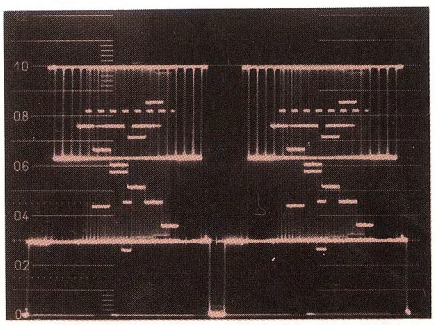
Input signal

SYNCHRONIZATION — The instrument may be genlocked to a composite video signal or a black burst signal. Amplitude: 0.5 - 4 Vpp, high ohmic looped-through. Return loss: > 34 dB up to 7 MHz. Synchronization with a composite sync signal will only give bl/wh genlocking.

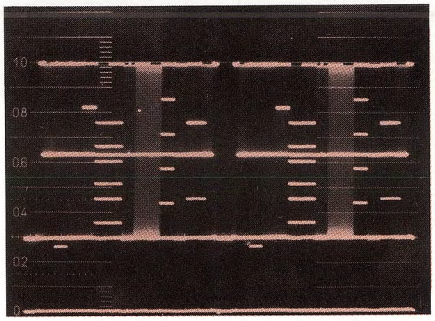
SPG characteristics

GENLOCK (all versions) — The PM 5535 can genlock to an external video signal, (C)VBS, or a composite sync signal. The scanning frequencies lock to the incoming sync by phase-lock/miscount circuitry (locking time less than 7 sec). The colour subcarrier locks to the incoming colour burst, if any. Catching range: ± 25 Hz at 4.43 MHz, ± 20 Hz at 3.58 MHz. Jitter of subcarrier: < 1°.

EXTERNAL FREQUENCY STANDARD (optional) — Via the 10 MHz interface card (optional) the PM 5535 can be controlled from an external frequency standard (i.e.



Luminance signal (Y) of the PM 5535 (horizontal time base).



Luminance signal of the PM 5535 (vertical time base).

PM 5535

atomic frequency standard). Amplitude: 0.1 - 2 Vrms. Impedance: 75 Ω. Return loss: > 26 dB at 10 MHz.

625-LINES SYSTEMS — Horizontal line frequency: 15 625 Hz (locked to the colour subcarrier). Line sync pulses: 4.7 µs ± 0.2 µs. Equalizing pulses: 2.35 µs ± 0.1 µs. Serrations of field pulses: 4.7 µs ± 0.2 µs. Number of equalizing pulses: 5 + 5. Front porch: 1.3 - 1.8 µs. Line blanking: 11.8 - 12.3 µs (G and I versions), 10.3 - 11.4 µs (N-version). Vertical blanking interval: 25 lines + 12 µs (G and I versions), 25 lines + 11 µs (N-version). Burst key width: 2.03 - 2.48 µs. Burst key position: 5.6 µs ± 0.2 µs referred to line sync pulses. Burst suppression: 9 lines per field. Frequency of colour subcarrier: 4.433 618 75 MHz ± 5 Hz (G and I versions), 3.582 062 50 MHz ± 4 Hz (N-version).

525-LINES SYSTEMS — Horizontal line frequency: 15 734 Hz (locked to the colour subcarrier). Line sync pulses: 4.8 µs ± 0.3 µs. Equalizing pulses: 2.4 µs ± 0.15 µs. Serrations of field pulses: 4.5 µs ± 0.6 µs. Number of equalizing pulses: 6 + 6. Front porch: 1.3 - 2.0 µs. Line blanking: 10.5 - 11.4 µs. Vertical blanking interval: 21 lines + 11 µs. Burst key width: 2.1 - 2.7 µs (M/NTSC), 2.3 - 2.7 µs (M/PAL). Burst key position: 5.5 µs ± 0.2 µs referred to line sync pulses. Burst suppression: 9 lines (M/NTSC), 11 lines (M/PAL). Frequency of colour subcarrier: 3.579 545 MHz ± 4 Hz (M/NTSC), 3.575 611 49 MHz ± 4 Hz (M/PAL).

Power supply

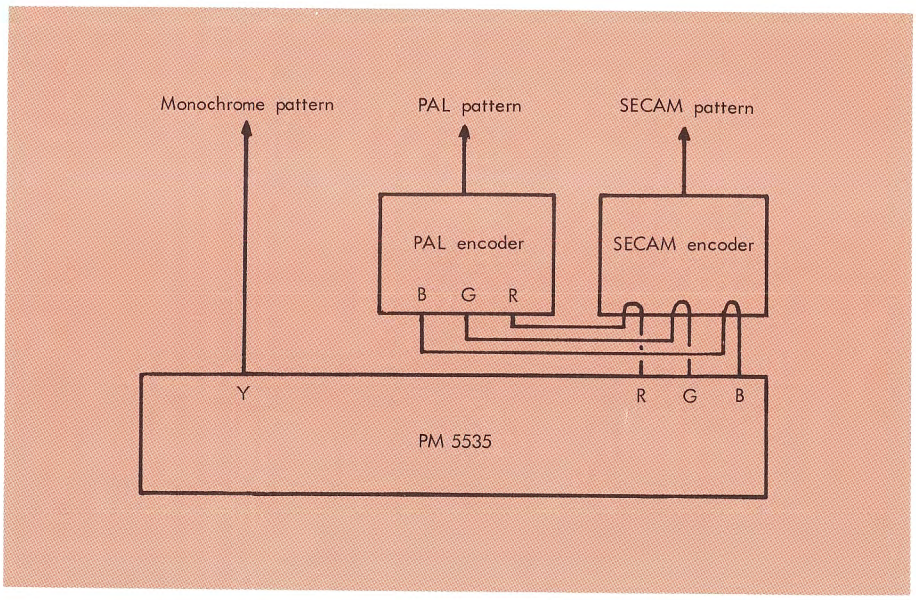
Voltage: 230 V (115 V) ± 20% (Internal selection). Frequency: 48 - 65 Hz. Consumption: 55 W at 220 V.

Temperature range

Operating: 0° - 45° C ambient.

Mechanical data

6/6 plug-in unit for the PHILIPS 19" rack/table cabinet.
Height : 132 mm
Width : 444 mm
Depth : 435 mm
Weight : 13.6 kg (incl. cabinet).



The PM 5535 has both a set of R-G-B outputs and a monochrome output (luminance). In connection with external colour encoders, patterns of different colour standards as well as a monochrome pattern are available simultaneously (f. inst. PAL, SECAM and monochrome). The monochrome signal is ideal for testing bl/wh TV sets and monitors.

Cabinet

The PM 9716 A cabinet is supplied with PM 5535.

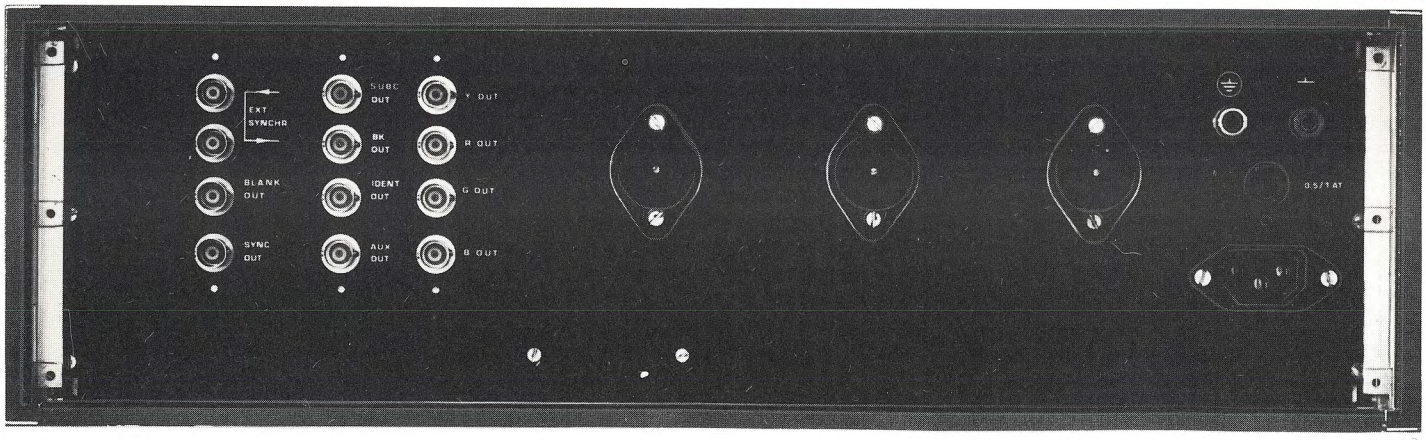
Options

PM 8501 Interface card allows the PM 5535 to be controlled via a 10 MHz (5 MHz) reference signal from for instance an atomic frequency standard. This may be required when the test pattern is using the colour subcarrier as a frequency standard and/or for displaying the local time in the test pattern. Note: only applicable when an extra input socket is mounted.

PM 8502 Oven-controlled crystal oscillator consists of a print board with a 10 MHz crystal oscillator identical to the ones used in the PHILIPS range of precision counters. Due to a very tight temperature control of the crystal and the oscillator, combined with selection and ageing of crystals, the accuracy and stability is extremely good, in fact only surpassed by atomic frequency standards.

PM 8503 Text generator provides two lines of text (caption) in the colour pattern. The maximum number of characters per line is 7-8 in the upper line and 12-13 in the lower line. The text facility is used for displaying authority and source identifications, such as for instance the name and channel no. of the transmitting station.

PM 8504 Clock generator produces the necessary control signals for the text generator (PM 8503) to display the time in hours-minutes-seconds. The clock is controlled by the field pulses of the sync pulse generator, which are derived from the 10 MHz master oscillator or an external 10 MHz reference signal (PM 8501). In case of genlocking to an external video signal, the SPG is synchronized to the incoming colour burst. During mains failure the standby battery and a simple crystal oscillator (both situated on the very clock generator board) keep the clock going, so at return of the mains, the time is still correct.

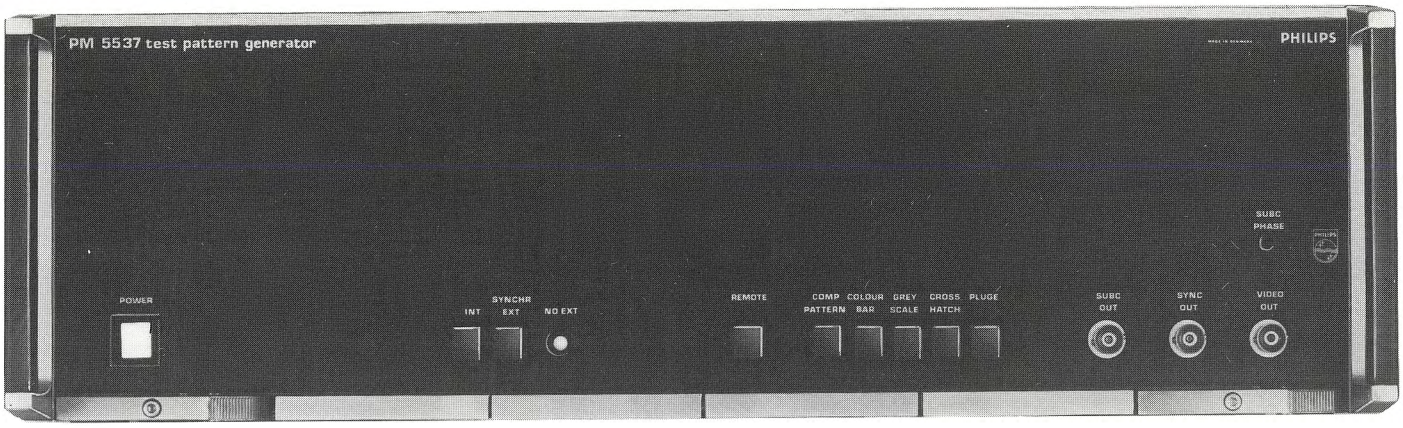


Test pattern generator

PM 5537

Code no. PM 5537:
9449 055 37003 (G-version, 625-lines PAL)
9449 055 37008 (M-version, 525-lines PAL)
9449 055 37108 (M-version, 525-lines NTSC)
9449 055 37009 (N-version, 625-lines PAL)

Note. A SECAM version of the PM 5537 is also available. Due to the presens of chroma all over the signals in SECAM, the pattern of the PM 5537 is mainly useful for colour monitor observations.



Composite pattern based upon international insertion test signals.

Used in Eurovision network as a standby and link test pattern.

Pattern composition allows both off-screen and waveform monitor evaluation of the transmission quality.

Built-in encoder for most colour systems.

Ideal instrument in EFP vans as master SPG with important patterns.

Extended performance with optional text generator and/or clock.

The PM 5537 is the successor to the PM 5547 test pattern generator, and it generates the same composite pattern, which is ideal for checking all sorts of internal and external transmission paths in broadcast TV systems and networks.

The pattern is designed so that it gives good impression of the transmission quality, when displayed on waveform monitors and colour monitors. The alpha numeric source identification display makes routing operations more safe.

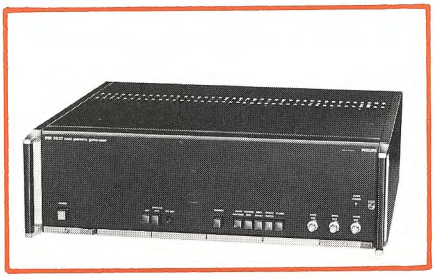
All the signal elements of the pattern, except the colour bar, are the same as those composing the insertion test signals viz. white reference bar, multiburst, 2T sine-squared pulse, 20T pulse carrier-born and grey scale signal. This means that the pattern represents a full-field VIT signal, and by proper selection of the time base controls, the TV engineer can check the most important transmission characteristics on his waveform monitor.

On top of that the colour bar signal gives valuable information that is not available from the VITS.

In addition to the composite pattern, the PM 5537 generates the following full-field signals: colour bar signal for those applications where colours are wanted all over the screen or for checks of specific colour phenomena, grey scale signal (staircase) with or without superimposed chroma, cross-hatch signal, and PLUGE. These signal are all important for setting-up and checking colour monitors and cameras. The selection of the signals is done via front panel push-buttons or remotely via a multi-pole connector at the rear (+ 5 V logic). The cross-hatch is also available at a separate rear panel output.

The PM 5537 has its own built-in sync pulse generator (SPG), which controls the generation of the various test signals. All synchronization signals needed for controlling a complete colour TV studio, are available at the rear: composite sync, composite blanking, colour subcarrier, burst keying pulses, PAL identification (PAL versions only), and black burst signal. The signal last mentioned can be used both as a "black" programme signal and as a synchronizing signal.

The SPG can either run in the free-run mode (int. sync), or it can be genlocked to an external video signal, (C)VBS, or composite sync. When external synchronization has been selected and there is no external signal available, a light emitting diode will light and the generator will switch automatically to the internal



sync mode.

By means of an internal selector VIT signals "line 17" and "line 330" may be added to the video signal (M-system only "line 17"). By internal coding these signals may be added on any of the lines 13-22 and lines 326-335 (M-system lines 11-20 in both fields).

Options

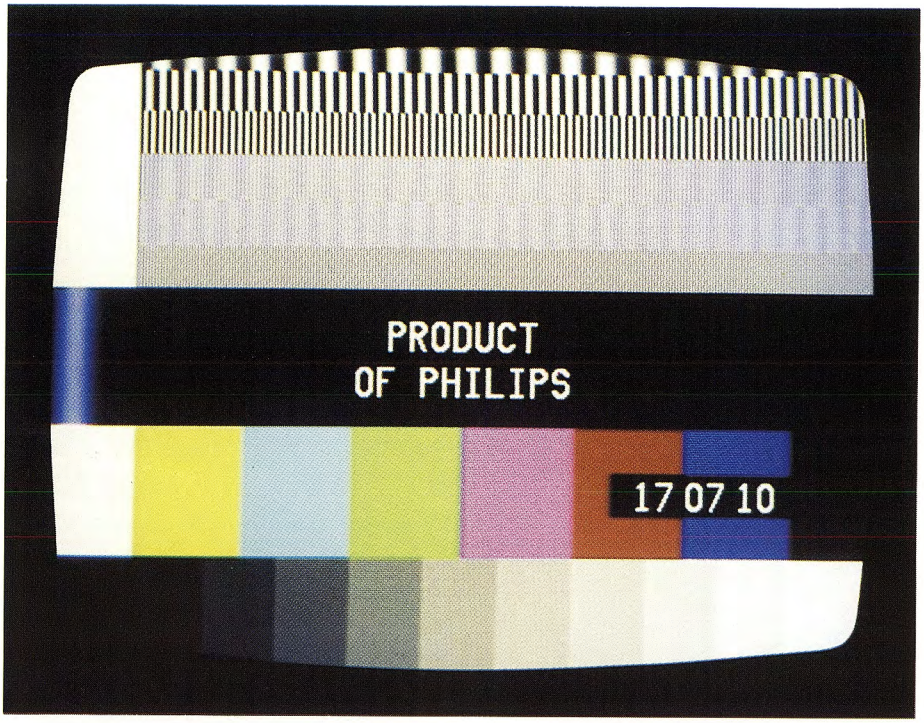
The following options may complete the instrument up to your requirements:

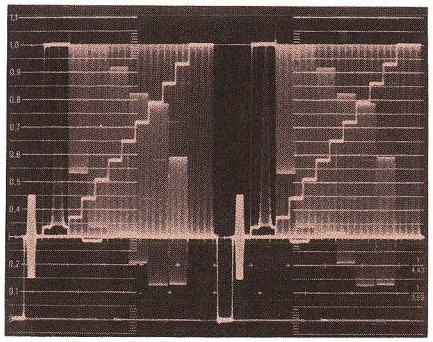
- 10 MHz interface card enabling the instrument to lock to an external very accurate 10 MHz.
Order code: PM 8501.

- oven-controlled clock oscillator of 10 MHz to ensure a subcarrier accuracy of ± 1 Hz.
Order code: PM 8502.

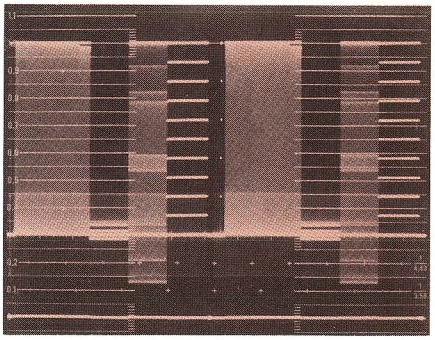
- text generator, giving two lines of text in the black bar, for source and/or authority identification.
Order code: PM 8503.

- digital clock, to display the correct time. This option works only together with the text generator.
Order code: PM 8504.





Waveform monitor display of the PM 5537 pattern (horizontal timebase).

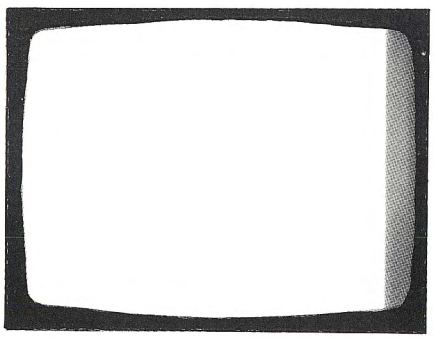


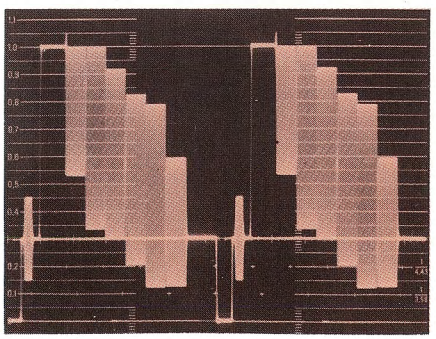
Waveform monitor display of the PM 5537 pattern (vertical timebase).

TECHNICAL DATA

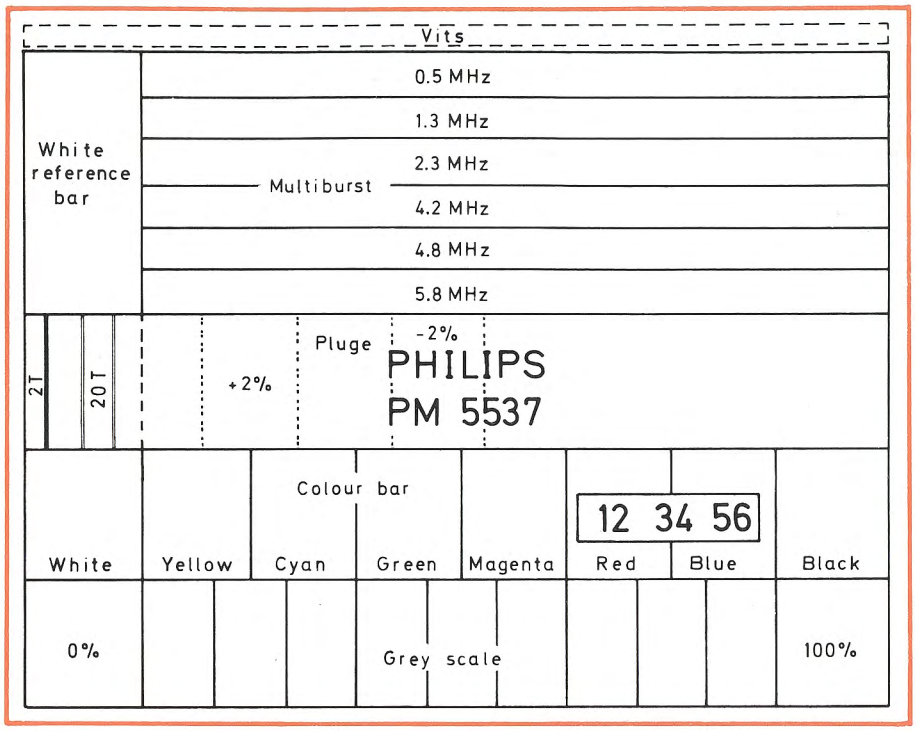
Pattern composition

COMBINED PATTERN (from top to bottom):
1) Multiburst signal consisting of white reference bar followed by 6 horizontal bars of sine wave signal. Bar amplitude: 700 mV ± 1% (G, I, M/PAL and N-versions), 714 mV ± 1% (M/NTSC-version). Rise and fall time: 200 ns ± 5% (G and I-versions), 225 ns ± 5% (M and N-versions). Overshoot: < 1%. Tilt: < 0.5%. Multiburst frequencies: 0.5 - 1.3 - 2.3 - 4.2 - 4.8 and 5.8 MHz (G and I-versions), 0.5 - 1.0 - 1.6 - 3.3 - 3.9 and 4.8 MHz (M and N-versions). Waveform: sinusoidal. Harmonic content: < 3%. Amplitude: peak-peak within ± 2% of bar (by internal selection: 75% or 50% of bar).
2) Horizontal bar containing a 2T sine-squared pulse, a composite sine-squared pulse, PLUGE, and optionally 2 lines of text (caption). 2T pulse-to-bar ratio: < 1%. Width of 2T pulse: 200 ns + 20/- 0 ns (G and I-versions), 225 ns + 25/- 0 ns (M and N-versions). K-factor: < 0.5%. Undershoot: < 0.5%. Set-up: 5% of bar (adjustable). Amplitude of composite pulse: within 1% of bar. Width of composite pulse: 20T = 2.0 µs ± 3% (G-version), 10T = 1.0 µs ± 3% (I-version), 20T = 2.25 µs ± 3% (M/PAL-version), 12.5T = 1.57 µs ± 3% (M/NTSC and N-versions). Phase of chroma: 60°. Inherent chrom/lum gain inequality: < 1%. Inherent chrom/lum delay inequality: < 10 ns. Chroma distortion: < 1%. Set-up: 5% (adjustable). PLUGE: bar of -2% of white level referred to black level and bar of + 2% of white level referred to black level (can be switched off).
3) Colour bar signal. Types: EBU 100/0/75/0 (G-version), BBC 100/0/100/25 (I-version), NTSC 77/7.5/77/7.5 (M and N-versions). Also 100/0/100/0 is possible. Accuracy of luminance levels: ± 2%. Rise and fall time of luminance: 200 ns ± 5% (G and I-versions), 250 ns ± 5% (M and N-versions). Rise and fall time of chroma: 300 ns (375 ns). Encoding: according to the relevant TV system (PAL or NTSC).





Full-field colour bar (EBU-version is showed. Also other versions are possible).



Phase accuracy of coding: within ± 2°.
4) Grey scale. Number of levels: 6 or 11 by internal selection (including black and white levels). Amplitude: 700 mV ±1% of white bar (714 mV ± 1% for M/NTSC version). Inequality of steps: < 1%. Rise and fall time: 200 ns < 5% (G and I-versions), 225 ns < 5% (M and N-versions). Chroma: the grey scale may be superimposed with colour subcarrier. Amplitude: 280 mVpp (G and I-versions), 265 mVpp (M and N-versions). Inherent differential gain: < 0.5%. Inherent differential phase: < 0.5°.
5) VIT signals (G and I-versions). 1.field signal: bar, 2T, 20T (10 or 12.5T) and staircase. 2.field signal: bar, 2T and staircase with chroma. Specification as full-field signals. By internal coding the VITS can be generated on lines 13-22 and 326-335 respectively. VIT signal (M and N-versions). Both fields: bar, 2T, 12.5T and staircase with chroma. Specification as full-field signals. By internal coding the VITS can be generated on lines 11-20.

Outputs

VIDEO OUT — Number of outputs: 1 at the front, 2 at the rear. Impedance: 75 Ω ± 1%. Return loss: > 34 dB up to 7 MHz. Isolation between outputs: > 40 dB up to 4.43 MHz. Signal: composite video signal. Amplitude video: 700 mVpp ± 1%. Amplitude sync and burst: 300 mVpp ± 2% (M/NTSC: 714 mVpp video, 286 mVpp sync and burst). Signal types:
1) Combined pattern (as above).
2) Colour bar (as colour bar of the combined pattern).
3) Grey scale (as grey scale of the combined pattern).
4) Cross-hatch (14 x 19 lines as specified below).
5) PLUGE consisting of vertical bars of -2%, +2% and 100% of white level. Rise and fall time: 200 ns ± 5% (225 ns ± 5%). Selection of signals: front panel push-buttons or remote.

CROSS-HATCH — Number of outputs: 1. Impedance: 75 Ω ± 1%. Amplitude video: 700 mVpp ± 3%. Amplitude sync: 300 mV pp ± 3% (M/NTSC: 714 mVpp video, 286 mVpp sync). Signal type: 14 x 19 lines (corresponds to stand 14 x 19 lines cross-hatch), 14 x 17 lines (525-lines versions). Width of vertical lines: 225 ns ± 5% (280 ns ± 5%). Rise and fall time: 100 ns ± 5% (125 ns ± 5%).

COMPOSITE SYNC — Number of outputs: 1 at the front, 1 at the rear. Amplitude: 4 Vpp ± 0.4 V. Rise and fall time: 200 ns. Impedance: 75 Ω. Return loss: > 30 dB up to 4 MHz.

COMPOSITE BLANKING — Amplitude: 4 Vpp ± 0.4 V. Rise and fall time: 200 ns. Impedance: 75 Ω. Return loss: > 30 dB up to 4 MHz.

BURST KEY — Amplitude: 4 Vpp ± 0.4 V. Rise and fall time: 200 ns. Impedance: 75 Ω. Return loss: > 30 dB up to 4 MHz.

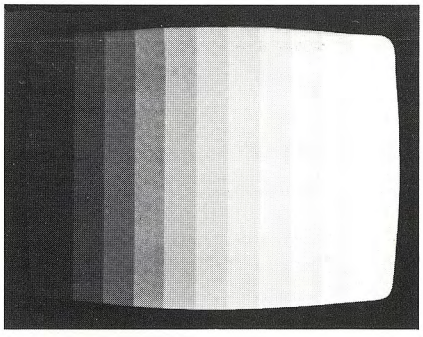
PAL IDENTIFICATION — Amplitude: 4 Vpp ± 0.4 V. Rise and fall time: 200 ns. Impedance: 75 Ω. Return loss: > 30 dB up to 4 MHz.

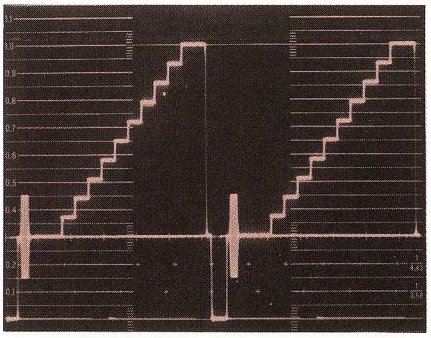
COLOUR SUBCARRIER — Number of outputs: 1 at the front, 1 at the rear. Amplitude: 2 Vpp ± 0.2 V. Impedance: 75 Ω. Return loss: > 30 dB at 4.43 MHz (3.58 MHz).

BLACK BURST — Composite "black" video signal. Amplitude sync: 300 mVpp. Amplitude burst: 300 mVpp. Impedance: 75 Ω. Return loss: 30 dB up to 7 MHz. (M/NTSC: 286 mVpp).

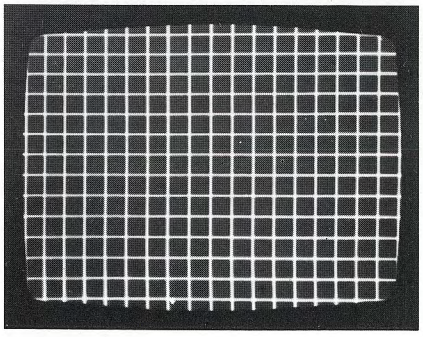
Input

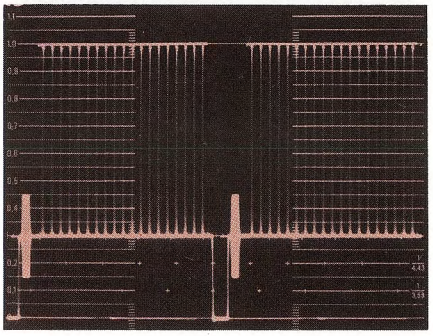
SYNCHRONIZATION — The instrument may be genlocked to a composite video signal or black burst. Amplitude: 0.5 - 4 Vpp, high ohmic looped-through. Return





Grey scale signal. Either a 5-riser or a 10 riser grey scale can be selected.





Cross-hatch signal 14 x 19 lines.

PM 5537

loss: > 34 dB up to 7 MHz. Composite sync will only give bl/wh genlocking.

SPG characteristics

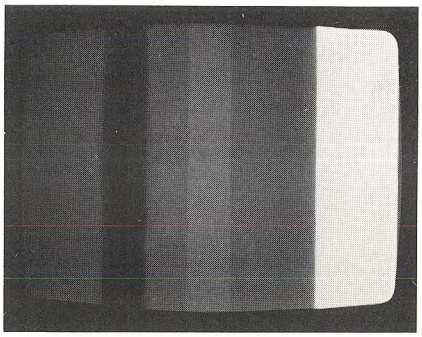
MODES OF OPERATION — Internal mode: the sync pulse generator (SPG) is controlled by the internal 10 MHz crystal oscillator (TCXO). 10 MHz oven-controlled crystal oscillator is optional. All timings and frequencies are derived from this oscillator. External mode: SPG locks to an external video or black burst signal or composite sync (monochrome locking only).

GENLOCK (all versions) — The PM 5534 can genlock to an external video signal, (C)VBS, or a composite sync signal. The scanning frequencies lock to the incoming sync by phase-lock/miscount circuitry (locking time less than 7 sec). The colour subcarrier locks to the incoming colour burst, if any. Catching range: ± 25 Hz at 4.43 MHz, ± 20 Hz at 3.58 MHz. Jitter of subcarrier: < 1°.

EXTERNAL FREQUENCY STANDARD (optional) — Via the 10 MHz interface card (optional) the PM 5534 can be controlled from an external frequency standard (i.e. atomic frequency standard). Amplitude: 0.1 - 2 Vrms. Impedance: 75 Ω. Return loss: > 26 dB at 10 MHz.

625 LINES SYSTEMS — Horizontal line frequency: 15 625 Hz (locked to the colour subcarrier). Line sync pulses: 4.7 µs ± 0.2 µs. Equalizing pulses: 2.35 µs ± 0.1 µs. Serrations of field pulses: 4.7 µs ± 0.2 µs. Number of equalizing pulses: 5 + 5. Front porch: 1.3 - 1.8 µs. Line blanking: 11.8 - 12.3 µs (G and I-versions), 10.3 - 11.4 µs (N-version). Vertical blanking interval: 25 lines + 12 µs (G and I-versions), 25 lines + 11 µs (N-version). Colour burst width: 2.03 - 2.48 µs. Colour burst position: 5.6 µs ± 0.2 µs referred to line sync pulses. Burst suppression: 9 lines per field. Type of burst: alternating 135°/225°. Frequency of colour subcarrier: 4.433 618 75 MHz ± 5 Hz (G and I-versions), 3.582 056 25 MHz ± 4 Hz (N-version).

525 LINES SYSTEMS — Horizontal line frequency: 15 734 Hz (locked to the colour subcarrier). Line sync pulses: 4.8 µs ± 0.3 µs. Equalizing pulses: 2.4 µs ± 0.15 µs. Serrations of field pulses: 4.5 µs ± 0.6 µs. Number of equalizing pulses: 6 + 6. Front porch: 1.3 - 2.0 µs. Line blanking: 10.5 - 11.4 µs. Vertical blanking interval: 21 lines + 11 µs. Colour burst width: 2.1 - 2.7 µs (M/NTSC), 2.3 - 2.7 µs (M/PAL). Colour burst position: 5.5 µs ± 0.2 µs referred to line sync pulses. Burst suppression: 9 lines (M/NTSC), 11 lines (M/PAL). Type of burst: non-alternating 180° (M/NTSC), alternating 135°/225° (M/PAL). Frequency of colour subcarrier: 3.579 545 MHz ± 4 Hz (M/NTSC), 3.575 611 49 MHz ± 4 Hz (M/PAL).

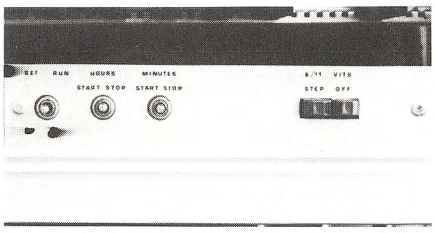


Full-field PLUGE signal.

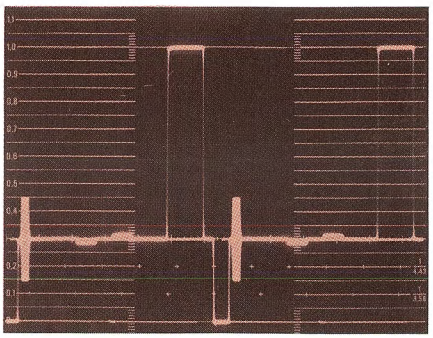
Coding characteristics

PAL SYSTEMS — Residual subcarrier: < 0.5%. R-Y, B-Y quadrature error: < 0.5°. R-Y phase switch error: < 0.5°. Luminance/chrominance time difference: < 20 ns. Colour subcarrier phase control: > 360°.

NTSC SYSTEM — Identical to PAL, however without R-Y switching.



The internal selector panel, where 6 or 11 levels, and VITS on-off are selected. Also the time of the clock is set here.



Remote control

Via a multi-pole connector at the rear panel the selection of signal on the video out connector can be controlled remotely (+ 5 V logic).

Power supply

Voltage: 230 V (115 V) ± 20% (Internal selection). Frequency: 48 - 65 Hz. Consumption: 55 W at 220 V.

Temperature range

Operating: 0° - 45° C ambient.

Mechanical data

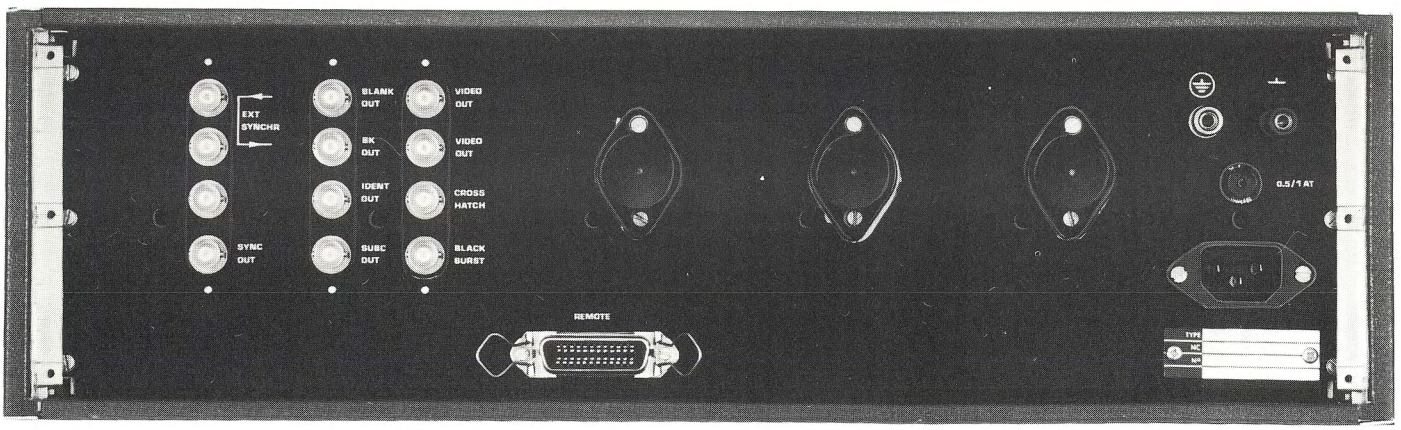
6/6 plug-in unit for the PHILIPS 19" rack/table cabinet.
Height : 132 mm
Width : 444 mm
Depth : 435 mm
Weight : 13.6 kg (incl. cabinet).

Cabinet

The PM 9716 A cabinet is supplied with the PM 5537.

Options

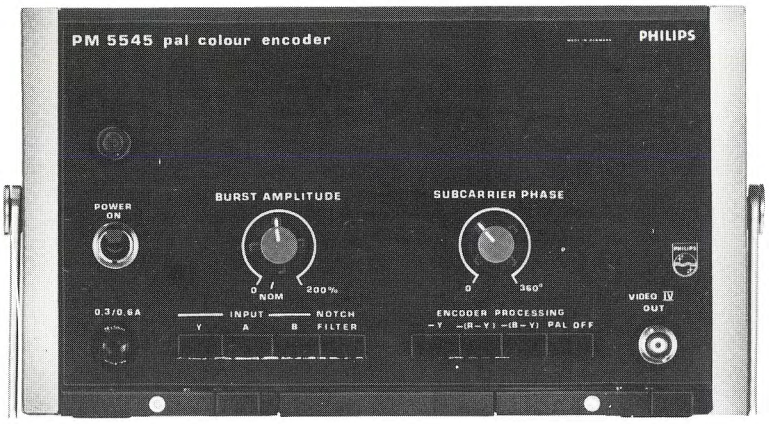
-PM 8501 Interface card
-PM 8502 Oven-controlled X-tal oscillator
-PM 8503 Text generator
-PM 8504 Clock generator



Colour encoder

PM 5545

Code no. PM 5545:
9449 055 45003 (G-version, 625-lines PAL)
9449 055 45008 (M-version, 525-lines PAL)
9449 055 45108 (M-version, 525-lines NTSC)
9449 055 45009 (N-version, 625-lines PAL)



Precision colour encoder of high class

Two inputs: (Y) RGB and Y, R-Y, B-Y giving the choice of optimal quality of the encoded signal

Separate colour and bl/wh outputs are available

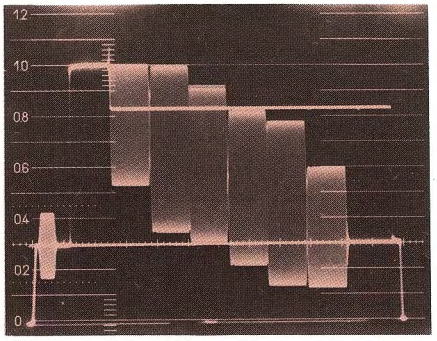
Switchable luminance and chrominance information facilitates testing of encoding/decoding characteristics

The PM 5545 colour encoder is a precision instrument designed for the encoding of critical test signals, like for instance the RGB signals of the PM 5535 colour pattern generator or the PM 5633 colour generator, RGB. The encoder may also be used for the encoding of the RGB signals of colour cameras, telecines and RGB computer graphics. The PM 5545 has two inputs, one for a (Y)RGB signal and one for a Y, R-Y, B-Y signal (inputs A and B). The desired input is selected with a front panel selector. The luminance (Y) component of the encoded RGB signal is normally derived from the RGB signal but may be supplied separately to a fourth input connector (Y selected). A switchable notch filter reduces the frequency content of the luminance signal at colour subcarrier frequencies. To allow special tests and measurements the PM 5545 has switchable luminance, R-Y and B-Y functions, and the PAL alternation may be cancelled. The burst amplitude is variable from 0 to 200% (nominal in calibrated position). The process of encoding RGB and component signals into PAL and NTSC involves a delay line in the luminance channel. This delay line compensates for the delay of the modulation and filtering of the chrominance signals. In the PM 5545 this delay line has a bandwidth of 10 MHz in order to ensure a flat response of the 5 MHz base band without ripples and a good pulse response. To function properly the encoder must be synchronized to the signal source. The following synchronization signals are needed: composite sync, colour subcarrier, and burst keying pulses. These signals are available from both the PM 5535 and the PM 5633. The PM 5545 has two pairs of two output connectors. Each pair may deliver the encoded signal in one of the following versions (by internal programming): composite colour signal (CVBS), composite monochrome (VBS), or same signals without sync (CBV and VB).

Applications

The PM 5545 is used for encoding of precision RGB or Y/R-Y/B-Y test signals, f.inst. for test of colour monitors, TV receivers, and colour decoders. Although overspecified for that application the PM 5545 may also be used to encode camera signals and other programme RGB sources.

The PM 5545 is a half rack plug-in unit, which fits into the PM 9716A Philips 19" rack/table cabinet.



Multiburst signal supplied to the luminance input of the YRGB input. The output signal shown above has therefore no chroma content, and the superior performance of the PM 5545 is thereby made clearly visible.



PM 5545

TECHNICAL DATA PM 5545 G/PAL.

Encoding characteristics

MATRIXING — Luminance signal: $E_Y = 0.299\ E_R + 0.587\ E_G + 0.114\ E_B$. Matrixing error: < 1%. Chrominance signals: $E_U = 0.493\ (E_B - E_Y)$, $E_V = 0.877\ (E_R - E_Y)$. Crosstalk between all inputs: < - 50 dB.

COLOUR BURST — Type: Alternating 135° - 225°. Amplitude: Nominal 300 mV p-p, variable from 0 - 200%.

MODULATION — Unbalance: < 1% with reference to 0.7 Vp-p bl/wh level, typical value < 0.5%. Lowpass characteristic: f_{3dB} = 1.7 MHz. Inaccuracy R-Y axis switching: ± 90° ± 0.5°. Subcarrier phase adjustment: 0° - 360°. Max. subcarrier phase drift: < 2° from 0° C to 45° C.

FREQUENCY RESPONSE — Luminance channel: 6 MHz < 0.5 dB, 10 MHz < 3 dB. Notch filter: 4.43 MHz < 6 dB, 4.43 MHz ± 200 kHz < 3 dB. Chrominance channel: 4.43 MHz ± 1.4 MHz < 3 dB, 4.43 MHz ± 4 MHz < 20 dB.

DISTORTION AND TIME DELAY — Differential gain: < 0.5%. Differential phase: < 0.5°. Time difference between R-Y and B-Y signals: < 10 ns. Time difference between luminance and chrominance signals: < 15 ns.

TRANSIENT RESPONSE — Luminance channel: Rise time t_r < 55 ns, ripple < 1% (through 100 ns Thomson filter). Chrominance channel: Rise time t_r appr. 225 ns, ripple < 1%.

Input signals

VIDEO —
1) (Y)RGB, amplitude 0.7 Vp-p (without sync and set-up), looped-through.
2) R-Y and B-Y, amplitude 1.4 Vp-p (without sync and set-up), terminated with 75 Ω and Y, amplitude 0.7 Vp-p (without sync and set-up), terminated with 75 Ω.

SYNC AND BURST KEYING PULSES — Amplitude: 2 - 8 Vp-p, negative, looped-through. Max. permissible hum: 100%.

SUBCARRIER — Nominal frequency: 4.433 619 MHz. Amplitude: 1 - 4 Vp-p, looped-through. Return loss: For all inputs > 35 dB.

Output signals

ENCODED VIDEO SIGNAL — Amplitude: 1 Vp-p, incl. sync. Video content: As input signal. Sync content: 0.300 V p-p. Output impedance: 75 Ω. The encoded video signals are available via 2 separate output amplifiers with 2 outputs each. Each output amplifier can supply either of the following signals (modification by internal selection:
1) Luminance + sync.
2) Luminance + chrominance.
3) Luminance + chrominance + sync.

Power supply

Voltage: 230 V (115 V) ± 20% (Internal selection). Frequency: 48 - 65 Hz. Consumption: 25 W at 220 V.

Temperature range

Operating: 0° - 45° C ambient.

Mechanical data

3/6 plug-in unit for the PHILIPS 19" rack/table cabinet.
Height : 132 mm
Width : 225 mm
Depth : 400 mm
Weight : 5.3 kg (without cabinet).

Cabinet

(To be ordered separately):
3/6 table cabinet: PM 9713
6/6 rack/table cabinet: PM 9716 A.

TECHNICAL DATA PM 5545 M/PAL and PM 5545 N/PAL.

Encoding characteristics

MATRIXING — Luminance signal: $E_Y = 0.299\ E_R + 0.587\ E_G + 0.114\ E_B$. Matrixing error: < 1%. Chrominance signals: $E_U = 0.493\ (E_B - E_Y)$, $E_V = 0.877\ (E_R - E_Y)$. Crosstalk between all inputs: < - 50 dB.

COLOUR BURST — Type: Alternating 135° - 225°. Amplitude: Nominal 300 mVp-p, variable from 0 - 200%.

MODULATION — Unbalance: < 1% with reference to 0.7 Vp-p bl/wh level, typical value: < 0.5%. Lowpass characteristic: f_{3dB} = 1.7 MHz. Inaccuracy R-Y axis switching: ± 90° ± 0.5°. Subcarrier phase adjustment: 0° - 360°. Max. subcarrier phase drift: < 2° from 0° C to 45° C.

FREQUENCY RESPONSE — Luminance channel: 6 MHz < 0.5 dB, 10 MHz < 3 dB. Notch filter: 3.58 MHz < 6 dB, 3.58 MHz ± 200 kHz < 3 dB. Chrominance channel: 3.58 MHz ± 1.4 MHz < 3 dB, 3.58 MHz ± 4 MHz < 20 dB.

DISTORTION AND TIME DELAY — Differential gain: < 0.5%. Differential phase: < 0.5°. Time difference between R-Y and B-Y signals: < 10 ns. Time difference between luminance and chrominance signals: < 15 ns.

TRANSIENT RESPONSE — Luminance channel: Rise time t_r < 55 ns, ripple < 1 % (through 100 ns Thomson filter). Chrominance channel: Rise time t_r appr. 225 ns ripple < 1%.

Input signals

VIDEO —
1) (Y)RGB, amplitude 0.7 Vp-p (without sync and set-up), looped-through.
2) R-Y and B-Y, amplitude 1.4 Vp-p (without sync and set-up), terminated with 75 Ω and Y, amplitude 0.7 Vp-p (without sync and set-up), terminated with 75 Ω.

SYNC AND BURST KEYING PULSES — Amplitude: 2 - 8 Vp-p, negative, looped-through. Max. permissible hum 100%.

SUBCARRIER — Nominal frequency: 3.575 611 MHz (M/PAL), 3.582 056 MHz (N/PAL). Amplitude: 1 - 4 Vp-p, looped-through. Return loss: For all inputs > 35 dB.

Output signals

ENCODED VIDEO SIGNAL — Amplitude: 1 Vp-p incl. sync. Video content: As input signal. Sync content: 0.300 V p-p. Output impedance: 75 Ω. The encoded video signals are available via 2 outputs each. Each output amplifier can supply either of the following signals (modification by internal selection):
1) Luminance + sync.
2) Luminance + chrominance.
3) Luminance + chrominance + sync.

Power supply

Voltage: 230 V (115 V) ± 20% (Internal selection). Frequency: 48 - 65 Hz. Consumption: 25 W at 110 V.
NB. Factory wired for 230 V, unless otherwise indicated.

Temperature range

Operating: 0° - 45° C ambient.

Mechanical data

3/6 plug-in unit for the PHILIPS 19" rack/table cabinet.
Height : 132 mm
Width : 225 mm
Depth : 400 mm
Weight : 5.3 kg (without cabinet)

Cabinet

(To be ordered separately):
3/6 table cabinet: PM 9713
6/6 Rack/table cabinet: PM 9716 A.

TECHNICAL DATA PM 5545 M/NTSC.

Encoding characteristics

MATRIXING — Luminance signal: $E_Y = 0.299\,E_R + 0.587\,E_G + 0.114\,E_B$. Matrixing error: < 1%. Chrominance signals: $E_U = 0.493\,(E_B - E_Y)$, $E_V = 0.877\,(E_R - E_Y)$. Crosstalk between all inputs: < - 50 dB.

COLOUR BURST — Amplitude: nominal 286 mVp-p (40 IRE), variable from 0 - 200%.

MODULATION — Unbalance: < 1% with reference to 0.714 V bl/wh level, typical value: < 0.5%. Low-pass characteristic: f_{3dB} = 1.7 MHz. Inaccuracy R-Y axis switching: 90° ± 0.5°. Subcarrier phase adjustment: 0° - 360°. Max. subcarrier phase drift: < 2° from 0° C to 45° C.

FREQUENCY RESPONSE — Luminance channel: 6 MHz < 0.5 dB, 10 MHz < 3 dB. Notch filter: 3.58 MHz < 6 dB, 3.58 MHz ± 200 kHz < 3 dB. Chrominance channel: 3.58 MHz ± 1.4 MHz < 3 dB, 3.58 MHz ± 4 MHz > 20 dB.

DISTORTION AND TIME DELAY — Differential gain: < 0.5%. Differential phase: < 0.5°. Time difference between R-Y and B-Y signals: < 10 ns. Time difference between luminance and chrominance signals: < 15 ns.

TRANSIENT RESPONSE — Luminance channel: rise time t_r < 55 ns, ripple < 1% (through 100 ns Thomson filter). Chrominance channel: rise time t_r appr. 225 ns, ripple < 1%.

Input signals

VIDEO — 1) (Y)RGB, amplitude 0.714 Vp-p (without sync and set-up), looped-through. 2) R-Y and B-Y, amplitude 1.428 Vp-p (without sync and set-up), terminated with 75 Ω, Y, amplitude 0.14 Vp-p (without sync and set-up), terminated with 75 Ω.

SYNC AND BURST KEYING PULSES — Amplitude: 2 - 8 Vp-p, negative, looped-through. Max. permissible hum: 100%.

SUBCARRIER — Nominal frequency: 3.579 545 MHz. Amplitude: 1 - 4 Vp-p, looped-through. Return loss: for all inputs > 35 dB.

Output signals

ENCODED VIDEO SIGNAL — Amplitude: 1 Vp-p, incl. sync. Video content: as input signal, sync content: 0.286 Vp-p (40 IRE). Output impedance: 75 Ω. The encoded video signals are available via 2 separate output amplifiers with 2 outputs each. Each output amplifier can supply either of the following signals (modification by internal selection):
1) Luminance + sync.
2) Luminance + chrominance.
3) Luminance + chrominance + sync.

Power supply

Voltage: 115 V (230 V) ± 20% (Internal selection). Frequency: 48 - 65 Hz. Consumption: 25 W at 110 V.
NB. Factory wired for 230 V, unless otherwise indicated.

Temperature range

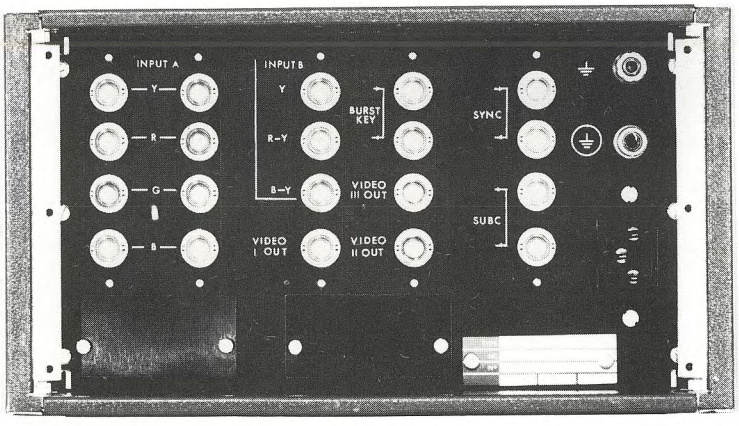
Operating: 0° - 45° C ambient.

Mechanical data

3/6 plug-in unit for the PHILIPS 19" rack/table cabinet.
Height : 132 mm
Width : 225 mm
Depth : 400 mm
Weight : 5.3 kg (without cabinet).

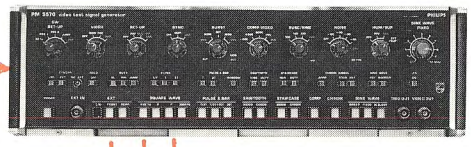
Cabinet

(To be ordered separately):
3/6 table cabinet: PM 9713
6/6 rack/table cabinet: PM 9716 A.

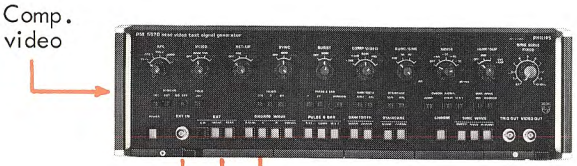


Test signal generators

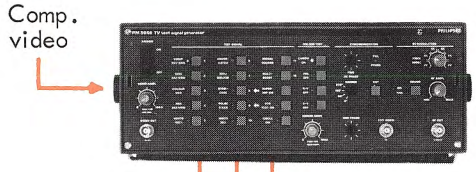
PM 5570 Video test signal generator



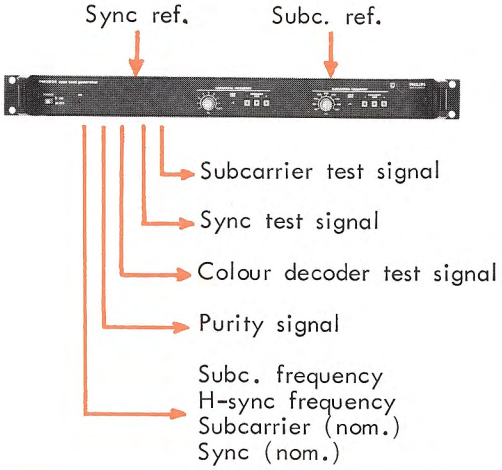
PM 5570M NTSC video test signal generator



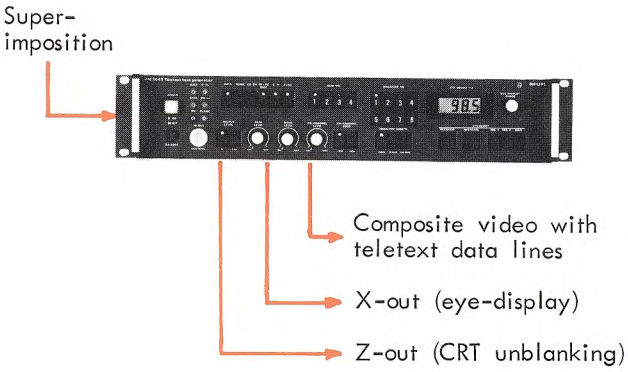
PM 5646 TV test signal generator



PM 5634 Sync test generator



PM 5645 Teletext test generator



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Intro	Video test signals and parameters	56
PM 5570	Video test signal generator	57
PM 5570M	NTSC video test signal generator	61
PM 5646	TV test signal generator	65
PM 5634	Sync test generator	70
PM 5645	Teletext test generator	74

Philips, of course.

Video test signals and parameters

Whenever a television signal is processed in one way or another, it is exposed to various sorts of distortion. These distortions degrade the quality of the signal and its components.
In the television world a number of parameters (distortions) have been defined. These parameters have been given names that describe the effect they give on the picture.

The table below describes the various types of video parameters as well as the commonly used test signals applied for the measurement of same parameters.

In the column "observation" is described what one sees on a waveform monitor or vectorscope, but sometimes auxiliary filters or special equipment is needed to expose the effect of the distortion.

The PM 5570 and PM 5570M and partly the PM 5646 described on the following pages generate all the signals needed for the measurements mentioned below, and many more.

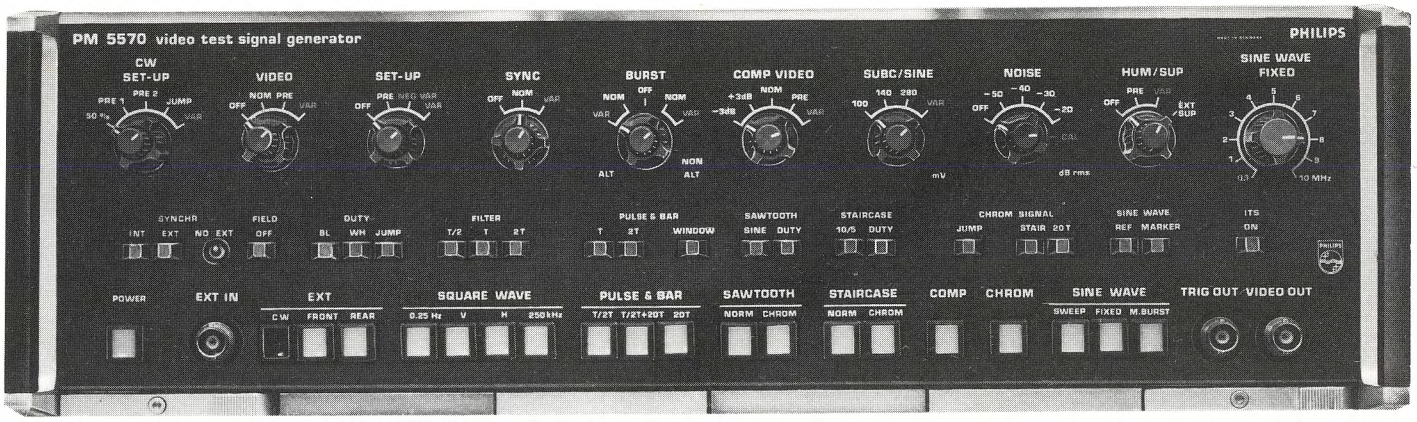
		Parameter	Test signal	Observation
Linear distortions	Frequency domain (sine wave measurements)	Amplitude response.	Video sweep 50 Hz to 6 MHz or more. Multiburst signal.	Amplitude referred to the amplitude at reference frequency.
		Group delay response (envelope delay).	Video sweep 50 Hz to 6 MHz or more, or stepped frequency signal.	Phase referred to the phase at reference frequency.
	Time domain (pulse measurements) Luminance parameters	Level (absolute amplitude).	White reference bar.	Amplitude of bar.
		Long-time waveform distortion.	0.25 Hz square wave, manually controlled jumps white-to-black and vice versa.	Change or instability of black level.
		Field-time waveform distortion, field sag or tilt.	50 or 60 Hz squarewave.	Tilt of squarewave.
		Line-time waveform distortion, line sag or tilt, bar tilt.	15.625 or 15.725 kHz squarewave or white reference bar.	Tilt of bar or squarewave.
		Short time waveform distortion, bar overshoot/ringing, 2T pulse overshoot/ringing.	White reference bar, 250 kHz squarewave, 2T sine-squared pulse. Note: this measurement is very dependent on waveform rise time/pulse width.	Overshoot and/or ringing after the transients, overshoot and/or ringing before or after the 2T pulse.
	Colour parameters	Chrominance/luminance gain inequality.	20T (10T or 12.5T) carrier born sine-squared pulse (or ditto bar).	Cosine curvature of the baseline of the pulse or bar.
		Chrominance/luminance delay inequality.	20T (10T or 12.5T) carrier born sine-squared pulse (or ditto bar).	Sine curvature of the baseline of the pulse or bar.
		Chrominance waveform distortion.	20T (10T or 12.5T) carrier born sine-squared pulse (or ditto bar).	Waveform of the pulse or bar.
Non-linear distortions	Sync signal	Compression/stretching.	Any with sync pulses.	Amplitude of sync pulses.
	Picture signal luminance parameters	Luminance non-linearity/static non-linearity.	Sawtooth or staircase.	Non-linearity, height of spikes from differentiated staircase.
		Chrominance-to-luminance cross-talk (intermodulation).	Chroma staircase or chroma bar on pedestal.	"Foot-print" in the pedestal after removal of the chroma.
	Colour parameters	Chrominance non-linearity.	Chroma staircase on pedestal.	Non-linearity of the staircase.
		Luminance-to-chrominance cross-talk (amplitude). Diff. gain.	Staircase or sawtooth with superimposed chrominance.	Change of chroma amplitude as function of luminance level.
		Chrominance phase distortion. Incidental phase modulation.	Chroma staircase or chroma sawtooth.	Change of the chroma phase as function of the chroma level.
		Luminance-to-chrominance cross-talk (phase). Diff. phase.	Staircase or sawtooth with superimposed chroma.	Change of the chroma phase as function of the luminance level.

Video test signal generator

PM 5570

Code no. PM 5570:
9449 055 70003 (G-version, 625-lines PAL)
9449 055 70005 (I-version, 625-lines PAL)
9449 055 70008 (M-version, 525-lines PAL) (on request)
9449 055 70009 (N-version, 625-lines PAL) (on request)

Note. PM 5570 M/NTSC, see page 61.



Most versatile signal generator for testing transmission characteristics of video systems.

Easy to operate because of logical, ergonomic layout of front panel controls.

Sweep signal from 100 kHz up to 10 MHz in one sweep with marker indication for each MHz.

All levels are continuously variable with adjustable preset positions.

Generates all necessary signals for aligning and checking TV studios, transmission links and transmitters.

The blanking mixer converts any non-TV signal into a normal TV signal with blanking and sync.

The PM 5570 is the most versatile video test signal generator available nowadays. It generates a wide variety of test signals necessary for measuring the system parameters of all kinds of video transmission equipment. Besides, it enables the user to vary all signal levels so that level dependent parameters can be detected as well.

The generator has its own standard sync pulse generator, which can be genlocked to an external composite video – or a black burst signal. A choice of the following test signals can be made: squarewave signals of different frequencies and with different rise and fall times, pulse-and-bar signals, sawtooth- and staircase signals, - with or without superimposed sine wave or subcarrier, chrominance staircase, and various sine wave signals, viz. video sweep, multiburst and fixed frequencies. All signals can be superimposed with hum, and white noise can be added to check such things as sync separators, clamp circuits and processing amplifiers, etc. A duty signal can be added to the sawtooth and staircase signals forming the socalled duty cycled signals (alternating 3 lines duty signal, 1 line sawtooth/staircase).

By means of the amplitude controls the levels of the different signal parts can be varied or even switched off, like: video content, sync pulses, set-up, colour burst, composite video, superimposed signals as well as white noise. To make quick "settings" possible, the levels are controlled by means of selectors, which besides adjustable preset positions also have a variable position enabling continuously adjustable levels. Preset levels can be adjusted internally to own requirements.

The instrument also has an external continuous wave input enabling conversion of any supplied non-TV signal into a video signal. Such a signal may be the sweep signal from a side band analyser or group delay test set. The start of such a sweep can be triggered by the PM 5570, using the "sweep start" signal.

Application

The main application fields of the PM 5570 are: development, service and repair, and check of complicated video equipment.

For the design engineers developing high standard TV equipment, the PM 5570 offers the necessary video test signals for performing a complete test of all video parameters. Unlike a standard VITS generator, the PM 5570 generates individual test signals for each type of parameters, so that specific parameters can be studied more conveniently and more accurately than is the case with VIT signal. On top of that the effect of abnormal conditions can be analysed. This because the levels of all signal parts can be offset the nominal levels, and noise,

hum or other spurious signals can be added.

In service and repair of complicated TV equipment faulty components can often be located by means of simple measuring gear. However, periodic faults, or faults resulting in only minor degradation of the performance can be very difficult to find. Here the versatility of the PM 5570 can be of great help. By selection of proper test signals and/or extreme levels the influence of defective circuitry can be exaggerated thus making it traceable more easily.

Nowadays most routine checks of broadcast networks are performed with VIT signals, which do have the advantage that measurements can be performed during the programme time. In case of thourough checks and overhauls, however, more sophisticated measuring methods and gear are needded. The PM 5570 (or its predecessor PM 5572/73/74) is therefore found in many transmitting stations and switching centres all over the world.

TECHNICAL DATA (all versions)

Video test signals

SQUAREWAVE SIGNALS — Frequencies: 1) 0.25 Hz (transmitter bump), 2) 50 Hz, locked to field frequency, 3) 15.625 kHz, locked to line frequency, 4) 250 kHz, locked to line frequency. Rise and fall time: 1) 50 ns +10/-0 ns with T/2 filter, 2) 100 ns +10/-0 ns with T-filter, 3) 200 ns +20/-0 ns with 2T-filter. Overshoot: < 1%. Tilt < 1%.
(N-version: Rise and fall time: 1) 62 ns + 10/-0 ns. 2) 125 ns +10/-0 ns. 3) 250 ns +20/-0 ns).
(M-version: 2) 60 Hz, 3) 15.750 kHz. Rise and fall time: 1) 62 ns +10/-0 ns. 2) 125 ns +10/-0 ns, 3) 250 ns +20/-0 ns).

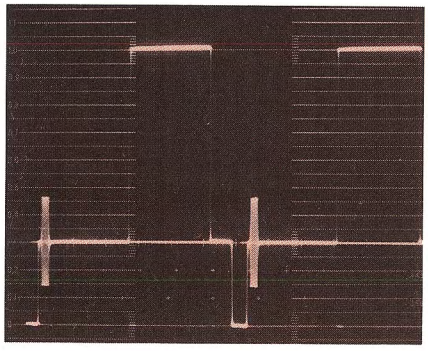
PULSE-AND-BAR SIGNALS — Types: 1) T-pulse and T-bar, 2) 2T-pulse and 2T-bar, 3) T-pulse, 20 or 10T-pulse composite and T-bar, 4) 2T-pulse, 20 or 10T-pulse composite and 2T-bar, 5) 20 or 10T-pulse composite and 20 or 10T-bar composite. First four signals can be gated with field frequency squarewave giving so-called window signal. Shape of pulses: sine-squared. Pulse width: T = 100 ns +10/-0 ns, 2T = 200 ns +20/-0 ns. 20T = 2.0 µs ± 0.06 µs (system G), 10T = 1.0 µs ± 0.03 µs (system I) K-factor: < 0.5% for both T- and 2T-pulse. Bar width: 25 µs ± 0.5 µs. Bar rise time: T-bar = 100 ns +10/-0 ns, 2T-bar = 200 ns +20/-0 ns. 20T-bar composite: 2.0 µs ± 0.1 µs (system G), 10T-bar composite: 1.0 µs ± 0.1 µs (system I). Bar overshoot: < 1%. Bar tilt: < 1.0%. 20T (10T) chrominance/luminance gain inequality: < 1%, delay inequality: < 10 ns
(M and N versions: T = 125 ns +10/-0 ns, 2T = 250 ns +20/-0 ns, 12.5T = 1.57 µs ± 0.1 µs).

Technical description

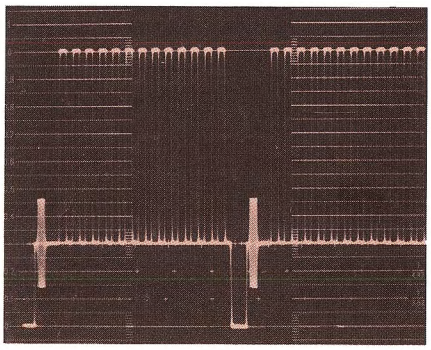
The PM 5570 consists of three main sections:
1) generator, 2) processing part, 3) control part.
The generator section contains all test signal generators and adder networks and supplies a complete test signal to the processing section. In the processing section sync, colour burst, set-up and superimposed signals are added to the video signal, and all amplitudes are controlled here. The control section, which contains the SPG with genlock facility, delivers the pulses controlling the timings of the test signal elements.

It also controls the signal selection and contains interface circuitry for remote control of signal selection.

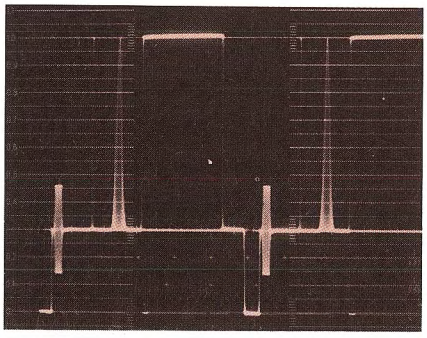
The processing part has a large number of controls to allow the operator to compose the optimum signal for tracing or checking a specific source of distortion. In order to make operation quick and safe the controls are arranged in such a way that the lower row of light push-buttons select the main function, i.e. selection of test signals, the row above the exact version of the selected test signal, while the upper row of rotary switches and potmeters controls mainly the levels.



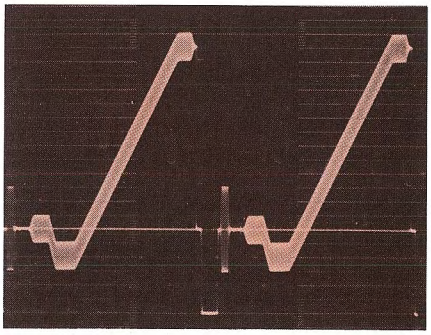
15.625 kHz squarewave. Also 0.25 Hz and 50 Hz are available.



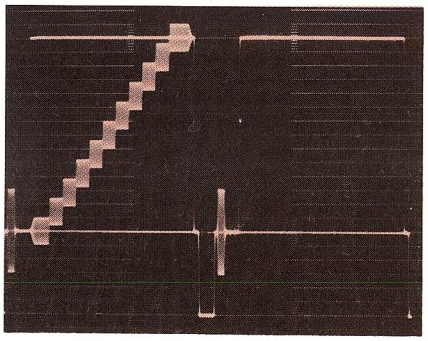
250 kHz squarewave. Rise time selectable 50, 100 or 200 ns.



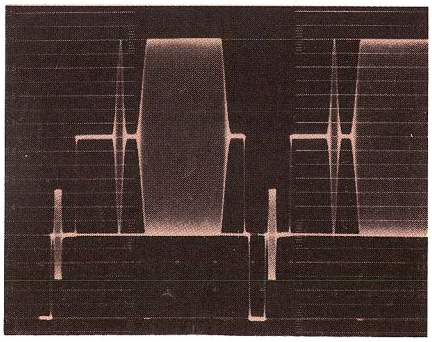
2T, 20T and bar signal. Window signal is also possible.



Special sawtooth signal with superimposed colour subcarrier.



Staircase with superimposed chroma and white duty cycle.



Chroma signal, 20T and bar. Available as chroma + luminance as well.

SAWTOOTH SIGNALS — Types: 1) sawtooth on all active lines (line frequency), 2) sawtooth as 1) with superimposed sine wave frequencies, 3) special sawtooth with superimposed subcarrier frequency. A duty signal can be added giving alternating three lines duty signal and one line sawtooth.

STAIRCASE SIGNALS — Types: 1) staircase on all active lines (line frequency), 2) staircase as 1) with superimposed subcarrier frequency. Number of steps: switchable 5 or 10. A duty signal can be added giving alternating three lines duty signal and one line staircase. Non-linearity of staircase: < 0.5%. Rise time: 228 ns ± 20 ns. (M and N-versions: 280 ns ± 20 ns).

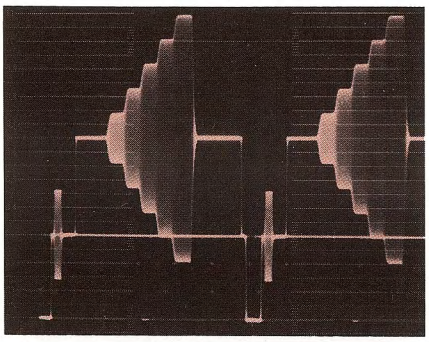
CHROMINANCE SIGNAL — Types: 1) 20T-pulse and 20T-bar (system G), 10T-pulse and 10T-bar (system I), chroma only (fixed 50% pedestal), 2) chrominance staircase (fixed 50% pedestal). Chroma staircase can be jumped. Jump frequency: 0.25 Hz. Rise time chroma bar: 2.0 µs (G-version), 1.0 µs (I-version). Rise time pedestal: 200 ns + 20/- 0 ns. Number of risers on chroma staircase: 5. Rise time of chroma staircase: approx. 1 µs. CLIM: < 0.5% of pedestal amplitude. Nominal amplitude chroma staircase: 875 mV ± 2% (peak to peak).
(M and N-versions: 20T-pulse and 20T-bar signal. Pulse width: 2.5 µs ± 0.1 µs. Chroma bar rise and fall time: 2.5 µs ± 0.1 µs. Pedestal rise and fall time: 250 ns +20/-0 ns.

COMPOSITE SIGNAL — Type: white reference bar, 2T-pulse, 20T-pulse (10T-pulse) composite and staircase. Bar width: 10 µs. Bar height: same as pulse-and-bar signal. 2T-pulse: as pulse-and-bar signal. 20T (10T) pulse: as pulse-and-bar signal. Staircase: 5 steps. The composite signal can also be inserted into lines 17 and 330 as a VIT signal. Level: 700 mVp-p independent of gain control settings.
(I-version: the composite signal is identical to the national UK insertion signal).
(M-version: the composite signal can be inserted in line 17, both fields).

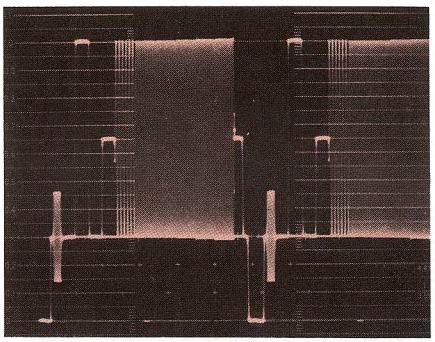
SWEEP SIGNAL — Frequency range: 0.1 - 10 MHz. Repetition rate 50 Hz. Locked to field. Amplitude accuracy: better than ± 2% (0-5 MHz), ± 4% (5-10 MHz). Markers (switchable): 1, 2 .. 10 MHz. Marker accuracy: X-TAL derived. Marker width: approximately 200 µs. Reference (switchable): white bar of 4 µs width in the beginning of each active line. Pedestal level: 50% of sweep signal. Pedestal rise time: 200 ns +20/-0 ns.
(M-version: sweep repetition rate is 60 Hz, locked to the field frequency).

FIXED SINE WAVE SIGNALS — Frequencies: 0.1 - 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 and 10 MHz by means of selector. Frequency accuracy: better than ± 3% or 15 kHz. Harmonic contents: < 3%. Reference (switchable): white bar of 4 µs width in the beginning of each active line. Pedestal level: 50% of sine wave signal. Pedestal rise time 200 ns +20/-0 ns.

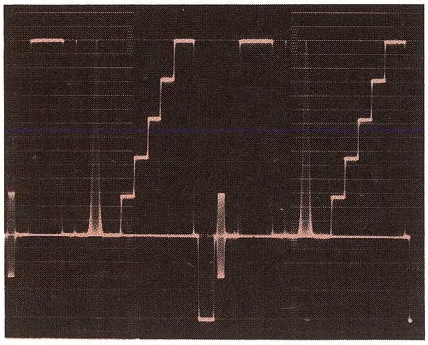
MULTIBURST SIGNAL — Frequencies: 1 - 2 - 3 - 4 - 5 and 6 MHz. Frequency accuracy: ± 3%. Fixed reference of 4 µs width in the beginning of each active line. Pedestal level: 50% of multiburst signal. Pedestal rise time: 200 ns +20/-0 ns.
(M and N-versions: pedestal rise and fall time: 250 ns +20/-0 ns on all sine wave signals).



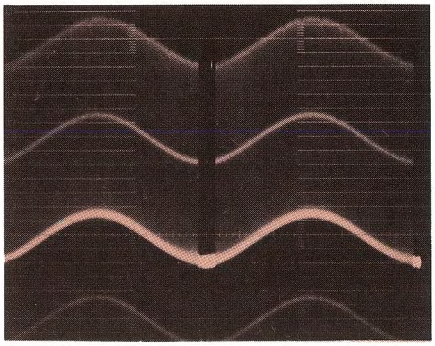
Chroma signal, staircase which can be switched automatically at 0.25 Hz rate.



Multiburst signal: reference 1-2-3-4-5 and 6 MHz.



Composite signal: bar-2T-20T and staircase (VITS).



Sweep signal 0.1-10 MHz superimposed with hum and white noise.

DUTY SIGNAL — Type: 1) 100% white level, 2) black level, 3) JUMP, alternating between white and black, alternating frequency 0.25 Hz.
NB. This signal can only be used in combination with the staircase - and the sawtooth signals to form duty cycled signals.

BLANKING MIXER — The PM 5570 can convert any signal into a TV signal by first erasing the signal content during the blanking time and then adding set-up, sync pulses and, if wanted, colour burst.
The set-up can any of two preset levels or jump between them at 0.25 Hz, or can be varied continuously.

Amplitude controls

The signal parts of the composite video signal can be controlled in amplitude, independently as well as combined, by means of front plate controls. Rotary switches ensure an easy selection of preset levels, while potentiometers enable continuous level control.

VIDEO — Positions: 1) off, 2) nominal, 3) preset, 4) variable. Amplitude range: 0 - 1 Vp-p. Nominal level: 700 mVp-p ± 1%. Preset level: adjustable over whole amplitude range, factory set: 200 mVp-p. Video off is indicated by flashing of test signal push-button.

SET-UP — Positions: 1) off, 2) preset, 3) negative variable, 4) variable. Amplitude range: 0 - 0.9 Vp-p. Amplitude range negative: 0 - 0.3 Vp-p. Preset level: 50 mVp-p ± 10 mVp-p (adjustable).

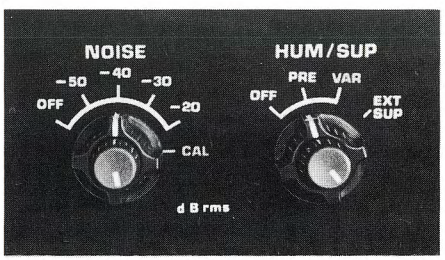
SYNC — Positions: 1) off, 2) nominal, 3) variable. Amplitude range: 0 - 0.6 V p-p. Nominal level: 300 mVp-p ± 1%.

BURST — Positions: 1) nominal, 2) off 3) variable. Amplitude range: 0 - 0.6 V p-p. Nominal level: 300 mVp-p ± 2%.

COMPOSITE VIDEO — Positions: 1) -3 dB, 2) +3 dB, 3) nominal, 4) preset, 5) variable. Amplitude range: 0 - 1.5 Vp-p. Nominal level: 1 Vp-p ± 1%. Preset level: 0.5 Vp-p ± 2% (adjustable). +3 dB level: 1413 mVp-p ± 1%. -3 dB level: 708 mV

Superimposition level controls

The levels of the superimposed signals are controlled independently from the compo-



site video control.

SUBCARRIER/SINE WAVES — Positions: 1) 100 mVp-p ± 3%, 2) 140 mVp-p ± 3%, 3) 280 mVp-p ± 3%, 4) variable. Amplitude range: 0 - 300 mVp-p. The superimpositions of subcarrier or sine wave is controlled by the test signal push-buttons.

NOISE — Positions: 1) off, 2) -50 dB, 3) -40 dB, 4) -30 dB, 5) -20 dB. All values rms. Variable control: 0 - 10 dB attenuation of selected position. Accuracy of fixed positions: ± 2 dB. Noise spectrum: 10 kHz - 5 MHz, within ± 3 dB.

HUM/SUPERIMPOSITION — Positions: 1) off, 2) Hum, preset, 3) Hum, variable, 4) external superimposition. Hum: mains locked 50 Hz (60 Hz). Amplitude range: 0 - 1.5 Vp-p. Preset level: 0.5 Vp-p ± 3%. External superimposition of any signal up to 5 MHz. Amplitude range: 0 - 1.5 Vp-p.

Sync pulse generator (SPG)

A complete colour SPG is incorporated, having the correct relationship between colour subcarrier and line/field frequency. The generator may also be genlocked to an external composite video or black burst signal. In both modes the vertical information can be switched off.

COMPOSITE SYNC — Line frequency: 15 625 Hz. Duration of line sync: 4.7 µs ± 0.2 µs. Field frequency: 50 Hz. Duration of field sync: 2.5 lines. Interval between field sync pulses: 4.7 µs ± 0.2 µs. Duration of equalizing pulses: 2.35 µs. Duration of line blanking: 11.8 - 12.3 µs. Front porch: 1.3 - 1.8 µs. Duration of field blanking: 25 lines + 12 µs. Colour subcarrier frequency 4 433 618.75 Hz ± 5 Hz (derived from TCXO). Duration of burst: 2.03 - 2.48 µs. Position: 5.5 µs ± 0.2 µs after leading edge of line sync. Burst suppression: 9 lines, starting lines 7, 319, 6 and 320. Types of colour burst: alternating or non-alternating.

COMPOSITE SYNC (M-version) — Line frequency: 15 734 Hz. Duration of line sync: 4.77 µs ± 0.32 µs. Field frequency: 60 Hz. Duration of field sync: 3 lines. Interval between field sync pulses: 4.45 µs ± 0.63 µs. Duration of equalizing pulses: 2.40 µs. Duration of line blanking: 10.52 µs - 11.32 µs. Front porch: 1.27 µs - 2.0 µs. Duration of field blanking: 21 lines + 11 µs. Colour subcarrier frequency 3 575 611.49 Hz ± 4 Hz (derived from TCXO). Duration of burst: 2.52 µs ± 0.28 µs. Position: 5.5 µs ± 0.2 µs after leading edge of line sync. Burst suppression: 11 lines, starting lines 9, 271, 8 and 270. Rise time of burst: 300 ns ± 25 ns. Type of burst: alternating and non-alternating.

Outputs

COMPOSITE VIDEO — 2 connectors at the rear. 1 at the front. Output resistance: 75 Ω ± 1%. Return loss: > 34 dB up to 7 MHz. Isolation between outputs: > 40 dB up to 1 MHz, > 30 dB at subcarrier frequency. Voltage: 1 Vp-p ± 1% with all amplitude controls in nominal position. Random HF noise: < -75 dB rms weighted. Low frequency noise: less than -56 dBp-p. NB. Noise figures measured with amplitude controls in nominal position and superimposed signals off.

COMPOSITE SYNC — 1 connector at the rear. Amplitude: 2 Vp-p. Output resistance: 75 Ω.

SUBCARRIER — 1 connector at the rear. Amplitude: 1 Vp-p ± 0.1 Vp-p. Output resistance: 75 Ω. Harmonic contents: < -34 dB.

TRIGGER OUT — 1 connector at the front. Signal type: added composite sync and field pulses. Amplitude: 4 Vp-p. Impedance: 1 kΩ.

SWEEP START SIGNAL — 1 connector at the rear. Type: pulse indicating edges of CW SET-UP jump. Amplitude: 15 V.

Inputs

EXTERNAL IN — 75Ω input at the front, high-ohmic looped-through input at the rear. Type: 1) video signal, 2) continuous wave signal. Amplitude 0 - 1 Vp-p. Return loss: > 34 dB up to 7 MHz. Blanking is mixed to CW signal, while a pedestal can be added by means of the CW SET-UP switch.

SYNCHRONIZATION IN — High-ohmic looped-through input at the rear. Amplitude: 0.5 - 4 Vp-p. Maximum permissible hum: 100%. Return loss: > 34 dB up to 7 MHz. Type: 1) composite sync signal, 2) a black burst signal, 3) a composite video signal.

EXTERNAL SUPERIMPOSITION IN — High-ohmic input at the rear (DC coupled). Maximum amplitude: approximately 4.50 Vp-p. Maximum gain: 0.33. Superimposed signal: 0 - ~1 Vp-p (variable by front control.

RESPONSE OF VIDEO PATH — Frequency response: better than ± 0.2 dB for frequencies 10 Hz - 5 MHz, ± 0.4 dB for 5 - 10 MHz. Distortion: differential gain < 0.5%, differential phase < 0.5° for external signals. (All levels at nominal and external video input 700 mVp-p). Inherent distortion of sawtooth or staircase with superimposed chroma: differential gain < 0.3 %, differential phase < 0.2°.

Remote control

The different test signals may be remotely controlled (+5 V logic). The selected test signal will be indicated by the light push-buttons of the instrument and it can also be remotely indicated (optional).

Power supply

Voltage: 230 V (115 V) ± 20% (Internal selection). Frequency: 48 - 65 Hz. Consumption: 70 W at 220 V.

Temperature range

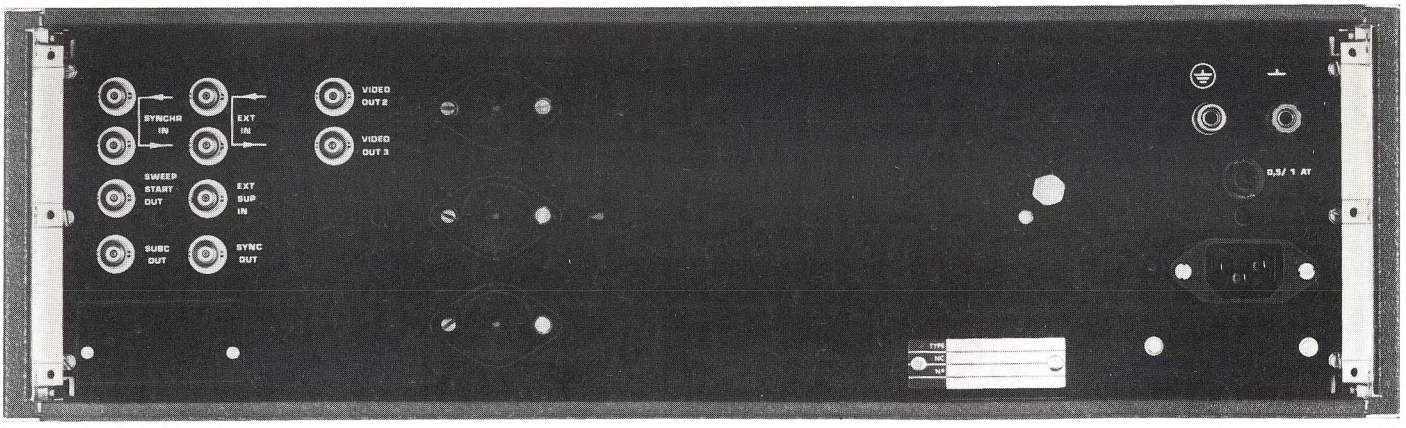
Operating: 0° - 45° C ambient.

Mechanical data

6/6 plug-in unit for the PHILIPS 19" rack/table cabinet.
Height : 132 mm
Width : 444 mm
Depth : 435 mm
Weight : 13,5 kg (incl. cabinet).

Cabinet

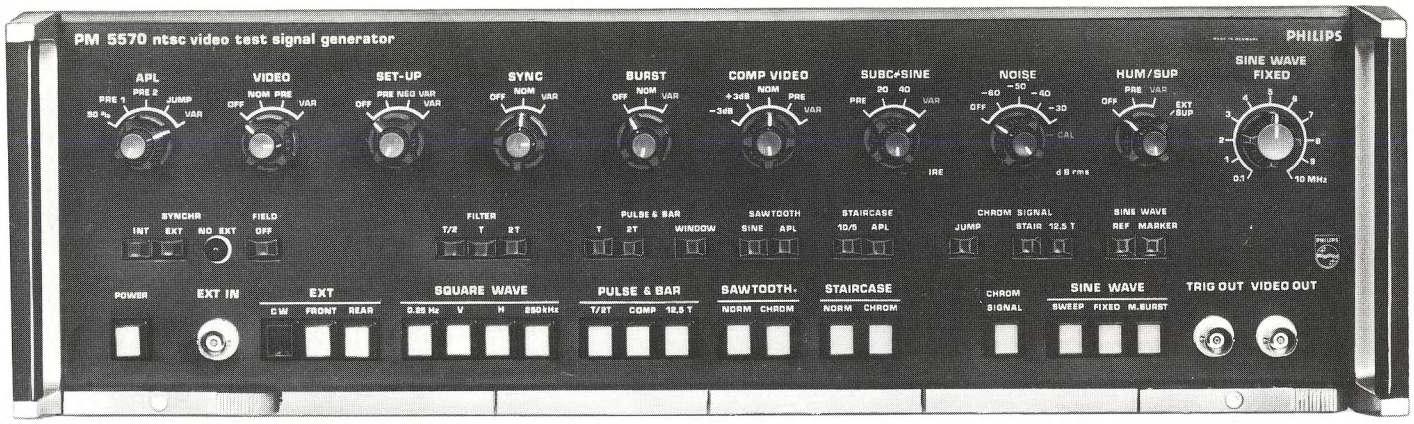
The PM 9716 A rack/table cabinet is supplied with the PM 5570.



NTSC video test signal generator

PM 5570 M

Code no. PM 5570 M:
9449 055 70108 (M-version, 525-lines NTSC)



Most versatile signal generator for testing transmission characteristics of video systems.

Easy to operate because of logical ergonomic layout of front panel controls.

The PM 5570 is the most versatile video test signal generator available nowadays. It generates a wide variety of test signals necessary for measuring the system parameters of all kinds of video transmission equipment. Besides, it enables the user to vary all signal levels so that level dependent parameters can be detected as well.

The generator has its own standard SPG built-in, which can be genlocked to an external composite video or a black burst signal. A choice of the following test signals can be made: squarewave signals of different frequencies and with different rise times, pulse-and-bar signals, sawtooth- and staircase signals with and without superimposed sine wave/subcarrier, chrominance staircase, and various sine wave signals, viz. video sweep, multiburst and fixed frequencies. All signals can be superimposed with hum, and white noise can be added to check such things as sync separators, clamp circuits, processing amplifiers, etc.

Sweep signal from 100 kHz up to 10 MHz in one sweep with marker indication for each MHz.

All levels are continuously variable with adjustable preset positions.

A flat field signal (APL) can be added to the sawtooth and staircase signals forming the so-called duty signals (alternating 3 lines APL, 1 line sawtooth/staircase).

By means of the amplitude controls the levels of the different signal parts can be varied or even switched off, like: video content, sync pulses, set-up, composite video, superimposed signals as well as white noise. To make quick "settings" possible, the levels are controlled by means of selectors, which besides adjustable preset positions also have a variable position enabling continuously adjustable levels. Preset levels can be adjusted internally to own requirements.

The instrument also has an external continuous wave input enabling conversion of any supplied non-TV signal into a video signal. Such a signal may be the sweep signal from a side band analyser or group delay analyser. The start of such a sweep can be triggered

Generates all necessary signals for aligning and checking TV studios, transmission links and transmitters.

The blanking mixer converts any non-TV signal into a normal TV signal with blanking and sync.

by the PM 5570, using the "sweep start" signal.

Application

The main application fields of the PM 5570 are: development, service and alignment and check of complicated video equipment.

For the design engineers developing high standard TV equipment, the PM 5570 offers the necessary video test signals for performing a complete test of all video parameters. Unlike a standard VITS generator, the PM 5570 generates individual test signals for each type of parameters, so that specific parameters can be studied more conveniently and more accurately than is the case with VIT signals. On top of that the effect of abnormal conditions can be analysed. This because the levels of all signal parts can be offset the nominal levels, and noise, hum or other spurious signals can be

added.

In service and repair of complicated TV equipment faulty components can often be located by means of simple measuring gear. However, periodic faults, or faults resulting in only minor degradation of the performance can be very difficult to find. Here the versatility of the PM 5570 can be of great help. By selection of proper test signals and/or extreme levels the influence of defective circuitry can be exaggerated thus making it traceable more easily.

Nowadays most routine checks of broadcast networks are performed with VIT signals, which do have the advantage that measurements can be performed during the programme time. In case of thourough checks and overhauls, however, more sophisticated measuring methods and gear are needded. The PM 5570 (or its predecessor PM 5572/73/74) is therefore found in many transmitting stations and switching centres all over the world.

TECHNICAL DATA

Video test signals

SQUAREWAVE SIGNALS — Frequencies: 1) 0.25 Hz (transmitter bump), 2) 60 Hz, locked to field frequency, 3) 15.734 kHz, locked to line frequency, 4) 250 kHz, locked to line frequency. Rise and fall time: 1) 62.5 ns +10/-0 ns with T/2 filter, 2) 125 ns +10/-0 ns with T-filter, 3) 250 ns +20/-0 ns with 2T-filter. Overshoot: <1%. Tilt: <1%.

PULSE-AND-BAR SIGNALS — Types: 1) T-pulse and T-bar, 2) 2T-pulse and 2T-bar, 3) T-pulse, 12.5T-pulse composite and T-bar, 4) 2T-pulse, 12.5T-pulse composite and 2T-bar, 5) 12.5T-pulse composite and 12.5T-bar composite. First four signals can be gated with field frequency squarewave giving so-called window signal. Shape of pulses: sine-squared. Pulse width: T = 125 ns +10/-0 ns, 2T = 250 ns +20/-0 ns, 12.5T = 1.57 µs ± 0.05 µs. K-factor: <0.5% for both T- and 2T-pulse. Bar width: 25 µs ± 0.5 µs. Bar rise time: T-bar = 125 ns +10/-0 ns, 2T-bar = 250 ns +20/-0 ns, 12.5T-bar composite: 1.57 µs ± 0.1 µs. Bar overshoot: <1%. Bar tilt: <1%. 12.5T chrominance/luminance gain inequality: < 1%, delay inequality: < 10 ns.

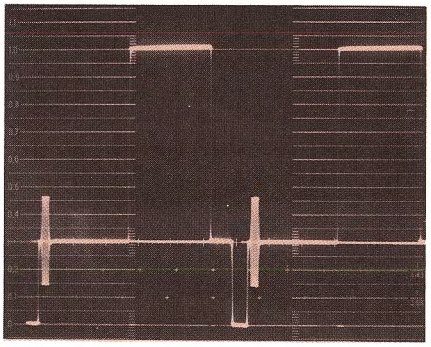
SAWTOOTH SIGNALS — Types: 1) sawtooth on all active lines (line frequency), 2) sawtooth as 1) with superimposed sine wave frequencies, 3) sawtooth as 1) with superimposed subcarrier frequency. A flat field signal (APL) can be added giving alternating three lines flat field and one line sawtooth.

STAIRCASE SIGNALS — Types: 1) staircase on all active lines (line frequency),

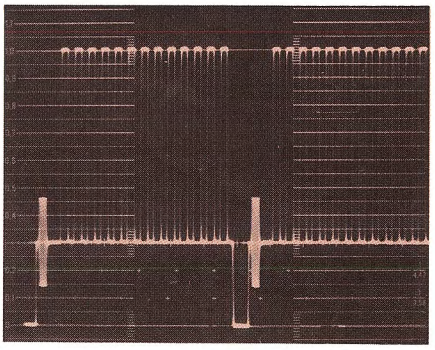
Technical description

The PM 5570 consists of three main sections:
1) generator, 2) processing part, 3) control part.
The generator section contains all test signal generators and adder networks and supplies a complete test signal to the processing section. In the processing section sync, colour burst, set-up and superimposed signal are added to the video signal, and all levels are controlled here as well. The control section, which contains the SPG with genlock facility, delivers the pulses controlling the timings of the test signal elements. It also controls the signal selection and contains interface circuitry for remote control of signal selection.

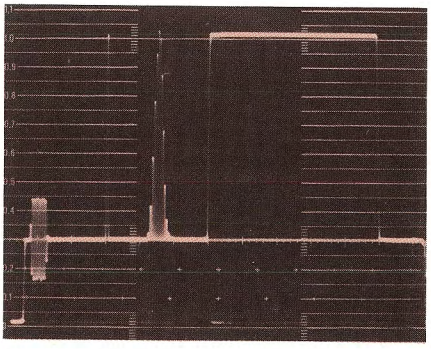
The processing part has a large number of controls to allow the operator to compose the optimum signal for tracing or checking a specific source of distortion. In order to make operation quick and safe the controls are arranged in such a way that the lower row of light push-buttons select the main function, i.e. selection of a particular type of test signal. The row of push-buttons above defines the exact version of the selected test signal, and finally the upper row of rotary switches and potentiometers controls mainly the level of the various signal parts.



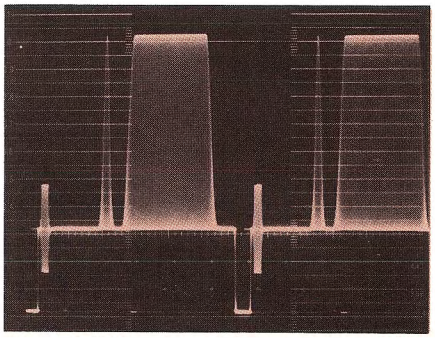
15.734 kHz squarewave. Also 0.25 Hz and 60 Hz are available.



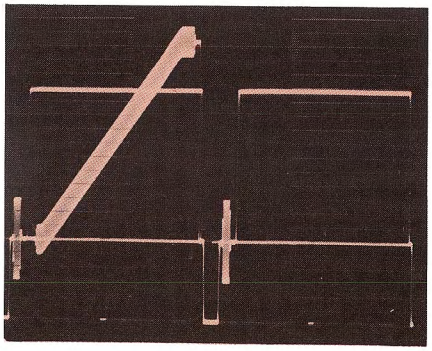
250 kHz squarewave. Rise time selectable 62.5, 125 or 250 ns.



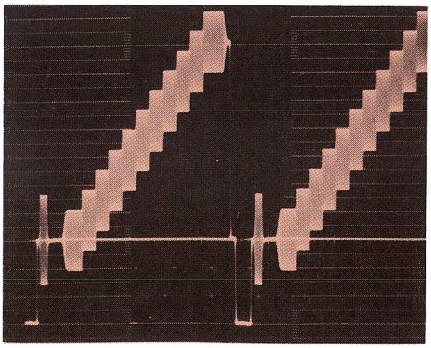
2T, 12.5T and bar signal. Also window signal possible.



Composite 12.5T and bar signal. Corresponding signal without chroma too.



Sawtooth with chroma, 1-3 lines sequence with APL signal.



Staircase with chroma. Chroma level: 20, 40 or variable 0 - 40 IRE.

2) staircase as 1) with superimposed subcarrier frequency. Number of steps: switchable 5 or 10. A flat field signal (APL) can be added giving alternating three lines flat field and one line staircase. Non-linearity of staircase: <0.5%. Rise time: 280 ns ± 20 ns.

CHROMINANCE SIGNAL — Types: 1) 12.5T-pulse and 12.5T-bar, chroma only (fixed 50% pedestal), 2) chrominance staircase (fixed 50% pedestal). Chroma staircase can be jumped. Jump frequency: 0.25 Hz. Rise time chroma bar: approx. 1.57 µs. Rise time pedestal: 250 ns + 20/-0 ns. Number of risers on chroma staircase: 5. Rise time: approximately 1 µs. CLIM: <0.5% of pedestal amplitude. Nominal amplitude chroma staircase: 125 IRE ± 2.5 IRE (peak to peak).

SWEEP SIGNAL — Frequency range: 0.1 - 10 MHz. Repetition rate 60 Hz. Locked to field. Amplitude accuracy: ± 2% (0-5 MHz), ± 4% (5-10 MHz). Markers (switchable): 1 - 10 MHz in 1 MHz steps. Marker accuracy: crystal derived. Marker width approximately 200 µs. Reference (switchable): white bar of 4 µs width in the beginning of each active line. Pedestal level: 50% of sweep signal. Pedestal rise time: 250 ns +20/-0 ns.

FIXED SINE WAVE SIGNALS — Frequencies: 0.1 - 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 and 10 MHz by means of selector. Frequency accuracy: better than ± 3% or 15 kHz. Harmonic contents: <3%. Reference (switchable): white bar of 4 µs width in the beginning of each active line. Pedestal level: 50% of sine wave signal. Pedestal rise time: 250 ns +20/-0 ns.

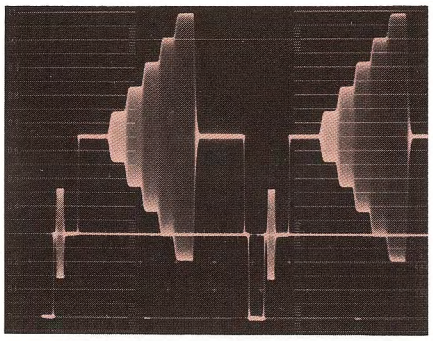
MULTIBURST SIGNAL — Frequencies: 0.5 - 1 - 2 - 3 - 3.58 and 4.2 MHz. Frequency accuracy: ± 3%. Fixed reference of 4 µs width in the beginning of each active line. Pedestal level: 50% of multiburst signal. Pedestal rise time: 250 ns +20/-0 ns.

APL (flat field signal) — Type: 1) 50% of white level, 2) PRE-1, an adjustable preset level, factory set to 10 IRE, 3) PRE-2, an adjustable preset level, factory set to 90 IRE, 4) JUMP, alternating between PRE-1 and PRE-2, alternating frequency 0.25 Hz, 5) continuously variable between 0 and 125 IRE.
NB. This signal can only be used in combination with the staircase - and the sawtooth signal to form a duty signal, and to add a pedestal to the externally applied continuous wave signal.

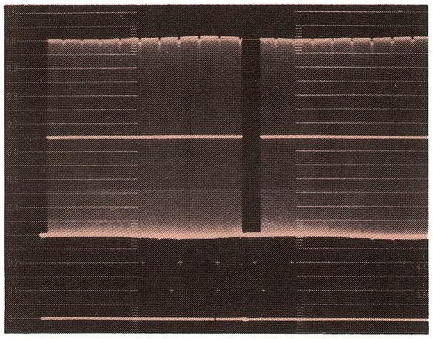
Amplitude controls

The signal parts of the composite video signal can be controlled in amplitude, independently as well as combined, by means of front plate controls. Rotary switches ensure an easy selection of preset levels, while potentiometers enable continuous level control.

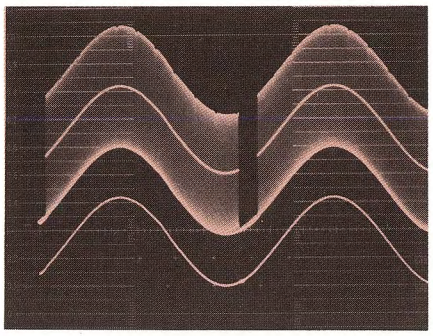
VIDEO — Positions: 1) off, 2) nominal, 3) preset, 4) variable. Amplitude range: 0 - 140 IRE. Nominal level: 100 IRE ± 1 IRE. Preset level: adjustable over whole amplitude range, factory set: 28 IRE.



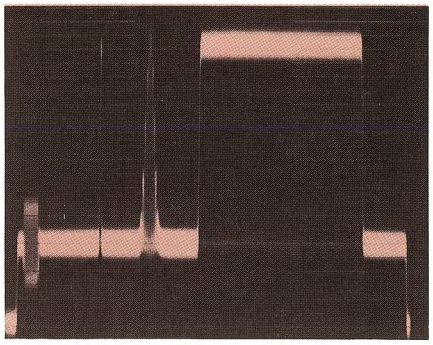
Chroma staircase. The chroma is switchable automatically at 0.25 Hz rate.



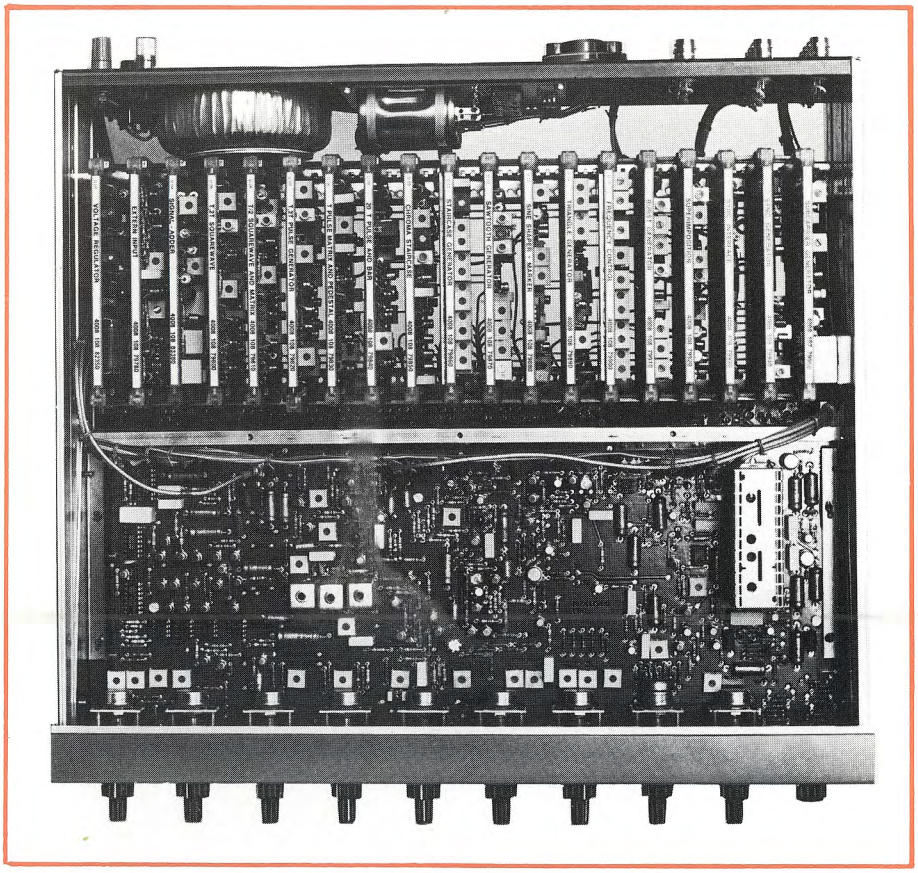
Video sweep 0.1 - 10 MHz with markers for every 1 MHz.



Video sweep 0.1 - 10 MHz. 60 Hz hum has been superimposed.



Pulse-and-bar signal. White noise has been superimposed.



The PM 5570M removed from the cabinet. The large print board at the front (bottom of photo) contains the processing part with selectors and potentiometers plus pre-set potmeters. Below is the logic part (not visible), and behind (top of photo) all the signal generator cards. In principle each card generates one specific signal element. The vertical position of these cards provides easy air ventilation and consequently efficient cooling of the instrument.

PM 5570 M

SET-UP — Positions: 1) off, 2) preset, 3) negative variable, 4) variable. Amplitude range: 0 - 125 IRE. Amplitude range negative: 0 - -40 IRE. Preset level: 7.5 IRE ± 1 IRE (adjustable).

SYNC — Positions: 1) off, 2) nominal, 3) variable. Amplitude range: 0 - 80 IRE. Nominal level: 40 IRE ± 0.5 IRE.

BURST — Positions: 1) nominal, 2) off 3) variable. Amplitude range: 0 - 80 IRE. Nominal level: 40 IRE ± 1 IRE.

COMPOSITE VIDEO — Positions: 1) -3 dB, 2) +3 dB, 3) nominal, 4) preset, 5) variable. Amplitude range: 0 - 210 IRE. Nominal level: 140 IRE ± 1 IRE. Preset level: 70 IRE ± 1 IRE (adjustable).

Superimposition level controls

The levels of the superimposed signals are controlled independently from the composite video control.

SUBCARRIER/SINE WAVES — Positions: 1) preset, 2) 20 IRE ± 0.5 IRE, 3) 40 IRE ± 1 IRE, 4) variable. Amplitude range: 0 - 40 IRE. Preset level: 14 IRE ± 0.5 IRE (adjustable 0 - 14 IRE). The superimposition of subcarrier or sine wave is controlled by the test signal push-buttons.

NOISE — Positions: 1) off, 2) -60 dB, 3) -50 dB, 4) -40 dB, 5) -30 dB. All values rms weighted. Variable control: 0 - -10 dB attenuation of selected position. Accuracy of fixed positions: ± 2 dB. Noise spectrum: 10 kHz - 5 MHz, within ± 3 dB.

HUM/SUPERIMPOSITION — Positions: 1) off, 2) preset, 3) variable, 4) external superimposition. Hum: locked to the mains. Amplitude range: 0 - 210 IRE. Preset level: 0.5 Vp-p ± 3%. External superimposition of any signal up to 5 MHz. Amplitude range: 0 - 1.5 Vp-p.

Sync pulse generator (SPG)

A complete colour SPG is incorporated, having the correct relationship between colour subcarrier and line/field frequency. The generator may also be genlocked to an external composite video or black burst signal. In both modes the vertical information can be switched off.

COMPOSITE SYNC — Line frequency: 15 734 Hz. Duration of line sync: 4.77 µs ± 0.32 µs. Field frequency: 60 Hz. Duration of field sync: 3 lines. Interval between field sync pulses: 4.45 µs ± 0.63 µs. Duration of equalizing pulses: 2.4 µs. Duration of line blanking: 10.52 - 11.32 µs. Front porch: 1.27 µs - 2 µs. Duration of field blanking: 21 lines + 11 µs. Colour subcarrier frequency: 3 579 545 Hz ± 4 Hz (derived from TCXO). Duration of burst: min. 0.38 µs after trailing edge of line sync, max. 7.94 µs after leading edge of line sync. Burst suppression: 9 lines, starting with field blanking.

Outputs

COMPOSITE VIDEO — 2 connectors at the rear. 1 at the front. Output resistance: 75 Ω ± 1%. Return loss: >34 dB up to 7 MHz. Isolation between outputs: >40 dB up to 1 MHz, >30 dB at subcarrier frequency. Voltage: 140 IRE ± 1 IRE with all amplitude controls in nominal position. Random HF noise: <-75 dB rms weighted. Low frequency noise: less than -56 dBp-p. NB. Noise figures measured with amplitude controls in nominal position and superimposed signals off.

COMPOSITE SYNC — 1 connector at the rear. Amplitude: 2 Vp-p (280 IRE). Output resistance: ∼ 75 Ω.

SUBCARRIER — 1 connector at the rear. Amplitude: 1 Vp-p ± 0.1 Vp-p (140 IRE). Output resistance: 75 Ω. Harmonic contents: < -34 dB.

TRIGGER OUT — 1 connector at the front. Signal type: added composite sync and field pulses. Amplitude: 4 Vp-p. Impedance: 1 kΩ.

SWEEP START SIGNAL — 1 connector at the rear. Type: pulse indicating edges of APL jump. Amplitude: 15 V.

Inputs

EXTERNAL IN — 75 Ω input at the front, high-ohmic looped-through input at the rear. Type: 1) video signal, 2) continuous wave signal. Amplitude 0 - 140 IRE. Return loss: >34 dB up to 7 MHz. Blanking is mixed to CW signal, while a pedestal can be added by means of the APL switch.

SYNCHRONIZATION IN — High-ohmic looped-through input at the rear. Amplitude: 0.5 - 4 Vp-p (70 - 560 IRE). Maximum permissible hum: 100%. Return loss: >34 dB up to 7 MHz. Type: 1) composite sync signal, 2) a black burst signal, 3) a composite video signal.

EXTERNAL SUPERIMPOSITION IN — High-ohmic input at the rear (DC coupled). Maximum amplitude: approximately 4.50 Vp-p. Maximum gain: 0.33. Superimposed signal: 0 - ∼ 100 IRE (variable by front control.

RESPONSE OF VIDEO PATH — Frequency response: better than ± 0.2 dB for frequencies 10 Hz - 5 MHz, better than ± 0.4 dB for 5 MHz - 10 MHz. Distortion: differential gain <0.5%, differential phase <0.5° for external signals. (All levels at nominal and external video input 100 IRE). Inherent distortion of sawtooth or staircase with superimposed chroma: differential gain <0.3%, differential phase <0.2°.

Remote control

The different test signals may be remotely controlled (open coll.). The selected test signal will be indicated by the light push-buttons of the instrument and it can also be remotely indicated (optional).

Power supply

Voltage: 115 V (230 V) ± 20% (Internal selection). Frequency: 48 - 65 Hz. Consumption: 70 W at 115 V.

Temperature range

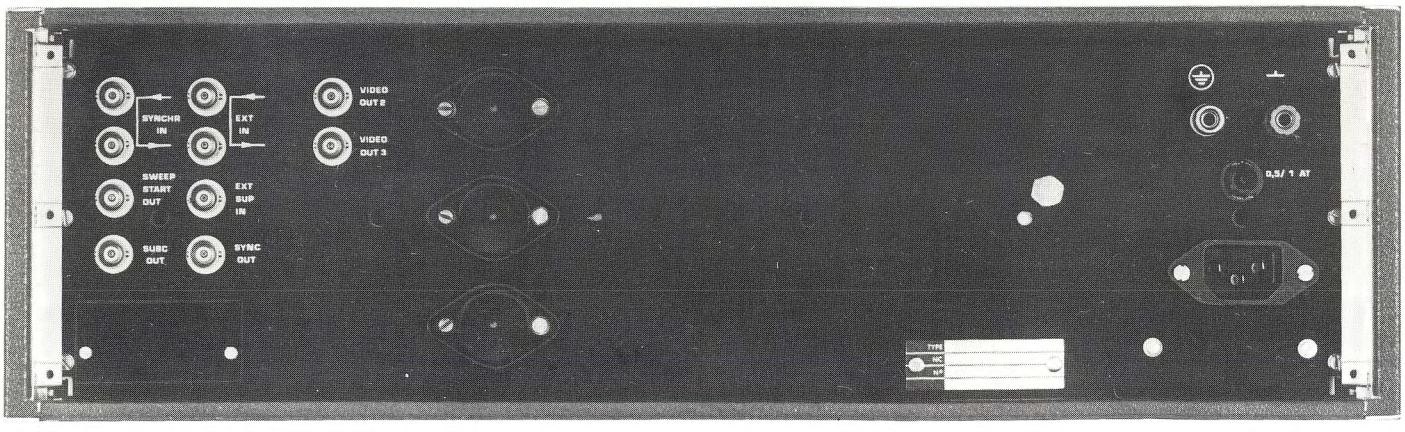
Operating: 0° - 45° C ambient.

Mechanical data

6/6 plug-in unit for the PHILIPS 19" rack/table cabinet.
Height : 132 mm
Width : 444 mm
Depth : 435 mm
Weight : 13,5 kg (incl. cabinet).

Cabinet

The PM 9716 A rack/table cabinet is supplied with the PM 5570.



TV test signal generator

PM 5646

NEW

Code no. PM 5646:
9449 056 46003 (G-version, 625-lines PAL)
9449 056 46108 (M-version, 525-lines NTSC)
9449 056 46009 (N-version, 625-lines PAL, on request)



Professional quality at economy price

Built-in sync pulse generator with genlock to external video source

Composite pattern with circle for test of colour and monochrome TV receivers

Optional text generator for captioning of the composite pattern

Separate signals for most of the alignments in colour monitors and TV receivers

Built-in modulator for TV band I (VHF)

Special test signals for measurement of transmission characteristics, such as pulse-and-bar and multiburst

Ideal as stand-by or reserve for the PM 5534 colour pattern generator

The signals are available as composite PAL and RGB simultaneously

The PM 5646 TV test signal generator is a low cost universal test signal generator with built-in sync pulse generator (SPG) and auxiliary RF modulator for band I. The generator offers a variety of useful signals for line-up of monitors, cameras, waveform monitors, vectorscopes, etc., and a number of test signals for check of video tape recorders, mixers and all types of transmission equipment. A composite test pattern with optional text (caption) may be used as standby pattern or for final test.

SPG functions

The PM 5646 contains a complete SPG that may be free-running or genlocked to an external video signal. The horizontal timing and the subcarrier phasing are adjusted with front panel screwdriver controls. The SPG part generates all necessary synchronizing signals for its own internal use, plus the following output waveforms:
- Colour subcarrier
- Composite (mixed) sync
- Composite blanking
- Vertical (field) drive

These signals are available on rear plate BNC connectors, and they all have 75 Ω output impedance.

Test signal generator

The generator part is controlled by the sync pulses of the internal SPG. The timings and positions of the various signal elements are controlled by digital circuitry, thus ensuring high accuracy and excellent stability. The following test and line-up signals for cameras, monitors, TV receivers, colour decoders, video cassette recorders, etc. can be selected by front panel push-buttons:
- Cross-hatch
- Red pattern
- White pattern (100%)
- White pattern (30%)
- Demodulator signal
- Grey scale (staircase)
- Colour bar
- Composite pattern (with text)

A digitally generated circle can be included in all patterns. Furthermore the following chrominance tests may be performed:
- Chroma on/off
- PAL on/off
- R-Y on/off

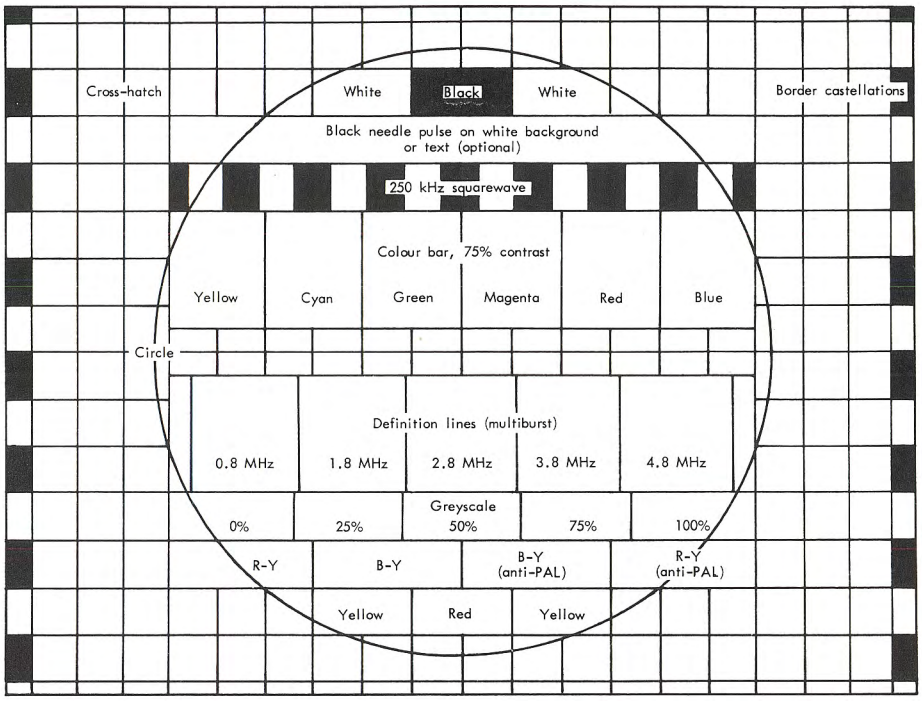
- B-Y on/off
- Chroma amplitude variable (0-100%)

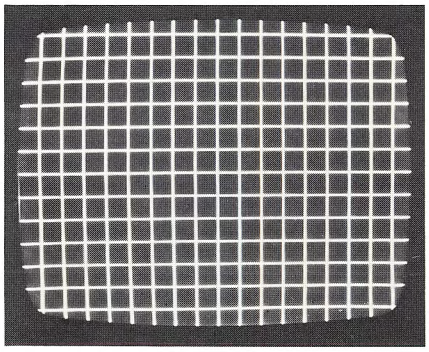
For the test of transmission parameters, such as amplitude response, pulse response, etc., the PM 5646 generates the following signals:
- Multiburst
- Pulse-and-bar signal
- 250 kHz square wave signal
- 50 Hz square wave signal
- Staircase with superimposed chrominance

The pulse-and-bar signal consists of a 2 T sine-squared pulse, a composite 20T or 12.5T sine-squared pulse and a white reference bar. For helical video tape recorder testing, a special VTR test may be included. In this case the 2 T pulse is only generated in every other line of field 1, but in every line of field 2. In case of synchronization problems two vertical lines will be seen on the screen, of which the dotted line is field 1. The circle signal can be added to most of the test signals.

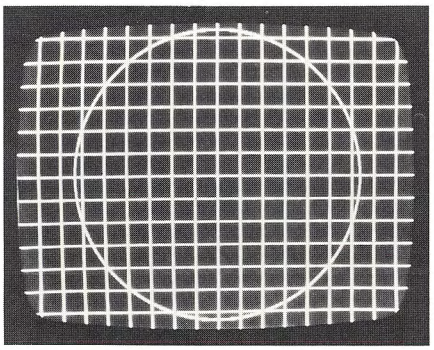
The generator has three outputs that supply the selected test signal:
- Front panel output (variable 0-2 Vpp, normal or inverted polarity)
- Rear panel output (nominal 1 Vpp)
- RGB output (nominal 0.7 Vpp)

The PM 5646 includes a double sideband tunable modulator in order to make test of TV receivers, video cassette recorders and other equipment with RF input possible. The frequency range is 35-85 MHz. The tuning is continuous so that also IF signals can be generated. A sound carrier may be added, unmodulated or modulated with a 1000 Hz audio signal. The output level is adjustable in the range 1-20 mV.

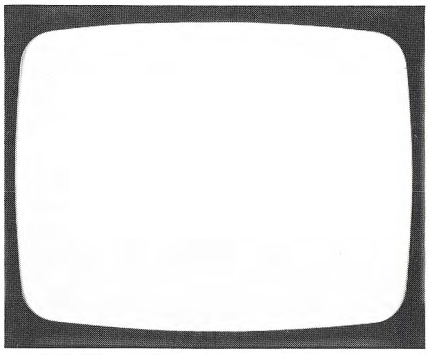




Cross-hatch.



Cross-hatch with circle.



Flat-field white 100%.

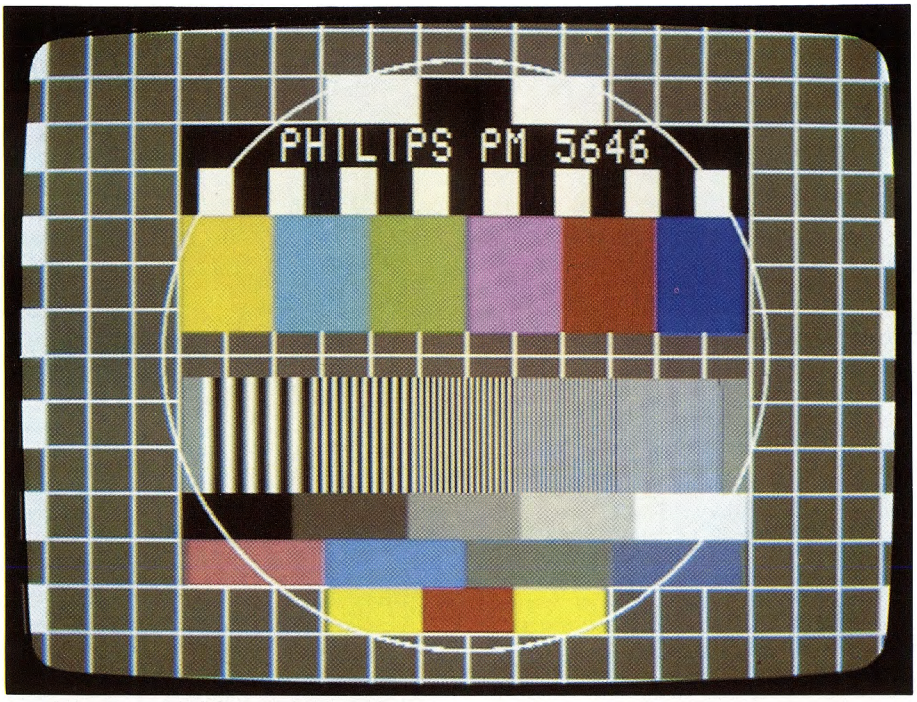


Flat-field white 30%.

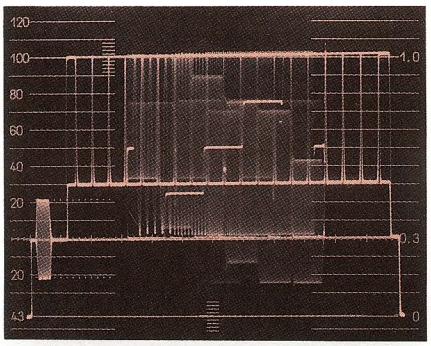
Applications

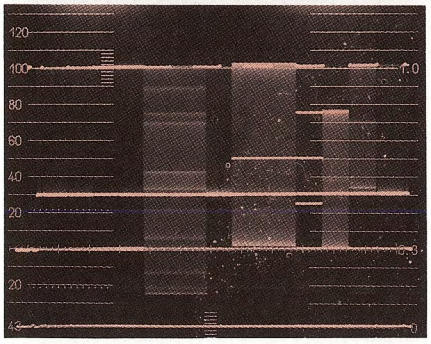
The PM 5646 is used in small TV studios and video production centres for test and line-up of the various types of equipment. In fact the following Philips package solves all display, monitoring and test needs, and supplies in addition all driving and operational signals:
- PM 5630 colour generator and SPG
- PM 5646 test signal generator
- PM 5565 waveform monitor
- PM 5567 vectorscope
- LDH 6200/6220 colour monitors

In TV receiver and video cassette recorder factories signals are needed for test and alignment of the various building blocks and or the final equipment. The PM 5646 has all these signals, especially the composite pattern for final test. In large factories more professional and thus more expensive equipment is normally used, like f.inst. the PM 5534 colour (Philips) pattern generator. The PM 5646 pattern resembles, however, the Philips pattern sufficiently well to be used as stand-by or reserve for this pattern.

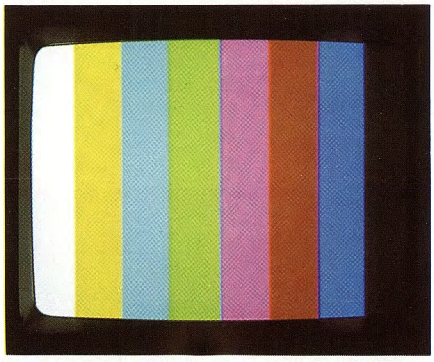


Composite pattern with text option.

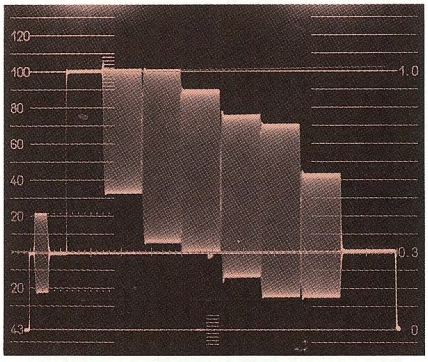




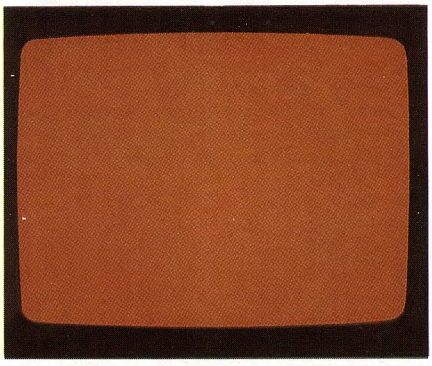
Oscillograms (horizontal and vertical time base) of the composite pattern.



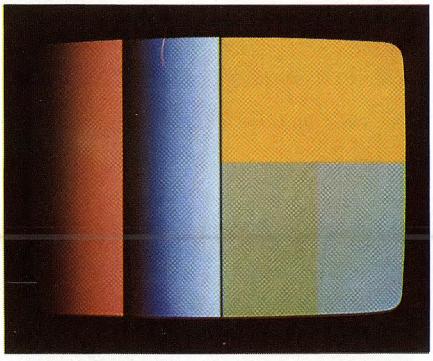
Colour bar signal.



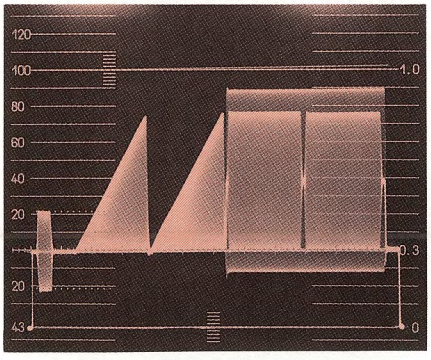
Oscillogram of colour bar.



Full-field red pattern.



Colour demodulator (DEM) pattern.



Oscillogram of DEM pattern.

The PM 5646 is also ideal for service and repair of consumer and most professional equipment. Small consumer repair shops normally use equipment from the Philips service TV line, but for large, central service shops and trade agents, the higher price and performance of the PM 5646 is easily justified. For professional and semi-professional service, such as for instance audio-visual equipment, ENG and medium class broadcast equipment the PM 5646 offers all the "professional" signals for alignment and repair. Due to its low weight and handy size the PM 5646 is superior for portable applications.

TECHNICAL DATA

Video outputs

VIDEO OUT (front) — Type: composite video. Level: 0-2 Vpp, variable with potentiometer. Polarity: positive or negative (negative with level knob pulled out). Output impedance: 75Ω.

VIDEO OUT (rear) — Type: composite video. Level: 1 Vpp. Output impedance: 75Ω.

RGB OUT (rear) — Type: Red, Green and Blue signals identical with the main

signal. Levels: 700 mVpp (100 IRE). Output impedance: 75Ω. Note: some signal elements of the composite signals are not available on the RGB output (circle, background signal, decoder test signal, etc.).

Video signals

COMP. PATTERN — Composition: cross-hatch on dark grey back-ground with the following test signal elements (from the top): white-black-white transients / white bar (or optional text) / 250 kHz square-wave / colour bar / multiburst / grey scale / colour difference and anti-PAL signals / yellow-red-yellow transients / circle (front panel selectable). Specifications:
1) Cross-hatch 15 x 19 lines. Level: 700 mV (100 IRE) ± 2%. Back-ground level: 30% of white. Shape of vertical lines: 2T sine-squared. Border castellations: to the left and to the right of the cross-hatch (NTSC-version has 7.5% set-up).
2) White-black-white steps. Level: 700 mV (100 IRE) ± 2%. Rise/fall times 80 ns.
3) White bar with black needle pulse or optional text. Level: 700 mV (100 IRE) ± 2%. Width of the needle pulse: 2T sine-squared (200 ns or 250 ns).
3) Text (option PM 8526), one line of maximum 15 characters. Number of texts (by internal selection): maximum 16.
4) 250 kHz squarewave. Level 700 mV (100 IRE) ± 2%. Rise/fall times: 80 ns.
5) Colour bar. Type: 75% contrast bars in sequence of decreasing luminance, without white and black reference bars. Sequence: yellow-cyan-green-magenta-red-blue. Inaccuracy of the chroma amplitude: < ± 5%. Inaccuracy of chroma phase: < ± 3°. Inaccuracy of the luminance levels: < ± 3%. Set-up (NTSC): 7.5%.
6) Multiburst. Type: sine wave bursts of increasing frequency. Amplitude: 700 mV pp (100 IRE) ± 5%. Pedestal: 350 mV. Frequencies: 0.8 - 1.8 - 2.8 - 3.8 - 4.8 MHz (G-version), 0.5 - 1.0 - 2.0 - 3.0 - 4.0 MHz (M and N-versions).
7) Grey scale. Number of levels: 5 (0 - 25% - 50% - 75% - 100% of white). Level: 700 mV (100 IRE) ± 2%. Inherent line time non-linearity: < 2.5%.
8) Colour difference signals (PAL-versions). Type of signal: R-Y (alternating), B-Y, B-Y (alternating, anti-PAL), R-Y (non-alternating, anti-PAL). Pedestal level: 263 mV ± 2%. Chroma amplitude: 525 mVpp ± 5%. Inaccuracy of chroma phases: < 2°.
8) Colour difference signals (NTSC-version). Type of signal: R-Y (V), B-Y (U), colourless B-Y, colourless R-Y (alternating). Pedestal level: 37.5 IRE. Chroma amplitude: 75 IRE pp.
9) Yellow-red-yellow colour transients. Type: bars of yellow, red and yellow. Amplitude and phase accuracies as for the colour bar.
10) Circle. Type: generated digitally by a PROM. Level: 700 mV (100 IRE).

DEM PATTERN (PAL) — Composition: alternating R-Y sawtooth and B-Y sawtooth (left hand side of screen), G-Y signal, alternating B-Y and non-alternating R-Y (right hand side of screen).

DEM PATTERN (NTSC) — Composition: chroma sawtooth I and chroma sawtooth Q (left hand side of screen), G-Y chroma signal, colourless R-Y, colourless B-Y signal (right hand side).

COLOUR BAR — Type: 8 bars arranged in order of decreasing luminance. Contrast: 75%. Bars: white-yellow-cyan-green-magenta-red-blue. Standard: EBU and FCC. Other parameters as in the composite pattern.

RED PATTERN — Type: full-field red pattern. Levels: as red bar of colour bar.

WHITE 100% — Type: flat-field pattern at 100% white. Level: 700 mV (100 IRE) ± 2%.

CROSS-HATCH — Type: 15 x 19 lines. Level: 700 mV (100 IRE) ± 3%. Shape of the vertical lines: sine-squared.

50 (60) Hz SQUAREWAVE — Type: horizontal bar in the middle of the field. Level: 700 mV (100 IRE) ± 2%.

STAIRCASE — Type: 6 levels (0% - 20% - 40% - 60% - 80% - 100% of white), subcarrier (chroma) may be superimposed. Level: 700 mV (100 IRE) ± 2%. Inherent line time non-linearity: < 2%. Superimposed subcarrier amplitude: 215 mVpp (40 IRE) ± 5%. Phase of subcarrier: 180° ± 2° C. Inherent differential gain and phase: < 1% and 0.6°.

PULSE-AND-BAR — Composition: full-field signal having 20T (12.5T) composite sine-squared pulse, 2T sine-squared pulse and white reference bar. Width of composite pulse: 2 µs (1.56 µs). Amplitude of composite pulse: within ± 2% of reference bar. Width of 2T pulse: 200 ns (250 ns). Amplitude of 2T pulse: within ± 1.5 % of reference bar. Bar amplitude: 700 mV (100 IRE) ± 2%. Rise/fall times: 200 ns (250 ns). VCR function: 2T pulse in field 1 is suppressed in every other line.

WHITE 30% — Type: full-field grey signal. Level: 210 mV (30 IRE) ± 2%.

250 kHz SQUAREWAVE — Level: 700 mV (100 IRE) ± 2%. Rise/fall times: 80 ns.

MULTIBURST — Number of bursts: 6. Frequencies: 0.8 - 1.8 - 2.8 - 3.8 - 4.8 - 5.8 MHz (G-version), 0.5 - 1.5 - 2.0 - 3.0 - 3.58 - 4.2 MHz (M-versions). Amplitude: 700 mVpp (100 IRE) ± 5 %. Pedestal: 50% of white level.

Special functions

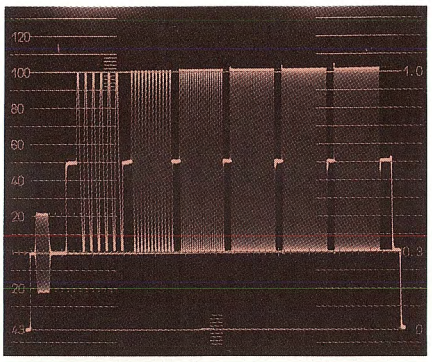
CHROM ON — Function: switches the chrominance content of all signals. Indicator lamp: shows green light when chrominance is on.

PAL OFF (PAL-versions) — Function: switches the alternation of the R-Y signal.

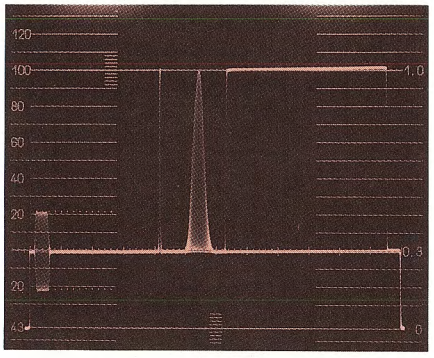
R-Y OFF — Function: switches the R-Y content of the colour bar signal.

B-Y OFF — Function: switches the B-Y content of the colour bar signal.

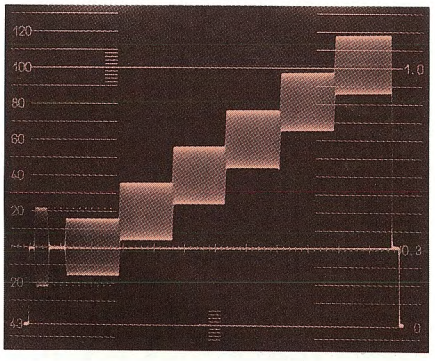
CHROM AMPL — Function: controls the amplitude of the chrominance part of the signal. Range: 0-100% of nominal. Cali-



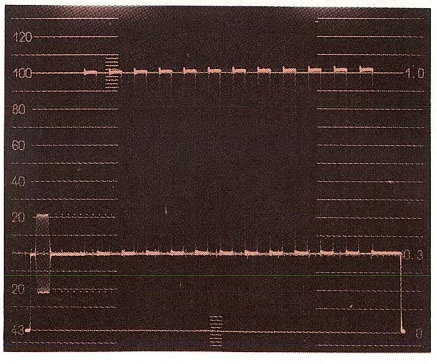
Multiburst signal.



Pulse-and-bar signal (20/12.5 T - 2 T - bar).



Staircase signal with chroma (also available without chroma).



250 kHz squarewave signal.

brated position: when pushed to its inner position, the chrominance amplitude is nominal.

Sync pulse generator (SPG)

MODES OF OPERATION — Internal mode: the SPG free-runs, i.e. all internal frequencies and timings are derived from the internal master oscillator. External mode (genlock): the internal master oscillator locks to an external video signal in such a way that all synchronizing pulses and video signals run synchronously with the external video signal.

MASTER OSCILLATOR — Type of oscillator: crystal oscillator. Frequencies:
- 4.433 619 MHz ± 5 Hz (G-version)
- 3.579 545 MHz ± 5 Hz (M/NTSC-version)
- 3.582 056 MHz ± 5 Hz (N-version)

Temperature drift: less than $5 \cdot 10^{-6}$ (+ 5 - 40° C).

Synchronizing signals

COLOUR SUBCARRIER — Number of outputs: 1 BNC at the rear. Output impedance: 75Ω ± 10%. Output level: 1.5 Vpp ± 0.5 Vpp.

COMPOSITE SYNC (PAL) — Number of outputs: 1 BNC at the rear. Output impedance: 75Ω ± 5%. Output level: 4 Vpp ± 0.5 Vpp. Line sync pulses: 4.7 µs ± 0.2 µs. Equalizing pulses: 2.35 µs ± 0.15 µs. Number of equalizing and serration pulses: 5 + 5 + 5.

COMPOSITE SYNC (NTSC) — Number of outputs: 1 BNC at the rear. Output impedance: 75Ω ± 5%. Output level: 4 Vpp ± 0.5 Vpp. Line sync pulses: 4.47 µs ± 0.2 µs. Equalizing pulses: 2.48 µs ± 0.2 µs. Number of equalizing and serration pulses: 6 + 6 + 6.

COMPOSITE BLANKING — Number of outputs: 1 BNC at the rear. Output impedance: 75Ω ± 5%. Output level: 4 Vpp ± 0.5 Vpp. Line blanking: 12 µs (11 µs). Field blanking: 25 lines + 12 µs (20 lines + 11 µs).

VERTICAL (FIELD) DRIVE — Number of outputs: 1 BNC at the rear. Output impedance: 75Ω ± 5%. Output level: 4 Vpp ± 0.5 Vpp. Pulse width: 10 lines (640 µs).

External synchronization

INPUT — Number of inputs: 1 BNC at the front. Input impedance: 75Ω. Input level: 1 Vpp ± 30%. Type of signal: standard composite with colour burst.

SUBCARRIER LOCKING — Locking range: nominal ± 100 Hz. Phase adjustment: steps of 90° C plus vernier control 0 - 120° C (front panel controls).

SYNC LOCKING — Locking range: nominal ± 1.5 Hz. Phase adjustment: - 2 µs to + 1 µs (front panel control).

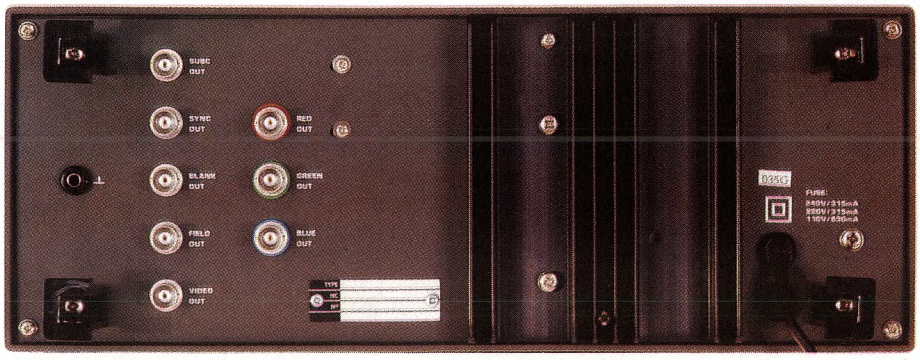
Modulator

RF OUTPUT — Number of outputs: 1 BNC at the front. Type of signal: combined vision and sound in band I. Output impedance: 75Ω. Output level: 20 mV, adjustable 0 dB to - 26 dB with front panel attenuator.

CARRIER DATA — Vision carrier: adjustable in the frequency range 37 MHz to 86 MHz (front panel control). Sound carrier: vision carrier plus 4.5, 5.5, 6.0, or 6.5 MHz by internal selection (the sound carrier may be switched off).

VISION MODULATION — Type of modulation: double side-band AM, negative. Type of video signal: the selected video signal at nominal level. Modulation depth: 10% to 20% rest carrier by internal adjustment.

SOUND MODULATION — Type of modulation: FM. Type of audio signal: 1 kHz internal audio signal. Sound switch: 1) no sound carrier at all, 2) unmodulated sound carrier, 3) sound carrier modulated with 1 kHz audio (front panel control). Vision/sound carrier ratio: 7 to 13 dB by internal adjustment. Frequency deviation (FM): 25 to 50 kHz internal adjustment.



TV NORMS — The various TV systems or norms have different parameters within the ranges specified above. Below is listed 1) the vision/sound spacing, 2) the vision/sound carrier power ratio, 3) vision modulation depth, and 4) the sound modulation (deviation) for the various systems:
- System B: 5.5 MHz, 13 dB, 10% rest carrier, and 50 kHz deviation
- System D: 6.5 MHz, 13 dB, 10% rest carrier, and 50 kHz deviation
- System I: 6.0 MHz, 7 dB, 20% rest carrier, and 50 kHz deviation
- System M (N): 4.5 MHz, 10 dB, 10% rest carrier, and 25 kHz deviation.

Front panel controls and indicators

- Power on/off
- Video signals (1 - 12)
- Superimposed subcarrier on/off
- VTR test on/off
- Circle on/off
- Chroma on/off
- PAL on/off (only PAL-versions)
- R-Y on/off
- B-Y on/off
- External synchronization on/off
- Sound carrier on/off, 1 kHz modulation on/off
- Video amplitude/polarity
- Chroma amplitude/nominal
- RF frequency
- RF amplitude
- Subcarrier phase, fine
- Subcarrier phase, coarse
- Horizontal phase
- PAL phase (only PAL-versions)

Power requirements

Voltage: 110/220/240 V ± 10%. Frequency: 45-65 Hz. Consumption: 40 W.

Environmental conditions

Operating temperature: 5-45° C ambient. Storage temperature: - 25° C to + 70° C.

Safety and EMI

Safety in accordance with IEC 348 class II. Electro magnetic interference: in accordance with VDE 0875/DIN 57875 grade K.

Mechanical data

Portable table cabinet with handle, 3 rack units high.

Height	:	155 mm (incl. feet)
Width	:	365 mm
Depth	:	385 mm
Weight	:	8 kg

Standard accessories:
- Combined operation and service manual
- Extention board (for repair).

Options

- PM 8526 Text generator
- PM 8527 19" rack mount kit

Sync test generator

PM 5634

NEW

Code no. PM 5634:
9449 056 34003 (G-version, 625-lines PAL)
9449 056 34008 (M/PAL-version, 525-lines PAL)
9449 056 34108 (M/NTSC-version, 525-lines NTSC)
9449 056 34009 (N-version, 625-lines PAL)



Colour signal with variable (jumping) subcarrier

Monochrome signal with variable (jumping) line frequency

Ideal for production test of colour and monochrome TV receivers and monitors

Both catching range and holding range of the synchronization circuitry can be tested

The function of the instrument can be extended for research and development by means of an external signal generator

Auxiliary red signal for test of the purity of colour receivers and monitors

High stability and accuracy through synthesizer circuitry

The picture on the screen indicates the actual frequency condition of the signal

The PM 5634 sync test generator is designed for test and alignment of various types of video equipment, such as TV receivers, monochrome and colour monitors, waveform monitors, vectorscopes, etc. Video generators usually generate test signals or test patterns designed for test of video or transmission characteristics, and they have standard sync waveforms and frequencies. The PM 5634, however, generates simple video signals with non-standard sync frequencies designed for test of the synchronization properties of the equipment under test. The video content of the signals only serves the purpose of identifying the actual status of the sync frequencies. The PM 5634 is built with modern integrated circuits using digital generation principles and synthesizer phase-lock loop technology. This ensures high accuracy and stability as well as very high reliability.

The PM 5634 generates a number of standard sync test signals sufficient for most routine tests and aligments. By means of an external signal generator or general purpose synthesizer, additional synchronization tests can be made. This may be very useful in design laboratories and where new equipment is thoroughly evaluated.

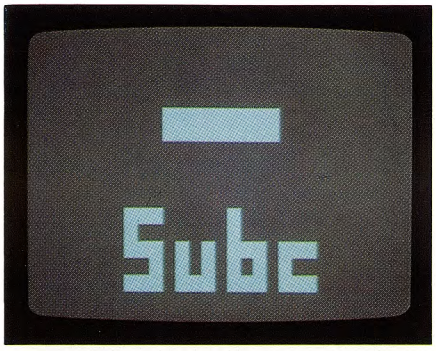
Output signals

The PM 5634 generates two main signals and two auxiliary signals:

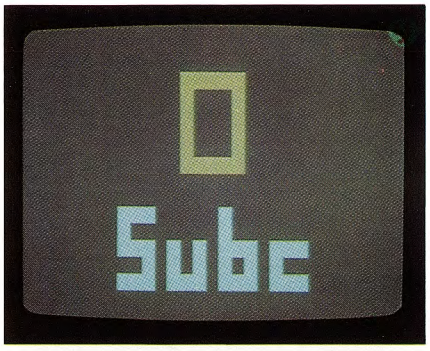
- Video 1 out has nominal horizontal sync frequency, while the colour subcarrier frequency may be nominal or shifted a specific amount of Hz from the nominal frequency. A front panel switch selects deviations from 50 Hz to 400 Hz in increments of 50 Hz. Three push-buttons allow the frequency to be either over or below nominal, or just nominal. Automatically jumping between over and below nominal frequency is also possible. In the jump mode the subcarrier can be suppressed or nominal for a short while, depending on whether the catching or the holding characteristics are examinated. The video signal is used as a display indicating whether the momentary frequency is nominal or over or below nominal.
- Video 2 out has variable horizontal frequency and no chrominance content. A front panel switch selects deviations from nominal in the range from 0 to 8% in increments of 1%. Three push-buttons allow the frequency to be either nominal, or over or below nominal. Automatic jumping between positive and negative deviations is also possible. In the jump mode the sync pulses can be either suppressed or nominal. The content of the pattern indicates whether the frequency is nominal or over or below nominal frequency.
- The colour test signal is designed for alignment of the decoder part of colour monitors and TV sets. The pattern has colour difference signals and the PAL-versions also anti-PAL signals.
- The purity signal is a standard red signal with nominal frequencies.

External synchronization

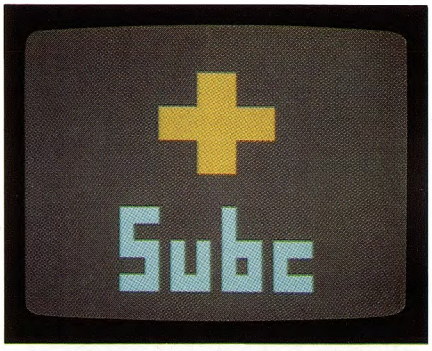
Any of the two main signals may be controlled from an external signal source in order to provide further testing capabilities. The video 1 signal has nominal sync frequencies, so the external source (f.inst. a continuous sine wave) connected to the subcarrier reference input determines the frequency of the chrominance content. The external source connected to the sync reference input determines the horizontal frequency of the video 2 signal.



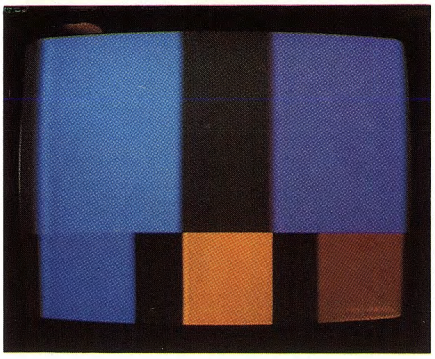
Picture of the video 1 signal (subcarrier test). The pattern indicates whether the



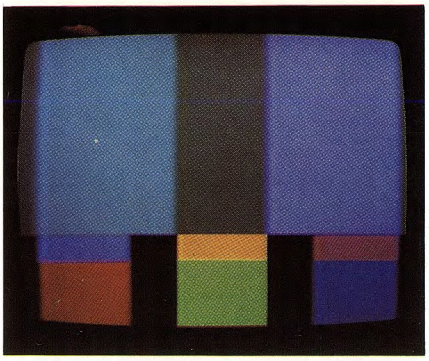
subcarrier frequency is over or below nominal or nominal (or external).



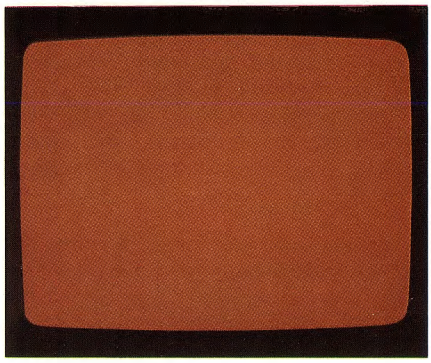
Lack of subcarrier locking is seen as disappearance of the colour or as running rainbow colours in the coloured areas.



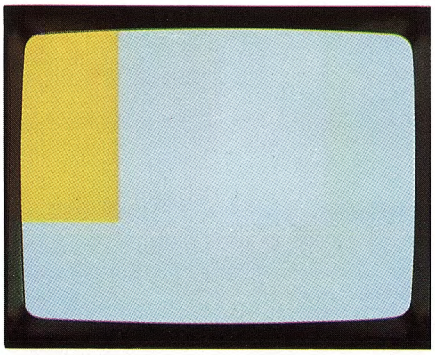
Colour test signal (NTSC). The upper two third of the screen has -I and Q bars. Below is R-Y = 0, G-Y = 0 and B-Y = 0.



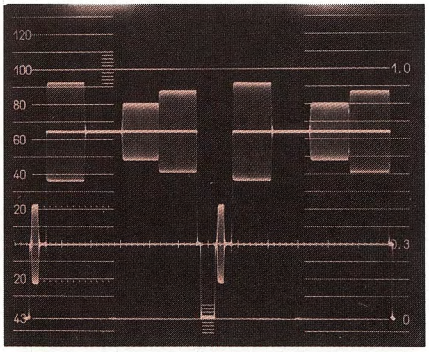
Colour test signal (NTSC, other version). The upper two third of the screen has -I and Q bars. Below is R-Y = 0, G-Y = 0, B-Y = 0 and RGB bars.



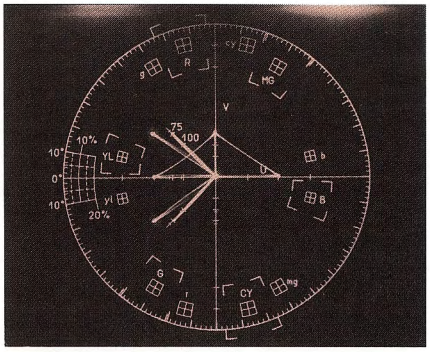
Purity signal (red).



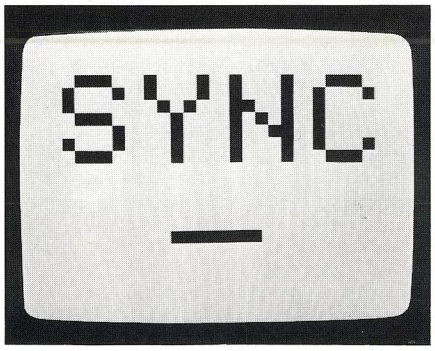
Colour test signal (PAL-version). The upper two thirds of the screen has four bars: G-Y = 0 (yellow), 70% white, non-



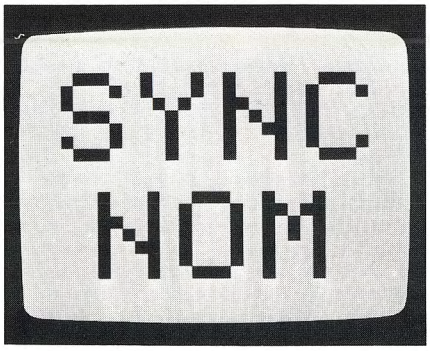
alternating R-Y (invisible), and alternating B-Y (invisible). Waveform monitor display of the colour test signal (PAL).



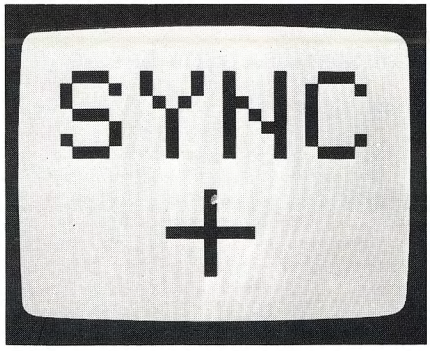
Vector display of the colour test signal (PAL-versions shown in the PAL mode of the vectorscope).



Picture of the video 2 signal (sync test). The pattern indicates whether the frequen-



cy is over or below nominal or nominal.



The amount is read from the deviation knob.

PM 5634

Applications

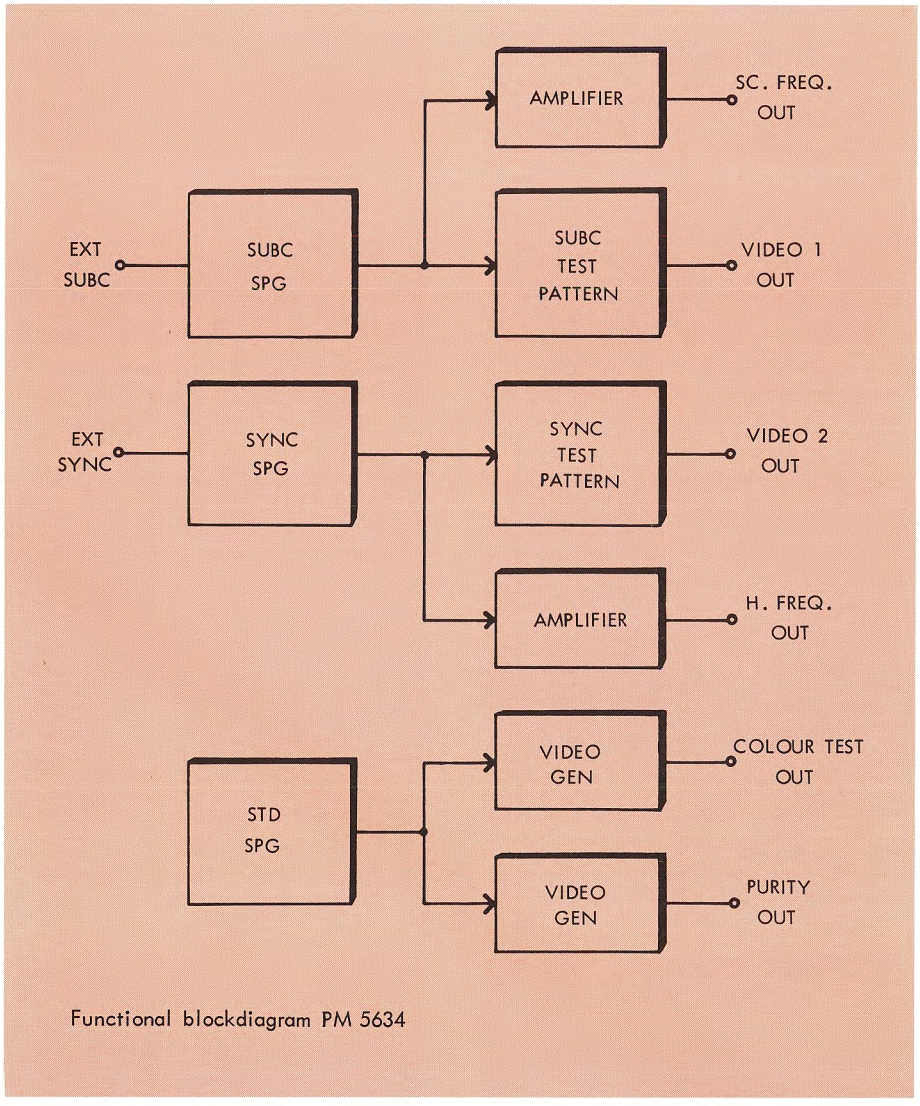
The PM 5634 is designed for production test of colour and monochrome monitors and TV receivers. It is, however, also very useful for service and repair of same equipment.

For production test the sync and subcarrier test signals are in most cases supplied to the test stations via the internal RF distribution system, which carriers all the other test signals anyway. The function buttons are normally set in the automatic jumping mode with the nominal signal suppressed in order to test the catching range, and with a specified frequency deviation. The operator can see from the screen which deviation is not accepted by the equipment under test, and can therefore react properly with alignment or repair. The other two signals (decoder signal and purity signal) may be handled in the same way.

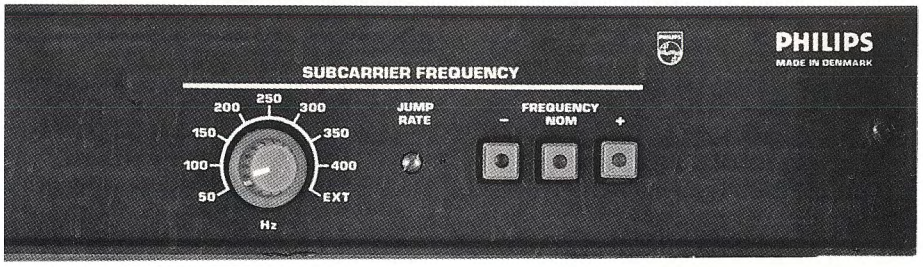
In case of sub-assembly testing and test of video equipment the test signals can be applied directly to the input of the equipment under test.

Quality control and evaluation of equipment take place with the signals applied directly to the equipment under test, if necessary via a TV modulator. By operation of the front panel controls it is possible to determine the catching as well as the holding ranges of the synchronization circuits. In this case both automatic jumping and manual frequency control are possible. If automatic jumping is applied, and the equipment under test has no screen, it may be convenient to loop the test signal through a monitor, which is then used as a display unit.

For research and development applications the use of external frequency sources gives the operator total freedom to measure and test the synchronization properties of the equipment under test.



Functional blockdiagram PM 5634



TECHNICAL DATA (all versions)

Video signals

VIDEO 1 SIGNAL (subcarrier test) — Number of outputs: 1 BNC. Output impedance: 75 Ω. Return loss: > 34 dB up to 7 MHz. Type of signal: colour pattern with nominal sync signal and variable frequency of the colour content (burst and chroma). The pattern indicates "Subc" plus "0", "-" or "+" in accordance with the actual frequency. Levels: luminance approx. 25% and 50% of white (700 mV or 100 IRE), sync 300 mV or 40 IRE, colour burst 300 mV or 40 IRE. Frequency of colour content (subcarrier): nominal (see sync characteristics), plus-deviations 50 - 100 - 150 - 200 - 250-300-350-400 Hz, minus-deviations 50-100-150-200-250-300 -350-400 Hz, or no burst at all (by front panel push-buttons and knob). Frequency of sync: nominal (see sync characteristics). Automatic jumping: the frequency of the colour subcarrier switches automatically between the selected frequencies. If, for instance, all three frequencies are selected: plus-deviation / nominal / minus-deviation / nominal / plus-deviation, and so forth. Jump rate: adjustable 4-32 seconds (by front panel screwdriver control).

VIDEO 2 SIGNAL (sync test) — Number of outputs: 1 BNC. Output impedance: 75 Ω . Return loss: > 34 dB up to 7 MHz. Type of signal: monochrome pattern with variable sync frequency. The pattern indicates "Sync" plus "0", "-" or "+" in accordance with the actual frequency. Levels: video 700 mV or 100 IRE, sync 300 mV or 40 IRE. Rise/fall times: approx. 230 ns. Sync frequency: nominal (see sync characteristics), plus-deviation 1-2-3-4-5-6-7-8%, minus-deviation 1-2-3-4-5-6-7-8%, or no signal at all. Automatic jumping: the frequency of the sync signal switches automatically between the selected frequencies. If, for instance, all three

frequencies are selected: plus-deviation / nominal / minus-deviation / nominal / plus -deviation and so forth. Jump rate: 4-32 seconds (by front panel screwdriver control).

COLOUR TEST SIGNAL — Number of outputs: 1 BNC. Output impedance: 75 Ω. Return loss: > 34 dB up to 7 MHz. Type of signal (PAL-versions): 1) Four vertical bars of G-Y=0, luminance, non-alternating R-Y, alternating B-Y (last two are the so-called anti-PAL signals), 2) Same as 1) with horizontal luminance bar in the lower part of the screen (split-field). Type of signal (NTSC-version): vertical bars of 1) -I and Q, 2) RGB, 3) R-Y=0, B-Y=0 and G-Y=0, or 4) split-field upper part -I and Q with lower part RGB or R-Y=0, B-Y=0 and G-Y=0. Levels: luminance approx. 442 mV (M/NTSC: 214 mV), sync 300 mV or 40 IRE. Rise/fall times: luminance 250 ns (G/PAL: 200 ns), sync 230 ns (M/NTSC: 140 ns). Residual subcarrier: < 3.5 mVpp. Timings: see sync characteristics.

PURITY SIGNAL (red) — Number of outputs: 1 BNC. Output impedance: 75 Ω. Return loss: > 34 dB. Type of signal: full-field red (100%). Levels: luminance 209 mV (M/NTSC: 251 mV, M/PAL: 246 mV) all ± 5%, chrominance 885 mVpp (M/NTSC: 825 mVpp, M/PAL: 819 mVpp) all ± 4%, sync 300 mV (M/NTSC: 40 IRE) all ± 3%. Phase of chrominance: 103.5° ± 2°. Rise/fall times: luminance 270 ns (G/PAL: 300 ns), sync 230 ns (M/NTSC: 140 ns).

Auxiliary outputs

SC. FREQ. — Number of outputs: 1 BNC. Output impedance: 75 Ω. Return loss: > 34 dB. Type of signal: continuous subcarrier. Level: 0.5 Vpp. Frequency: actual frequency of the chrominance content of VIDEO 1 signal.

H. FREQ. — Number of outputs: 1 BNC. Output impedance: 75 Ω. Return loss: > 26 dB. Type of signal: horizontal (line) drive pulses. Level: 4 Vpp. Rise/fall times: 200 ns. Frequency: actual horizontal frequency of VIDEO 2 signal.

Sync outputs

COLOUR SUBC. — Number of outputs: 1 BNC. Output impedance: 75 Ω. Return loss: > 34 dB. Type of signal: continuous subcarrier. Level: 1 Vpp. Frequency: nominal colour subcarrier frequency (see sync characteristics).

COMPOSITE SYNC — Number of outputs: 1 BNC. Output impedance: 75 Ω. Return loss: > 26 dB. Type of signal: standard sync with nominal frequency. Level: 4 Vpp ± 0.4 Vpp. Rise/fall times: 200 ns.

External reference inputs

SUBC. REFERENCE — Number of inputs: 1 BNC. Input impedance: approx. 3 kΩ. Input level: 0.5-4 Vpp. Frequency range: nominal subcarrier frequency ± 1000 Hz.

SYNC REFERENCE — Number of inputs: 1 BNC. Input impedance: approx. 3 kΩ. Input level: 1-5 Vpp (squarewave). Frequency range: nominal horizontal frequency ± 10%.

Sync characteristics

G/PAL — Subcarrier: 4.433 618 75 MHz. Accuracy: ± 2 ppm. Horizontal frequency: 15.625 kHz. Vertical frequency: 50 Hz. Line sync pulse width: 4.7 µs ± 0.2 µs. Equalizing pulse width: 2.35 µs ± 0.15 µs. Serration pulse width: 4.7 µs ± 0.2 µs. Number of equalizing pulses: 5 + 5. Number of serration pulses: 5. Front porch: 1.5 µs ± 0.2 µs. Line blanking: 12.0 µs ± 0.3 µs. Burst width: 2.25 µs ± 0.23 µs. Burst start (referred to line sync): 5.6 µs ± 0.1 µs.

M/PAL — Subcarrier: 3.575 611 49 MHz. Accuracy: ± 2 ppm. Horizontal frequency: 15.734 kHz. Vertical frequency: 59.94 Hz. Line sync pulse width: 4.7 µs ± 0.2 µs. Equalizing pulse width: 2.38 µs ± 0.15 µs. Serration pulse width: 4.7 µs ± 0.2 µs. Number of equalizing pulses: 6+6. Number of serration pulses: 6. Front porch: 1.5 µs ± 0.2 µs. Line blanking: 12.0 µs ± 0.3 µs. Burst width: 2.4 µs ± 0.15 µs. Burst start (ref. to line sync): 5.8 µs ± 0.1 µs.

N/PAL — Subcarrier: 3.582 056 MHz. Accuracy: ± 2 pmm. Horizontal frequency: 15.625 kHz. Vertical frequency: 50 Hz. Line sync pulse width: 4.7 µs ± 0.2 µs. Equalizing pulse width: 2.35 µs ± 0.15 µs. Serration pulse width: 4.7 µs ± 0.2 µs. Number of equalizing pulses: 5 + 5. Number of serration pulses: 5. Front porch: 1.5 µs ± 0.2 µs. Line blanking: 12.0 µs ± 0.3 µs. Burst width: 2.4 µs ± 0.15 µs. Burst start (ref. to line sync): 5.6 µs ± 0.1 µs.

M/NTSC — Subcarrier: 3.579 545 MHz. Accuracy: ± 2 ppm. Horizontal frequency: 15.734 kHz. Vertical frequency: 59.94 Hz. Line sync pulse width: 4.7 µs ± 0.2 µs. Equalizing pulse width: 2.38 µs ± 0.15 µs. Serration pulse width: 4.7 µs ± 0.2 µs. Number of equalizing pulses: 6 + 6. Number of serration pulses: 6. Front porch: 1.5 µs ± 0.2 µs. Line blanking: 11.0 µs ± 0.25 ns. Burst width: 2.5 µs ± 0.15 µs. Burst start (ref. to line sync): 5.6 µs ± 0.1 µs.

Front panel controls and indicators

- Power on/off
- Horizontal deviation / external reference selector (knob)
- Horizontal frequency selector
- Jump rate (screwdriver)
- Subcarrier deviation / external reference selector (knob)
- Subcarrier frequency selector
- Jump rate
- Power on indicator

Power requirements

Mains supply voltage: 100/120/220/240 V + 10% - 15%. Frequency range: 48 - 65 Hz. Power consumption: 40 W at 220 V.

Environmental conditions

Operating temperature: 5 - 45°C ambient. Storage temperature: - 30 to + 70°C.

Safety

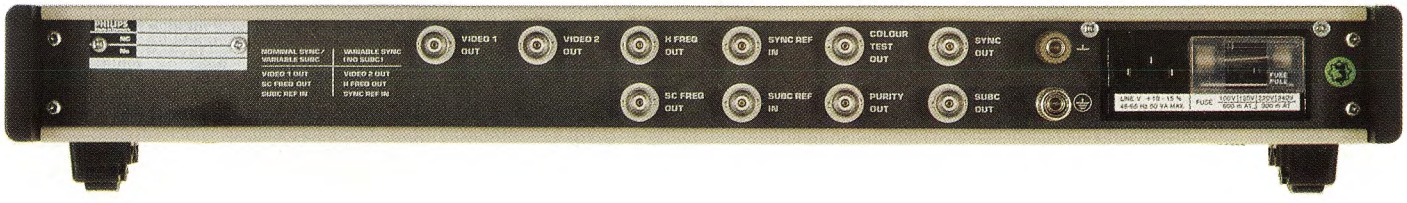
Safety: in accordance with IEC 348 class I

Mechanical data

19" rack/table cabinet, 1 rack unit high.
Height : 44 mm
Width : 440 mm (excl. brackets)
Depth : 460 mm
Weight : 5.2 kg

The cabinet has handles and rackmount brackets (integrated part of cabinet) as well as rubber feet and a tilt bracket (removable). When rack mounted the cabinet should be supported at the rear. Improved air circulation through the instrument can be obtained by removal of the top and bottom plates.

Standard accessories:
- Operation and service manual
- Mains cord
- Extension board (for repair)



PM 5645

Teletext test generator

NEW

Code no. PM 5645:
9449 056 45005 (I-version, 625-lines British teletext)

Other versions, such as 525-lines teletext and Antiope, on request.



Complete teletext test generator with page generation and distortion simulation

In full conformity with the British teletext system

Four different pages are available, one at the time

Eight magazines of 1, 10 or 100 pages each

Eye-height reduction of the data signal by means of the DELPHI principle

Generators for white noise and co-channel interference are included

Ideal for production test of TV receivers with teletext decoder

The PM 5645 is an elaborate tool for test of the teletext transmission characteristics of all types of transmission equipment

Built-in full-field test signal with cross-hatch and 1.44 T pulses

The PM 5645 teletext test generator is a precision measuring instrument with teletext facilities designed for the test of professional and consumer teletext decoders, as well as TV receivers with built-in teletext decoder. The PM 5645 is also extremely suitable for test of the teletext transmission capabilities of any piece of equipment in the transmission path, - from the television studio to the transmitter aerial.

The PM 5645 succeeds the well-known Philips DELPHI teletext generator PM 5538. The main features of the PM 5645 are:
- 4 test pages selectable from the front.
- 8 magazines selectable from the front.
- magazine length can be 1, 10 or 100 pages by front panel selection.
- calibrated reduction of the data eye-height by means of negative and positive echoes.
- white noise generator for simulation of noisy signals.
- sine wave generator for simulation of co-channel interference.
- full-field cross-hatch pattern comprising 1.44 T sine-squared and bar signal.

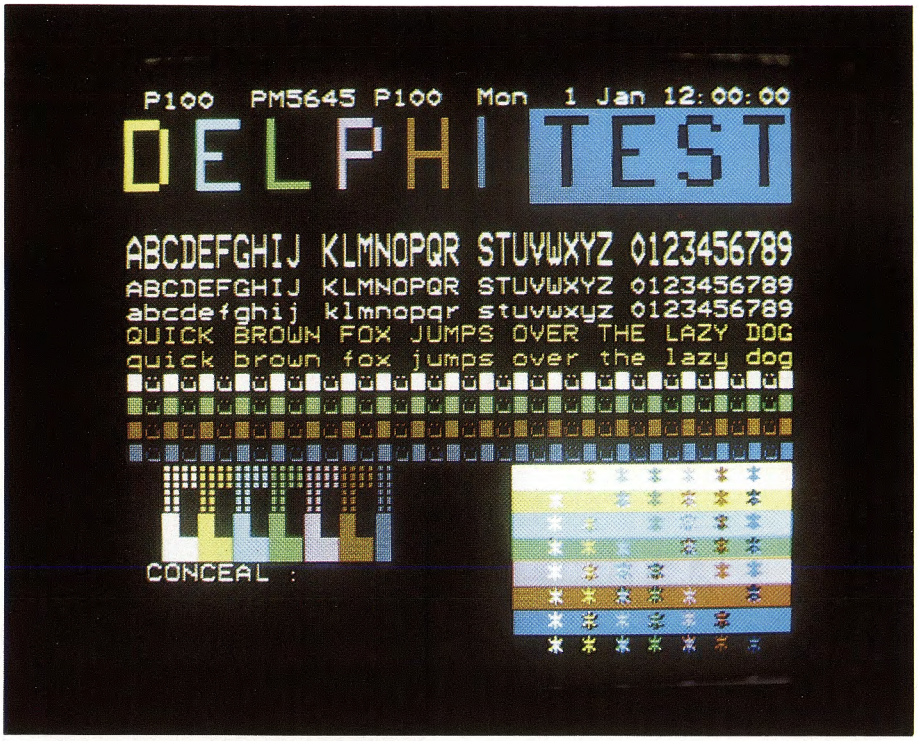
The calibrated eye-height reduction of the data pulses is the main measuring feature of the PM 5645. The eye-height reduction by means of a negative echo with a delay of 7 clock pulses and a positive echo with a delay of 14 pulses was invented by the Independent Broadcasting Authority, in connection with this authority's work on the development of the British teletext system.

The method is called DELPHI (Defined Eye-height Loss with Precision Held Indication). Although the long delays of the echoes do not reflect realistic receiving conditions, the DELPHI method has the advantage of giving consistent measuring results of a decoders decoding capabilities, i.e. regardless of changes of the amplitude and group delay characteristics.

The PM 5645 supplies the teletext signal with variable eye-height reduction, - from the almost undistorted 98% down to 0%. The actual distortion is read on a digital display. In addition the PM 5645 supplies auxiliary signals for eye display of the teletext signal on an oscilloscope. These features make the PM 5645 an extremely versatile tool for everybody involved in designing testing and manufacturing teletext equipment and teletext transmission equipment.

Some teletext background

Teletext is the British system for a television service that transmits digital information during the vertical blanking interval (fig.1), information which is displayed on the TV screen in form of printed pages and graphic symbols. The content of one page is transmitted by two data lines per field in 12 successive fields (one data line equals one line on the screen).



Test page no.1: Philips DELPHI pattern.

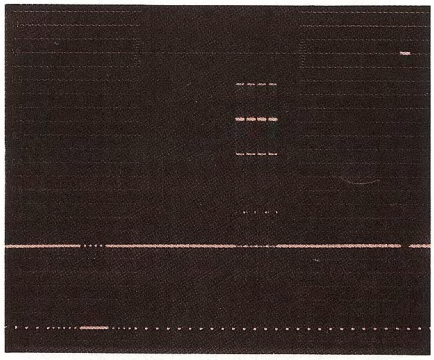


Fig.1. Details of the vertical blanking interval showing the field sync pulse, the data lines and a part of the active field.

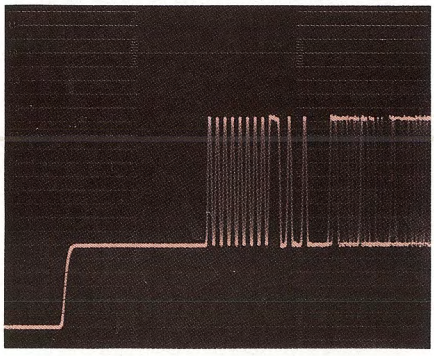


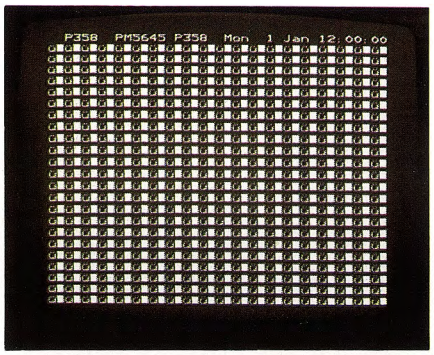
Fig.2. Details of the data line with the horizontal sync pulse, back porch, clock run-in,framing codes.

The digital signal forming the data lines consists of sine squared pulses 144 ns wide (1.44 T), positive for logic "0" levels, negative for logic "1" levels. If a number of "1"s or "0"s follow each other, the pulses "melt" together and form blocks of bars instead of discrete pulses (see the oscillogram, fig.2). The characters and the graphic symbols are transmitted in the form of ASCII coded digital information. In addition to the one line of information displayed on the screen, each data line contains some auxiliary codes for synchronization of the teletext receiver and for identification (run-in and frame codes).

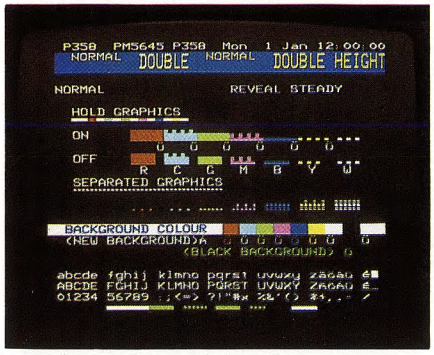
Teletext was pioneered by the two British broadcasting authorities: the Independent Broadcasting Authority (IBA) with its ORACLE and the British Broadcasting Corporation (BBC) with its CEEFAX.

Eye-height and eye-width

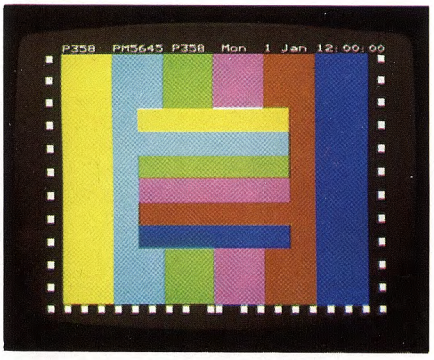
The teletext data signal consists of high speed pulses and high speed transients which are sensitive to amplitude and group delay distortions, echoes, non-linear distortions, noise, and spurious pulses. The success of a TV receiver to decode the digital data without errors depends on the amount of distortion that the transmission network has inflicted on the data signal. In this connection the transmission



Test page no.2: Clock cracker.



Test page no.3: BREMA pattern.



Test page no.4: RGB test pattern.

network means the total path from the generator in the teletext studio to the aerial input of the receiver.

The so-called "decoding margin" is the parameter that describes the "decodeability" of a teletext signal best. A relatively undistorted signal has a high decoding margin. A distorted signal or a signal with a low signal-to-noise ratio has a low decoding margin.

For testing purposes it is important to get reproducible measuring results, therefore statistical distortions such as noise and spurious pulses, etc., must be excluded from the so-called "eye-display". The eye display (see fig.3) is a Lissajou figure appearing on the

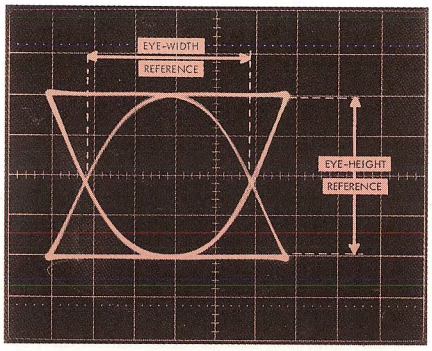


Fig.3. Eye-display. The undistorted eye-height and eye-width serve as reference for the later on distorted eye pattern.

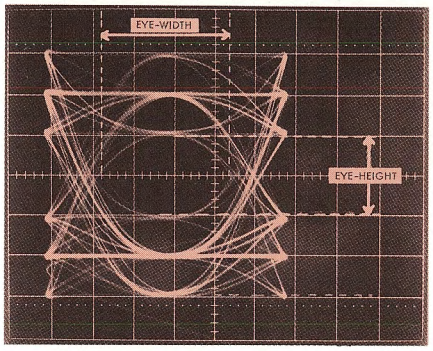
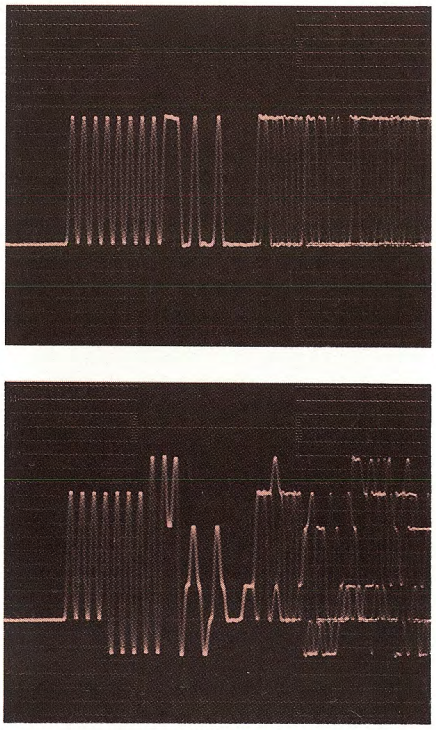


Fig.4. Eye-display of distorted signal. By comparison with the display above the following distortions can be read: eye-height = 50% and eye-width = 78%.



Details of the data signal. The upper photo shows the undistorted signal, the lower one shows the effect of DELPHI distortion.

oscilloscope screen, when the data signal is fed to the Y-plates of the oscilloscope and the data clock signal divided by four is fed to the X-plates (see photo). An unblanking signal coinciding with the data lines in the vertical interval is fed to the Z-input. Eye-height and eye-width are read directly from the screen as shown on the photo (see fig.4).

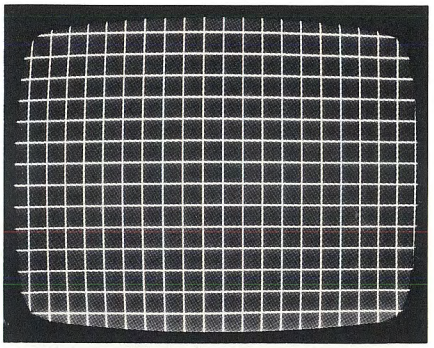
Eye-height reduction

Various types of distortions may cause reduction of the eye-height or the eye-width or both. The PM 5645 makes use of a negative echo and positive echo to introduce calibrated eye-height reduction. This method has the following advantages:

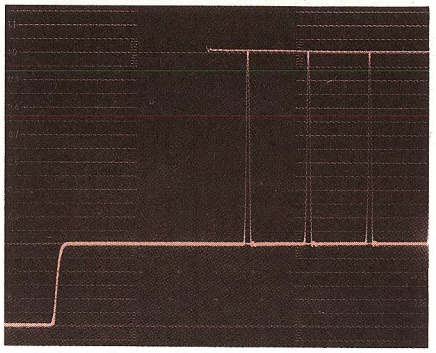
- the amplitude of the data signal remains constant when the eye-height control is operated (easy operation).
- there is a linear function between between control function and eye-height reduction (easy calibration).
- the introduction of eye-height reduction causes eye-width reduction (worst case measuring results).
- eye-height reduction generated by echo distortion is not so much subject to cancellation or enhancement by receiver amplitude and group delay characteristics (this means reproducible measuring results).
- echoes and noise are in practice the main limiting factors for teletext reception (realistic measuring procedure).

Applications

The eye-height reduction facility of the PM 5645 is indispensable for all work on teletext equipment. In particular the design of, alignment and check of decoders and teletext receivers, etc.. By gradually reducing the eye-height of the teletext signal until the equipment fails to perform correctly, one can directly read from the display of the PM 5645 what the minimum acceptable eye-height is.
For further analysis of decoder performance there is in the PM 5645 a possibility to exclude the echo distortion from the run-in and frame codes of the data signal. The full field pulse-and-bar signals (cross-hatch) allows the amplitude and group delay characteristics to be evaluated on a waveform monitor. The built-in noise generator and sine wave generator make it possible to simulate reality receiving conditions by introducing a certain amount of noise and sometimes sine wave interference similar to what an adjacent channel station would cause at the receiver screen.



Cross-hatch full-field pattern.



Full-field signal of the PM 5645. The vertical lines of the cross-hatch are formed by 1.44T sine-squared pulses.

TECHNICAL DATA

Teletext data signal

DATA SIGNAL — Clock frequency: 6.937 500 MHz ± 0.01% (5.727 272 MHz ± 0.01% in M-version). Format of data line: 8 bits clock run-in (RI), 8 bits framing code (FC) and 200 bits information, all in conformity with the British (and US) teletext standard. Number of pages: 4, one at the time (front panel selection). Number of pages per magazine: 1, 10 or 100 (front panel selection). Number of magazines: 8 (front panel selection). Amplitude: adjustable 312 - 612 mV (front panel control), calibrated value 462 mV (500 mV in M-version). Generation of data lines: during 1 to 16 consecutive lines in the vertical interval, lines 7 to 22 and 320 to 335 (factory setting: 17-18 and 330-331), lines 10-20 in both fields in system M.

PAGES — The PM 5645 has four different pages selectable with front panel push-buttons (see enclosed photos). Page 1: Philips DELPHI pattern. Page 2: clock cracker pattern. Page 3: British BREMA pattern. Page 4: special Philips colour bar for test of the RGB display. Custom designed pages can be made at extra costs.

EYE HEIGHT REDUCTION — 1) Echo distortion. Principle: one negative echo delayed by 7 clock periods and one positive echo delayed by 14 clock pulses referred to the original signal (delays may be modified by internal programming). Amplitude of echoes: front panel adjustable from 0 to the same level as the original

signal (corresponding to eye-heights almost 100% down to 0%). 2) Co-channel interference. Principle: superimposition of the data signal with sine wave signal. Frequencies: 26.042 kHz ± 1% or 52.083 kHz ± 1% by front panel selection (26.250 kHz and 52.500 kHz in M-version). Amplitude: variable -60 dB to -14 dB (referred to 1 Vpp video signal) by front panel control. Calibrated position: -28 dB. 3) Noise. Principle: superimposition of white noise. Amplitude: variable -60 dB to -14 dB by front panel control. Calibrated position: -28 dB. Bandwidth: 10 kHz to 5 MHz ± 1 dB.

Full-field signal

CROSS-HATCH — Type: 18 x 22 lines. Shape of vertical lines: sine-squared. Width: ∼144 ns. Amplitude: 700 mV (714 mV). Amplitude of sync: 300 mV (286 mV). Both the cross-hatch and the sync can be switched off with front panel push-buttons.

Outputs

VIDEO OUT — Number of outputs: 1 BNC on the rear (may be linked to the front panel). Type: composite video with teletext data. Amplitude: 1 Vpp or 2.5 Vpp by front panel selection (700 mV video, 462 mV data and 300 mV sync, in M-version 714 mV video, 500 mV data, and 286 mV sync). Output impedance: 75 Ω. Return loss: > 34 dB up to 7 MHz.

X OUT — Number of outputs: 1 BNC on the rear. Type of signal: data signal clock divided by 4 (for eye display). Shape of the signal: sinusoidal. Amplitude: 5 Vpp. Output impedance: 75 Ω.

Z OUT — Number of outputs: 1 BNC on the rear. Type of signal: unblanking pulse coincident with the data signal. Polarity: positive (standard) or negative. Amplitude: 5 Vpp. Output impedance: 75Ω.

TEST POINTS — The following signals are available as test points on the front panel: data, data lines, gated clock, sync, blanking, and logic ground. Type of socket: 2 mm banana. Levels: TTL.

Input

AUX IN — Number of inputs: 1 BNC on the rear. Type of signal: any signal to be added to the output signal. Amplitude: max. 1 Vpp. Polarity: negative (inverting). Bandwidth: dc to 6 MHz ± 0.1 dB. Input impedance: 75 Ω. Return loss: > 34 dB up to 7 MHz.

Front panel controls and indicators

- Power on/off
- Teletext data on/off
- Noise on/off
- Co-channel interference on/off
- Eye-height distortion of clock run-in and framing code bits on/off
- Cross-hatch on/off
- Sync on/off
- Page selector
- Magazine selector
- Magazine length selector
- Output level
- Teletext data line level
- Noise level
- Co-channel sine wave level
- Co-channel sine wave frequency
- Eye-height (echo) controls
- Eye display phase
- Power on indicator (in power button)
- Eye-height display (LCD)

Power requirements

Voltage: 115/230 V ± 15%. Frequency: 48-65 Hz. Consumption: 40 W at 230 V.

Environmental conditions

Operating temperature: 5-45° C ambient.
Storage temperature: - 40 to + 70° C.

Safety

In accordance with IEC 348.

Mechanical data

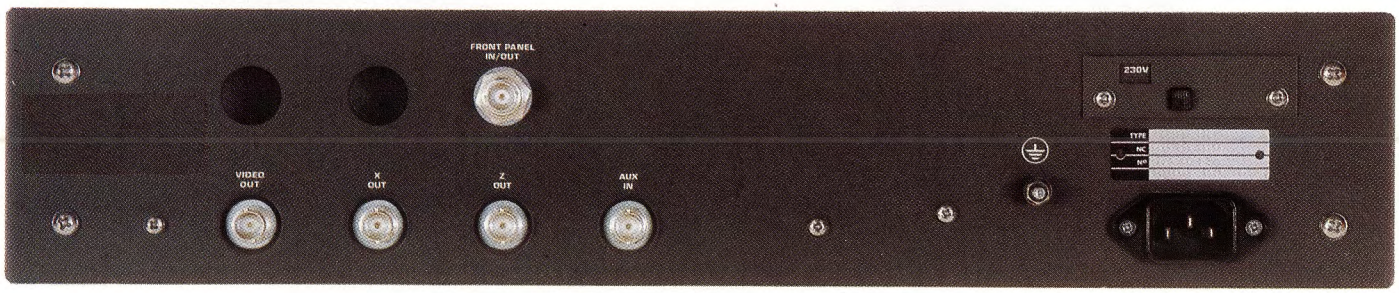
19" rack/table cabinet, 2 rack units high.
Height : 88 mm
Width : 440 mm
Depth : 440 mm
Weight : 9.5 kg

The cabinet has handles and detachable rubber feet. Rack mount brackets are included with the instrument.

Standard accessories:
- Operation and service manual
- Mains cord

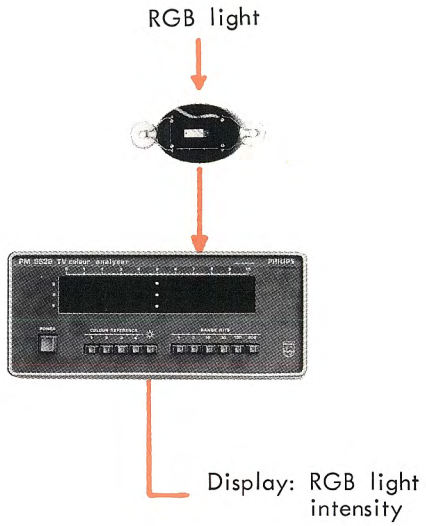
Modulators

For the test of some types of TV equipment, it is necessary to convert the baseband teletext test signal of the PM 5645 into a standard RF signal. In principle any modulator of good quality may be used, however, bandwidth and group delay precorrection must correspond to the equipment under test. Among the Philips range of professional TV modulators the following ones can be recommended:
- PM 5580 IF modulator
- PM 5581/82 RF converters
- PM 5671 TV modulator
- PM 5672 TV modulator, DS (dual or stereo sound)

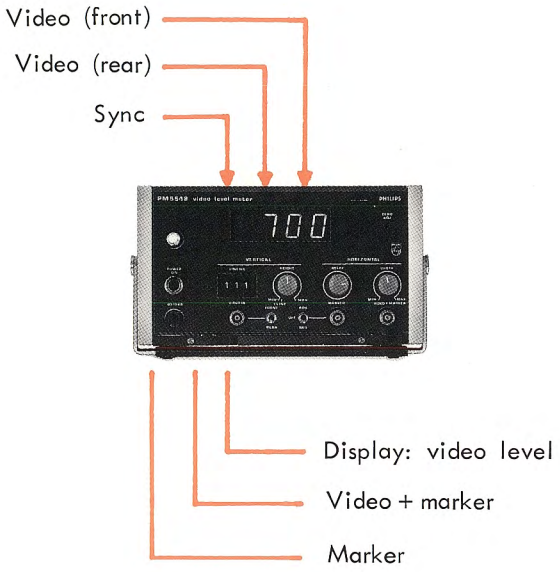


Video analysers

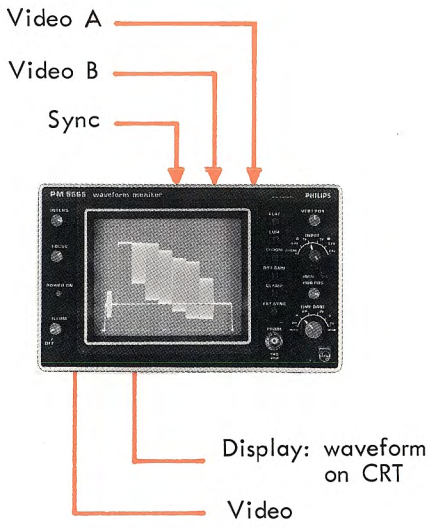
PM 5539 TV colour analyser



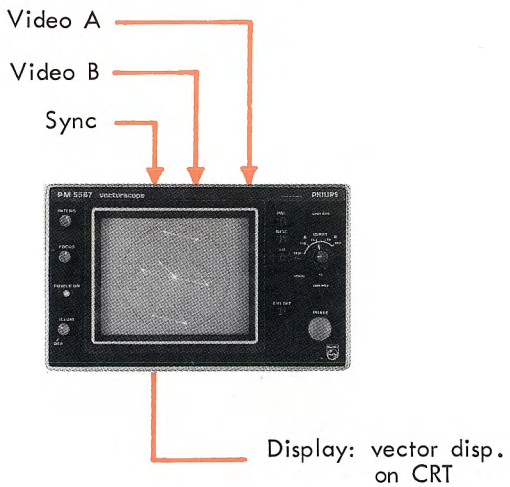
PM 5548 Video level meter



PM 5565 Waveform monitor



PM 5567 Vectorscope



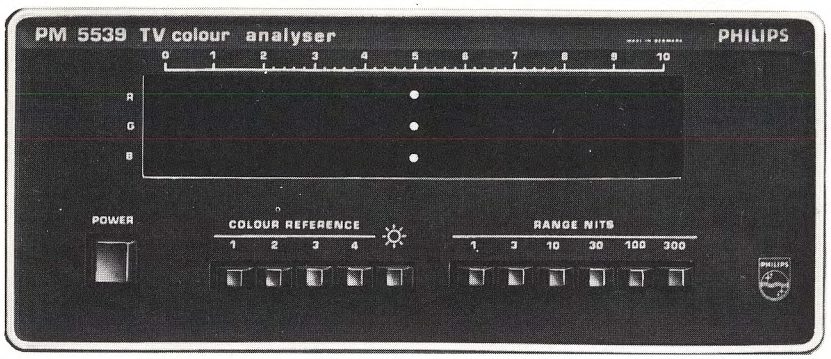
Type no.	Description	Page
PM 5539	TV colour analyser	80
PM 5548	Video level meter	83
PM 5565	Waveform monitor	85
PM 5567	Vectorscope	90
PM 5625	Colour monitor	94

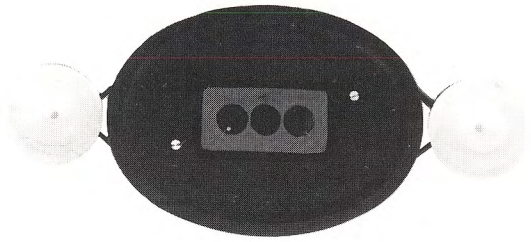
Philips, of course.

TV colour analyser

PM 5539

Code no. PM 5539:
9449 055 39001





First practical solution to the problem of ''objective setting'' of colour monitors.

Indispensable for camera and monitor setting and alignments

High sensitivity allows accurate setting of the ''colour white'' at low luminance levels.

Appreciated by TV-set manufactures and broadcasting authorities.

The three led bars mounted over each other ensure quick and accurate reading of the colour levels and balance.

Push-buttons allow adjustment to several different colour temperatures.

The Philips TV colour analyser PM 5539 has been developed to meet the increasing demand for measurement and adjustment of the "colour" white of colour TV-sets and colour monitors.

The light emitted by a colour picture tube consists of the three primary colours red, green and blue. White is obtained by additive mixing of these colours in the appropriate proportions (fig.1). The PM 5539 has three independent LED displays so that the intensities of the three primary colours can be measured simultaneously.

Several different "colour" white standards have been used in the course of time:
White mono: x = 0.265 y = 0.290
White C : x = 0.310 y = 0.316
White D : x = 0.313 y = 0.329
The last one is most commonly used at present.

To cope with different white standards or different brands of picture tubes, the PM 5539 has four matrix circuits which can be adjusted to give correct readings.

The colour temperature is normally adjusted at both high and low brightness levels, but the ratio of the three primary colours should also stay the same at "grey" levels. To permit this "grey scale tracking", the PM 5539 has a wide sensitivity range (1 to 300 NIT full scale).

Applications

The colour adjustment of colour TV monitors and receivers has always been regarded as a very important matter in television studios and TV factories. Nevertheless, until recently no objective method was available for doing this. In TV factories the controls for low-level and high-level colour balance (beam cut-off and gain controls) are often set by the final check technicians in a subjective procedure. This setting will be influenced by the colour temperature of the ambient light and the physical and psychological condition of the technician. A fluorescent lamp makes quite a good standard for setting the "white" on the CTV screen, however, standard tubes do show an appreciable colour spread, even if the brand and colour number are the same.

TV setmakers are well aware that the public often choose the set they think gives "the best colour" from among the various brands displayed by the dealer, however irrelevant to the quality of the set this criterion may be.

To make sure that their products can stand up to such a comparison, setmakers are using Philips TV colour analysers in their production lines.



In TV studios the problem is even more urgent. All picture sources, e.g. cameras, flying-spot scanners, diapositive scanners, telecine machines etc., depend on a type of light pick-up tubes (camera tubes). The pictures from these sources are far from objective, but have to be "corrected" by the CCU engineer. You might say that the CCU engineer adjusts the pictures on his monitor screens - until they look as possible like what he imagines the televised scene to be - or - until they look like the televised scene -. In order to ensure that this procedure is reasonably reproducible, all monitors must be adjusted as identically as possible.

TV productions are often composed of shots from different signal sources, recorded at different times. When they are run together during the actual program, any differences in colour temperature, brightness and contrast are easily seen.

The PM 5539 colour analyser may be regarded as the analysing part of a studio calibration system using any of the colour generators PM 5630/31/32/33 as generator. These combined SPGs and colour generators produce window or flat-field signals of selectable luminance values.

The procedure for precision setting of a colour monitor will run as follows: The measuring head of colour analyser is first mounted on the screen. The signal to be taken from the video signal generator is the flat-field signal, adjusted to black level. The brightness control of the monitor is adjusted so as to give a reasonable reading on the display with the colour analyser set to its most sensitive range. If the three displays show the same reading, i.e. the three lighting LEDs form a vertical bar, this means that the beam cut-off is all right. If not the appropriate controls must be adjusted.

The monitor's brightness and contrast controls are now set correctly by using the combined PLUGE/grey scale signal. A less sensitive range of the analyser is thereafter selected and the flat-field signal is applied now at almost white level (watch that the beam limit circuit has not become operative). The three displays (moving dots) should again form a vertical line, indicating that the colour temperature at white level is correct. Otherwise the RGB contrast controls should be readjusted.

Grey scale tracking may be checked by varying the level of the flat-field signal, while the displays should remain forming a vertical line (however at varying sensitivity).

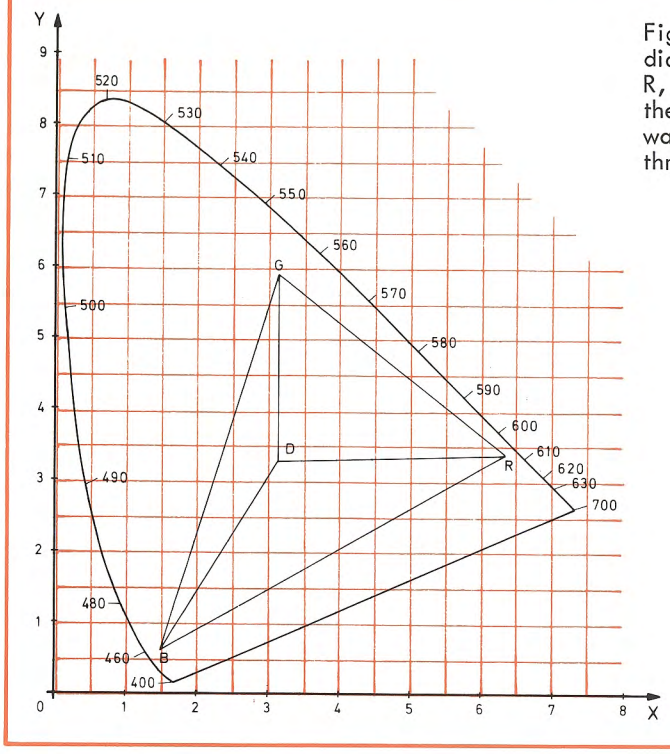


Fig. 1. X - Y colour diagram. The points R, G, B represent the saturation and wavelength of the three primary colours.

The colour generators PM 5630/31/32/33 generate many other test signals and patterns for calibration of monitors and receivers, as for instance cross-hatch, colour bars, red signal, etc.

Technical description

The measuring head contains three separate channels for red, green and blue.
The three colours are selected by means of filters; the light passing through each filter falls on a photo-diode, which converts it into an electrical current. These currents are fed to amplifiers, the amplification of which is controlled by the push-buttons for the different sensitivity ranges. The output signals of these amplifiers are via an A/D converter indicated by the LED displays at the front panel of the main unit.

Three compensating networks have been built into the PM 5539. Because the spectra of the primary colours and the filters of the measuring head partly overlap (see fig.2) the light of one

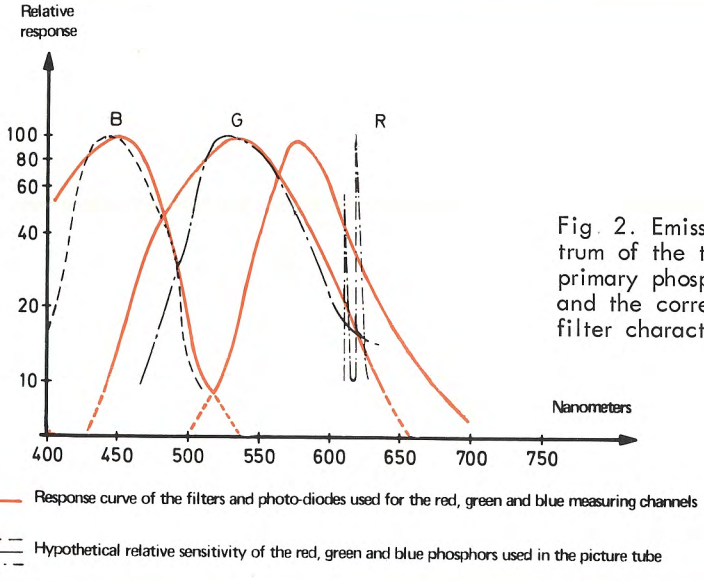


Fig. 2. Emission spectrum of the three primary phosphors, and the corresponding filter characteristics.

primary colour might give readings on the two other colours. The compensating networks prohibit this.

Since the sensitivity curves of the filters + photodiodes deviate from the ideal curved at some wave lengths - the TV colour analyser may have to be calibrated for each brand of colour picture tube. This is done with the above-mentioned four colour reference circuits. As the sensitivity curve of the green channel almost coincides with that of the human eye, brightness measurements are performed via the green channel, the red and blue channels being short-circuited.

Four different matrix circuits colour reference can be connected to the meters to calibrate them for up to four different white standards or brands of picture tubes. These matrix circuits are adjusted in such a way that the correct "white" is obtained when all three displays indicate the same value, so that the dots form a vertical line. This makes the matching of CTV and/or monitors a very simple matter.

Fig. 2 shows the sensitivity curves of the filters + diodes and the spectrum of the light emitted by a colour picture tube. Due to overlapping of the sensitivity curves, a given channel will contain not only the desired colour but also a certain amount of the other colours.

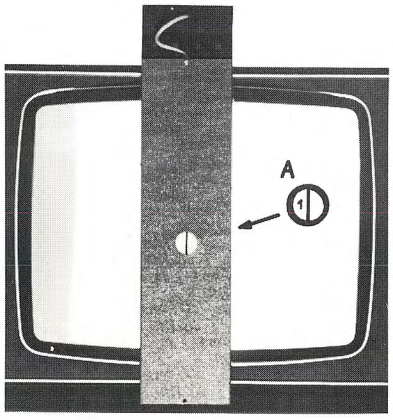
A standard light source giving the desired "white" colour point is needed to calibrate the analyser. This standard should moreover have phosphor dots with the same colour coordinates as the picture tubes to be adjusted later on with the analyser.

The calibration procedure will not be described here, as full details are given in the operating instructions of the manual.

However, we may say something about the adjustment of the standard light source. It will be clear from the above that the standard light source should be a CTV or a monitor, which is adjusted to the desired "white" colour before it can be used as standard.

Philips has developed a "white-D comparator" (type number PM 8519) which can be used to adjust a CTV-set or monitor to the "white" colour point by a simple optical method (see fig. 3). This "white-D comparator" contains a fluorescent tube of 6500°K. Looking through tube A (fig.3), one will see two semicircles:
- one with the light from the picture tube (1) and
- one with the light from the built-in "white-D standard".

The two areas can be matched very accurately since there is a very sharp transition between them. The colour analyser cannot be calibrated by direct comparison with this "white-D comparator" since the spectrum of the latter differs completely from that of a picture tube.



White-D comparator type PM 8519 . This unit (see photo above) contains a flourescent tube of 6500°K as colour temperature standard. A colour monitor or TV-receiver can be set to this colour temperature very accurately by means of the comparator. The monitor or TV set can then be used for calibration of the PM 5539.

TECHNICAL DATA

Selectors

COLOUR REFERENCE — A 5-position push-button selector allows up to four white reference to be selected, plus a brightness measurement to be performed via the green channel only. Factory preset white reference. White D: x = 0.31, y = 0.33.

SENSITIVITY RANGE — A 6-position push-button selector makes one of the following sensitivities obtainable: 0 - 1, 0 - 3, 0 - 10, 0 - 30, 0 - 100 or 0 - 300 NIT full scale deflection.

Display

Three rows of LEDs, mounted above each other. Deflection is proportionate to light intensity, equal deflections mean that colour temperature is equal to the preset colour temperature.

Photo diodes

The photo diodes are mounted in a small box which can be attached to the screen of the picture tube by means of two small sucking-discs. Only intensive ambient light will influence the measurements.

Stability

Due to the use of chopper stabilized amplifiers and stabilized power supply voltages, the drift versus temperature and mains variations are negligible.

Power supply

Voltage: 115/230 V ± 20%. Frequency: 48 - 65 Hz. Consumption: 4 W at 220 V (max. 16 W during battery charge).

Temperature range

Operating: 0° - 45° C ambient.

Mechanical data

MAIN UNIT — Standard PHILIPS portable table cabinet.

Height : 89 mm
Width : 210 mm
Depth : 330 mm
Weight : 2.5 kg

MEASURING HEAD — Die-cast box with sucking discs.
Dimensions: 120 x 167 mm
Weight : 0.5 kg

Option

White-D comparator type PM 8519 . This unit (see photo above) contains a flourescent tube of 6500°K as colour temperature standard. A colour monitor or TV-receiver can be set to this colour temperature very accurately by means of the comparator. The monitor or TV set can then be used for calibration of the PM 5539.

Video level meter

PM 5548

Code no. PM 5548:
9449 055 48003 (G-version, 4.43 MHz colour subcarrier)
9449 055 48008 (M-version, 3.58 MHz colour subcarrier)
9449 055 48108 (M-version, IRE readings)



Takes the guessing away in video level measurements.

The level at any point of the video signal can be measured by adjustment of the so-called vertical and horizontal controls.

Optional BCD output for print-out of video levels (PM 8509).

Ideal for check and adjustment of video signals as well as measurement of long term and temperature drift.

The digital video level meter is specially designed for aligning and checking of all kinds of video equipment as pattern and test signal generators, encoders, decoders, mixers, etc.

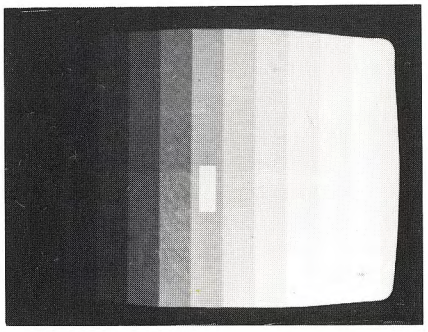
The instrument is using a sampling method enabling it to measure levels at any point of the television signal. The position of the sampling pulse is determined by four frontplate controls:
- thumbwheel switches, directly indicating the line number for the sampling to start
- control "height" appointing how many lines will be sampled
- multiturn potentiometer "delay" giving the sampling point on the selected line(s)
- control "width" determining the width of the sampling pulse

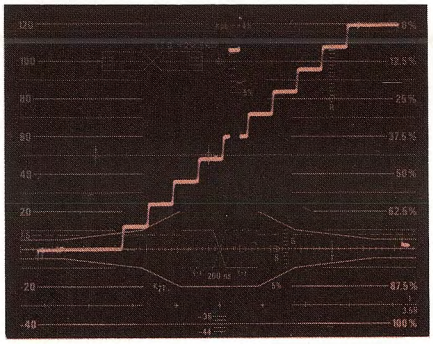
The digital video level meter performs level analysis on all kinds of video test signals even insertion test signals. The instrument provides two switchable video inputs and two outputs for the signal being measured, with superimposed sampling pulse. The polarity of this marker can be either positive or negative and can also be switched off. Together with a suitable precision video generator it forms the most accurate measuring system available.

Level settings and adjustments can now be performed in an easy, highly accurate way.

Technical description

The signal to be measured is applied to the 75Ω input amplifier, where it is filtered, amplified and then clamped at the blanking level. Via a voltage follower the signal is sampled and held at time intervals determined by the setting of the selectors i.e. horizontal and vertical positions. The obtained dc voltage will be converted from analogue into a digital signal, which is first stored and then transfered to the display. By means of the marker pulse, which is derived from the position pulse, it is possible to get a visual indication of the point being sampled, either an oscilloscope or on a monitor.





Video + marker output showing where the PM 5548 is measuring on the grey scale signal.

PM 5548

TECHNICAL DATA (all versions)

Voltmeter part

DIGITAL DISPLAY — Readings: in millivolts referred to the blanking level, in IRE units (M/NTSC-mode).

RANGE — From -600 to +1400 mV (from -60.0 to +2000.0 IRE units in M/NTSC mode).

POLARITY — Automatic polarity indication. Positive levels are above the blanking level.

ACCURACY — ± 0.1% of reading ± 1 mV (25 - 35° C ambient, signal/noise ratio > 26 dB).

SAMPLING PULSE — Vertically: start: line no. 1 - 625 (thumb-wheel switch). Height: 1 - appr. 50 lines. Horizontally: start: 1 - 64 µs from leading edge of sync pulse (multiturn potentiometer). Width: 0.3 - 10 µs continuously variable.

A/D CONVERTER — Dual slope with automatic polarity indication. Integration time 100 ms.

MEASURING TIME — 1 - 10 s depending on sampled area (height x width).

BCD OUTPUT — An optional BCD output kit gives possibility for having the measuring results sent to a printer or a computer. If the BCD option, PM 8509, is ordered together with a PM 5548, the option is automatically mounted and tested in the PM 5548 at no extra costs.

Inputs and outputs

INPUTS — Front: video or composite video ((C) VB or (C) VBS, sync negative). Input impedance 75 Ω ± 0.05%. Rear: 1) Video or composite video ((C) VB or (C) VBS, sync negative). Input impedance 75 Ω ± 0.05%. 2) Sync input 2 - 8 Vp-p, 75 Ω looped-through.

OUTPUTS — Front: 1) Incoming video signal superimposed with marker pulse (75 Ω output imp.). 2) Marker pulse. Rear: Incoming video superimposed with marker pulse (75 Ω output imp.).

Power supply

Voltage: 230 V (115 V) ± 20% (Internal selection). Frequency: 48 - 65 Hz. Consumption: 30 W at 220 V.

Temperature range

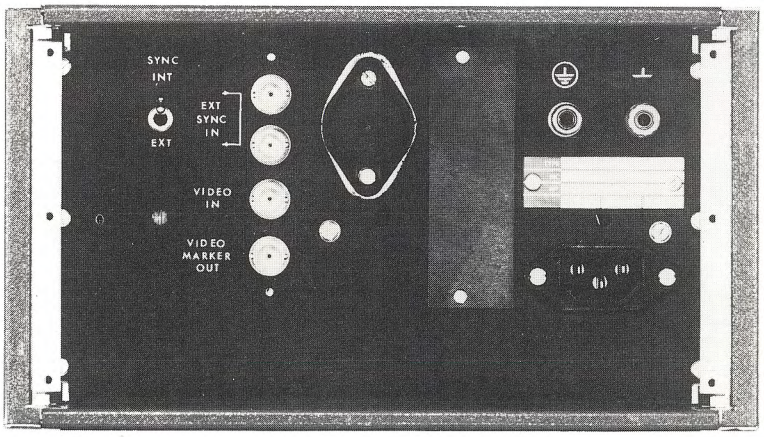
Operating: 0° - 45° C ambient.

Mechanical data

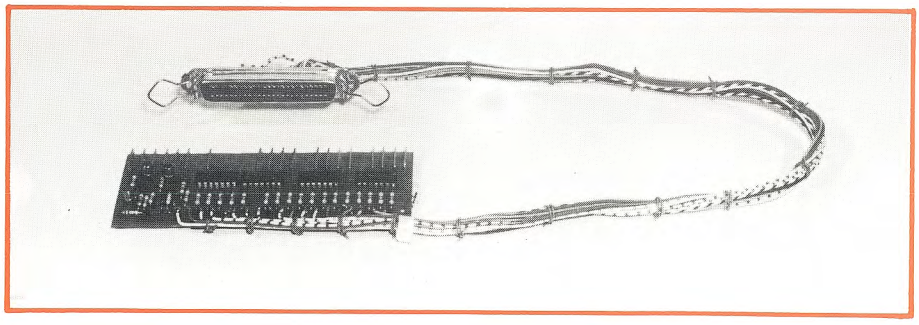
3/6 plug-in unit for the PHILIPS 19" rack/table cabinet.
Height : 132 mm
Width : 225 mm
Depth : 400 mm
Weight : 3.8 kg (without cabinet).

Cabinet

(To be ordered separately):
3/6 table cabinet: PM 9713
6/6 rack/table cabinet: PM 9716 A.



BCD option
PM 8509



With the BCD option for the PM 5548 it is possible to get the reading of the display out in digital form for applications such as printing, data processing or logic control. The data contains besides the actual reading of the display also polarity, transfer and stop signals.
The output level is selectable + 5 V or + 12 V logic.

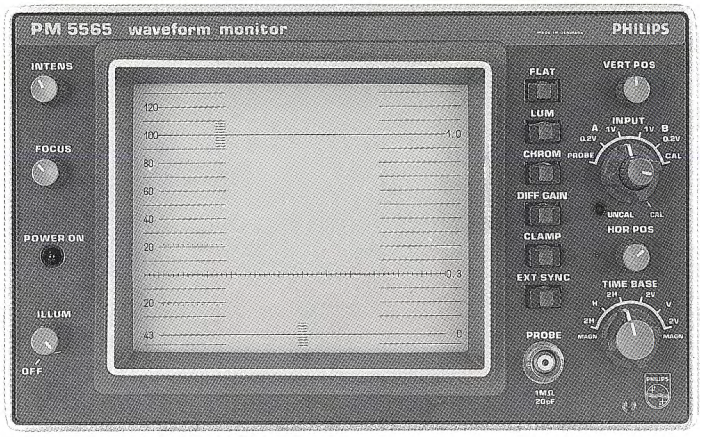
TECHNICAL DATA. Low level: 0 - 0.4 V. High level: +5 V to +12 V selectable with zener diode. Code: BCD (1 - 2 - 4 - 8), 13 bits for max. 1999. Polarity: 2-bit code.

Waveform monitor

PM 5565

Code no. PM 5565:

Standard versions:	VTR (Ampex) versions:	Staircase versions:
9449 055 65003 (G-version, 625-lines PAL)	9449 055 65053	9449 055 65073
9449 055 65008 (M-version, 525-lines PAL)	9449 055 65058	9449 055 65078
9449 055 65108 (M-version, 525-lines NTSC)	9449 055 65158	9449 055 65178
9449 055 65009 (N-version, 625-lines PAL)	9449 055 65059	9449 055 65079



External synchronization with composite video signals, also with sound-in-syncs.

Low weight, low power consumption and excellent serviceability.

Easy to operate because of logical, oscilloscope like front panel lay-out.

Very fast retrace allows more details to be seen.

Both sync tip and back porch clamping possible with selectable time constants slow and fast.

Mechanically compatible with other brands of waveform monitors.

Probe input at the front works with standard oscilloscope probes.

Six calibrated timebase positions.

Internal graticule means that parallax errors of readings are avoided.

Improved electrical specification.

Complementary vectorscope PM5567

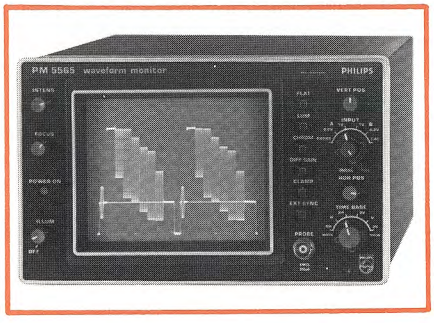
The PM 5565 Waveform monitor is a precision television oscilloscope designed specifically for broadcasting studios, EFP vans, cable TV studios and educational TV studios. The instrument is ideal for integration into the test system of camera control units, video tape recorders, film and slide scanners, as well as other video machines. The waveform monitor can be used for both monochrome and colour television systems. Together with the PM 5567 vectorscope the waveform monitor forms a complete colour set-up system for colour cameras.

The PM 5565 has the following important features for checking cameras and video machines.

- 2 equal inputs (A and B) with full screen deflection sensitivities of 1 V and 200 mV, plus a probe input and an internal calibration source.
- Input filters that pass only the luminance or the chrominance part of the displayed colour signal. The latter allows the measurement of differential gain distortion.
- Two clamping time constants that either display or suppress the hum of the displayed signal. By internal selection either sync tip or back porch clamping can be chosen.
- External synchronization with both composite sync (4 Vpp nominal) or any composite video signal (f.inst. black burst signal). The PM 5565 will synchronize also if the signals contain sound-in-syncs (digitally coded sound pulses in the sync signal).
- Parade display for setting up the individual pick-up tubes of colour cameras and flying spot scanners. The parade display can be shown on both horizontal and vertical time base.
  The parade display requires a switch box between the camera and the waveform monitor.
- 6 Calibrated time base deflections showing 1 line, 2 lines and 2 lines magnified as well as 1 field, 2 fields and 2 fields magnified on the screen. Due to the very fast retrace, the greater part of the sync pulses that trigger the display are visible on the screen.

Technical description

The waveform monitor has two looped-through video inputs A and B plus a 1 MΩ probe input on the front. The combined input selector/sensitivity selector switches between the three inputs and the 1 V calibration signal generator. The display sensitivity is 1 V or 200 mV full deflection for the A and B input with the variable gain control (centre shaft of the switch) in its calibrated position (click position). The variable gain control can reduce the sensitivity by a factor of 5. The probe input has an extra amplifier, so that full deflection is obtained for 1 V



with a 10 : 1 probe and 100 mV with a 1 : 1 probe.

The displayed signal passes a filter section which has the following selectable characteristics:

1. Flat. The signal is displayed with the full bandwidth of the waveform monitor. The bandwidth is flat up to 7 MHz (see specification), however, the frequency response has a slow roll-off beyond the 7 MHz in order to give an optimum pulse response of fast transients.
2. Lum. The signal passes a low-pass filter which removes the higher frequencies of the video band, in particular the colour subcarrier.
3. Chrom. The signal passes a band-pass filter that extracts the colour content of the signal. This facility can be used for various testing purposes such as encoder checks and differential gain measurements.
4. Diff gain. Same function as point 3, however the sensitivity of the vertical channel is automatically increased in order to make differential gain measurements more convenient.

In order to secure a stable display, independant of variations of the average picture level, the black level or the sync tips are clamped to an internal reference level. One of the following two modes, sync tip clamping or back porch clamping, can be selected inside the instrument. Furthermore each clamping mode may have two different time constants, namely slow clamping or fast clamping. In the slow mode (clamp button released) the average black level or the average sync tip level is clamped to the internal reference level. Any possible hum or low frequency content superimposed on the signal is displayed with very little attenuation.

This facility is incorporated for testing equipment for incorrect clamping, hum and other level irregularities. When the clamp button is pressed normal clamping function is established (fast clamp), which removes hum, etc. Also dc-coupling is possible by internal selection.

The horizontal deflection of the CRT is triggered by the sync pulses of the displayed signal itself or the sync pulses of an extra (external) signal. External synchronization is chosen when the ext sync button is pressed.

The time base selector has 6 calibrated positions, namely:

1. 2 H mag. Every second line sync pulse initiates a horizontal sweep so that two consecutive lines are displayed, however, a magnification factor of 10 is applied to the horizontal deflection system, thus providing possibility for studying the details of the line period.
2. H. Each line sync pulse initiates a sweep, so that all lines are displayed superimposed upon each other.
3. 2 H. As position 1, however, magnification is not applied.
4. 2 V. Every second vertical sync pulse starts a horizontal sweep of the CRT so that two consecutive fields are visible on the screen.
5. V. Each fields sync pulse triggers the sweep so that all fields are displayed superimposed on all the others.
6. 2 V. As position 4, however, a magnification factor of 20 is applied to the deflection amplifier.

In both the 2 H and the 2 V display mode the horizontal position control is used to bring the desired part of the signal within the screen.

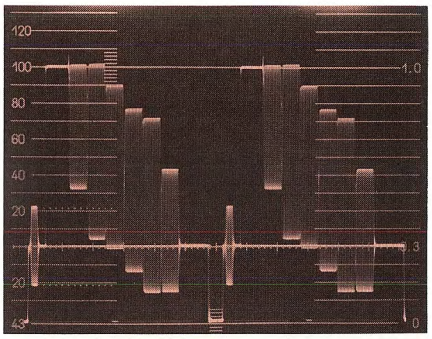
The so-called parade display represents a second type of deflection, which is suitable for ligning-up the three (or four) pick-up tubes of colour cameras and flying spot scanners (R-G-B or Y-R-G-B). The parade display can only be obtained in conjunction with a switch box that switches sequencially between the three (or four) camera signals, and at the same time delivers a staircase signal for the horizontal deflection system of the waveform monitor. The PM 5565 can produce parade displays on both horizontal and vertical time base, i.e. either 3 (or 4) lines are displayed or 3 (or 4) fields are displayed after each others.

Besides the already mentioned controls, the waveform monitor has the usual oscilloscope and CRT controls such as vertical position, intensity, focus and graticule illumination. Astigmatism and trace rotation are internal adjustments.

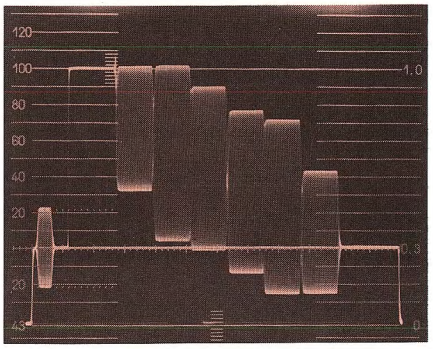
The instrument is housed in a painted cabinet and locked to the cabinet by means of spring loaded tap. The lock is released by insertion of a screwdriver in the small hole on the front panel below the time base selector.

TECHNICAL DATA (all versions)

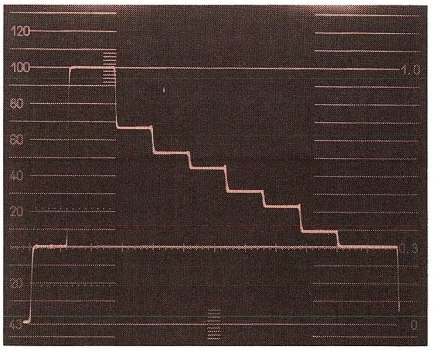
PM 5565M/PAL: identical with PM 5565G/PAL except for chrominance filter 3.58MHz and 525-lines time base rates.
PM 5565N/PAL: identical with PM 5565G/PAL except for chrominance filter 3.58 MHz.



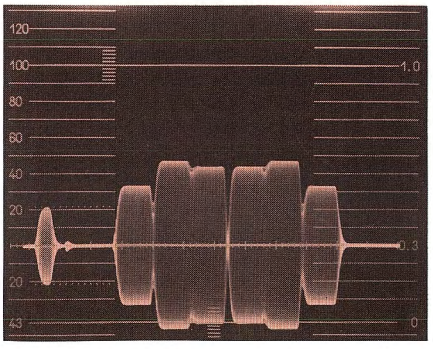
Colour bar signal, two-line display mode.



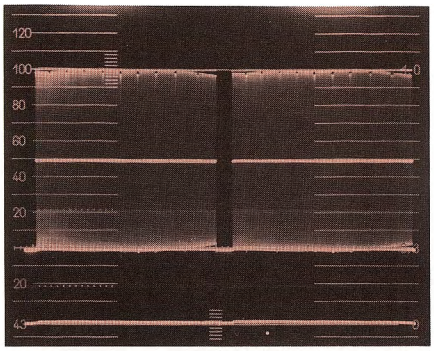
Colour bar signal, one-line display mode. Filter selection flat.



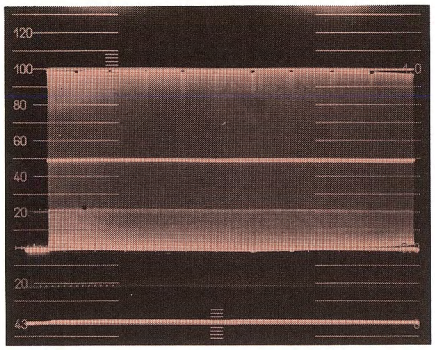
Colour bar signal with luminance filter selected.



Colour bar signal with chrominance filter selected.

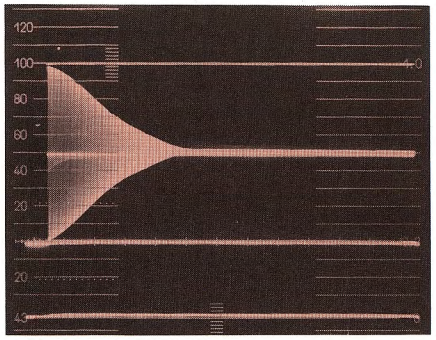


Sweep signal 0.1-10 MHz, two-field display mode.

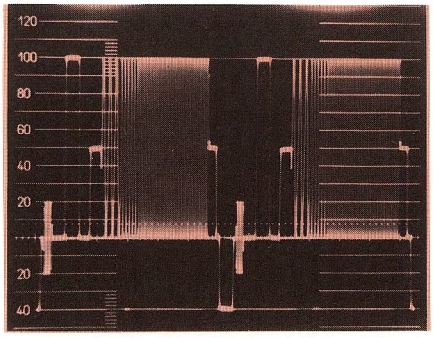


Sweep signal, one-field display mode.

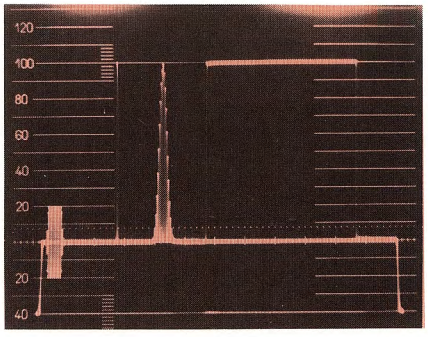




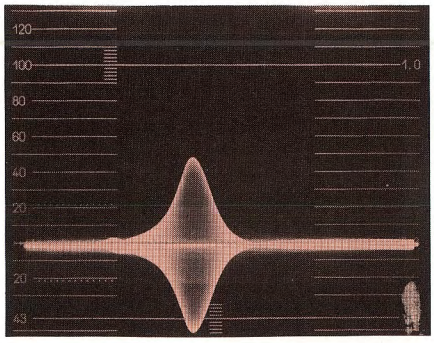
Sweep signal with luminance filter.



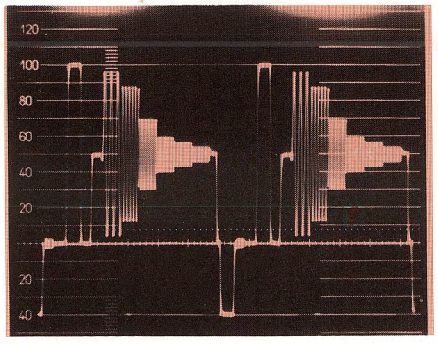
Multiburst signal, flat.



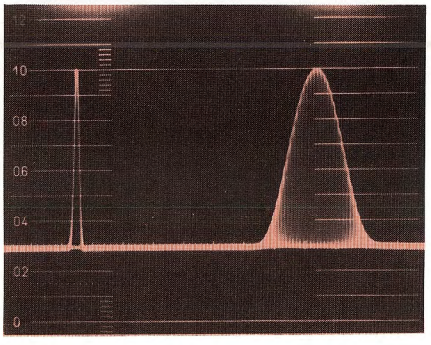
Pulse-and-bar signal (NTSC), one-line display.



Sweep signal with chrominance filter.

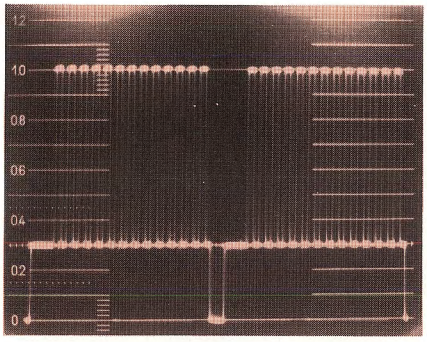


Multiburst signal with luminance filter.

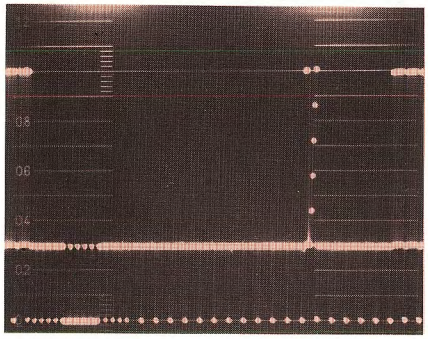


Pulse-and-bar signal (PAL), two-line magnified display mode.

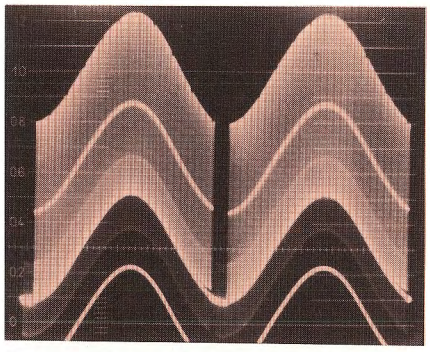
PM 5565



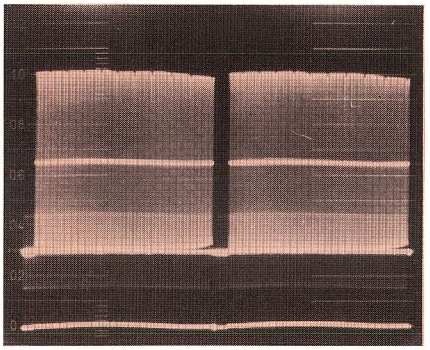
250 kHz squarewave, two line display.



Vertical interval with VITS, two-field magnified display mode.



Video sweep with hum, two-field mode without clamping (slow clamping).



Video sweep with hum with clamping (fast clamping).



Fig. 20. The PM 5565 without cabinet. The instrument has two printed circuit boards, - one containing all the television and deflection circuitry, and one containing the power supply circuitry. Servicing of the main circuit board is made very because it forms a plug-in unit in the waveform monitor.

Vertical system

VIDEO INPUTS — Number of inputs: 2 (A and B) on the rear. Type of signal: 625-lines composite video signals (G-version), 525-lines (M-version). Maximum input level: 5 Vpp ac on maximum ± 5 V dc. Input impedance: 75Ω looped-through. Return loss: ≥ 46 dB up to 5 MHz. Delay of looped-through signals: ≤ 1 ns. Gain inequality of the two inputs: ≤ 1% at 0.5 MHz.

PROBE INPUT — Number of inputs: 1 on the front. Connector type: BNC. Maximum input level: ± 10 V. Input impedance: 1 MΩ//20 pF. Probe types: standard 1 : 1 and 10 : 1 oscilloscope probes.

INPUT FILTERS — Selection: by front panel push-buttons. Flat: response within ± 2% (50 Hz - 5 MHz), within +2%/-4% (5 MHz - 7 MHz). Luminance filter: attenuation at 1 MHz < 3 dB (acc. to IRE 1958 std. 235-1 (M-version)). Chrominance filter: 3 dB-bandwidth 0.5 - 1 MHz. Center frequency of chrom. filter: 4.43 MHz (G-version), 3.58 MHz (M-version).

DEFLECTION SENSITIVITY — Video inputs A and B: 1 V ± 1% full scale and 0.2 V ± 1% by front panel control. Probe input: 0.1 V ± 3% full scale. Maximum deflection: 2 x screen height. Vertical position range: 3 x screen height. Variable gain control range: ≥ 5 : 1.

DISTORSIONS — 2T K-factor: better than 1%. 2T pulse-to-bar ratio: better than 100% ± 1%. 10 µs bar tilt: less than 1%. 50 Hz squarewave tilt: less than 1%. Differential gain: less than 1%.

DC RESTORATION — Type: clamping at back-porch or sync tip level (by internal selection). Time constants: slow and fast by front panel push-button selection (fast ∼ clamp-button depressed). Hum suppression: < 1 dB in slow mode, > 26 dB in fast mode. DC restoration variations: < 10 mV (APL 10% - 90%, colour burst on-off). By internal selection the vertical channel can be dc-coupled.

INTERNAL CALIBRATION GENERATOR — Type of signal: squarewave signal. Frequency: approx. 32 kHz. Amplitude: 1 V ± 1%.

VIDEO OUT — Number of outputs: 1 on the rear. Connector type: BNC. Output level: 1 Vpp ± 5% for nominal display. Output impedance: 75 Ω. Protection: the output level is limited to approx. 2 Vpp.

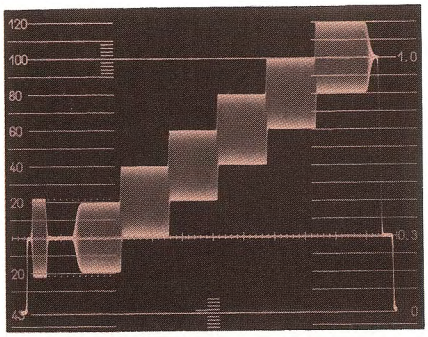
Horizontal system

EXT. SYNCHRONIZATION INPUT — Signal types: composite video, black burst, or composite sync signals. Maximum input signal: 10 Vpp. Permissible hum: ≥ 1 Vpp. Input impedance: 75Ω looped-through. Return loss ≥ 46 dB up to 5 MHz.

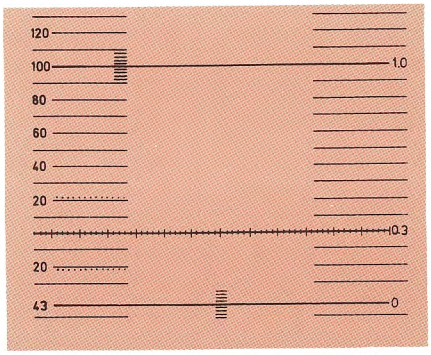
TRIGGERING — Trigger modes: int sync, i.e. trigger derived from the displayed signal, and ext sync, i.e. trigger derived from signal at ext synchronization input. Trigger sensitivity A and B inputs: 0.05 V sync amplitude. Trigger sensitivity ext sync input: 0.15 V sync amplitude.

TIME BASE — Selection: by front panel knob. Positions: H (= one line displayed), 2 H (= two lines displayed), V (= one field displayed), 2 V (= two fields = 1 frame displayed), 2 H mag (= 2 H x 10 = 1 µs/div. displayed), and 2 V mag (= two fields x 20 displayed). Accuracy: 2 H ∼ 12.8 div. ± 0.5 div., 2 V ∼ 12.3 div. ± 0.3 div.

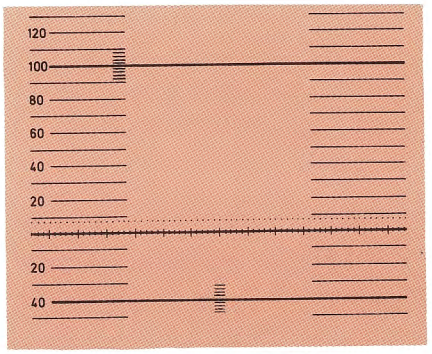
PARADE DISPLAY — Modes: RGB and YRGB (by internal selection). Control: via 9-pin connector on the rear panel. Sen-



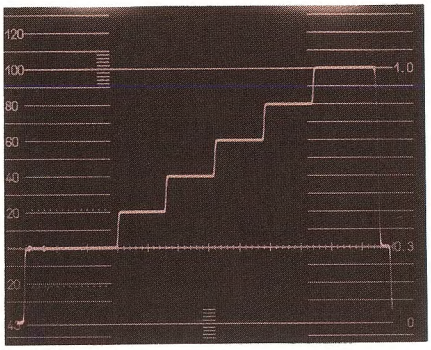
Staircase with superimposed chroma.



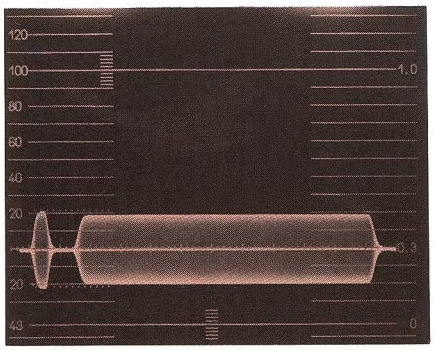
Graticule of the G, M/PAL and N/PAL versions of the PM 5565



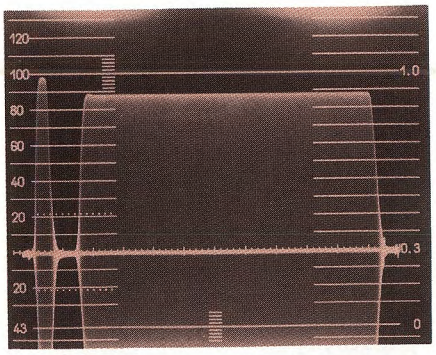
Graticule of the M/NTSC version of the PM 5565



Staircase with chroma, luminance filter selected.



Staircase with chroma, chrominance filter selected.



Staircase with chroma, diff. gain selected.

sitivity: staircase of 10 V ± 15% or 1 V ± 15% (by internal selection) for 10 divisions deflection. Display rate: H or V time base. Sweep length for one line or field: 27 - 33% of normal length (RGB mode), 20 - 25% of normal sweep length (YRGB mode).

Cathode ray tube

Screen area: 8 x 10 cm^2. Phosphor type: P31 (GH). Acceleration voltage: 4 kV. Graticule: Internal.

Electromagnetic Interference

In accordance with VDE störgrad K (German standard for electronic measuring equipment).

Power supply

Voltage: 92/110/127 V ± 10% (M/NTSC-version, 220/240 V ± 10% (other versions) by internal selections. Frequency: 48-65 Hz. Consumption: 30 W at 220 V. Safety: acc. to IEC 348 class 1.

Environmental conditions

Operating: 5° - 40° C ambient. Limit range: 0° - 55° C. Storage and transport: -40° - 70° C. Altitude: < 5000 metres (operation), < 15.000 metres (transport).

Mechanical data

Plug-in unit for table cabinet/19" rack cabinet.

Height : 133 mm (3U)
Width : 216 mm (half rack width)
Depth : 465 mm
Weight : 5.8 kg

Standard accessories: combined operation and service manual.

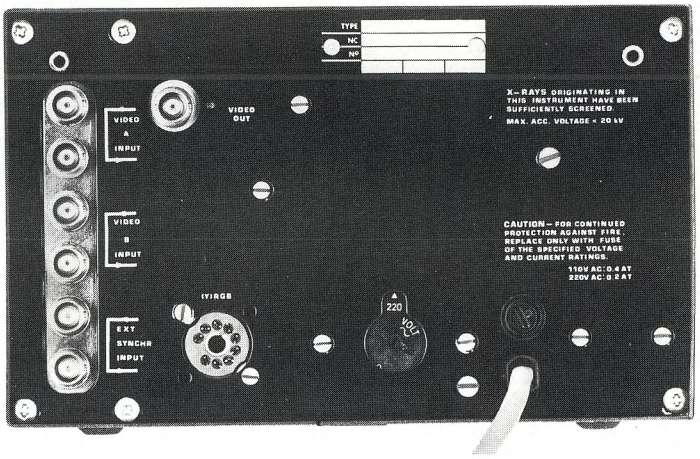
Cabinet

The PM 5565 is supplied in a table cabinet.

Options

PM 8510: 19" rack cabinet for two PM 5565 or two PM 5567 or one of each.
PM 8517: Blind plate for the PM 8510 19" rack cabinet.
PM 8518: Table cabinet with handle and feet for one PM 5565 or one PM 5567.
PM 8925 : 10 : 1 probe (1.5 m cable).
PM 8925L : 10 : 1 probe (2.5 m cable).
PM 8921 : 1 : 1 probe (1.5 m cable).
PM 8921L : 1 : 1 probe (2.5 m cable).
PM 9366 : Collapsible viewing hood.
PM 9381 : Oscilloscope camera.

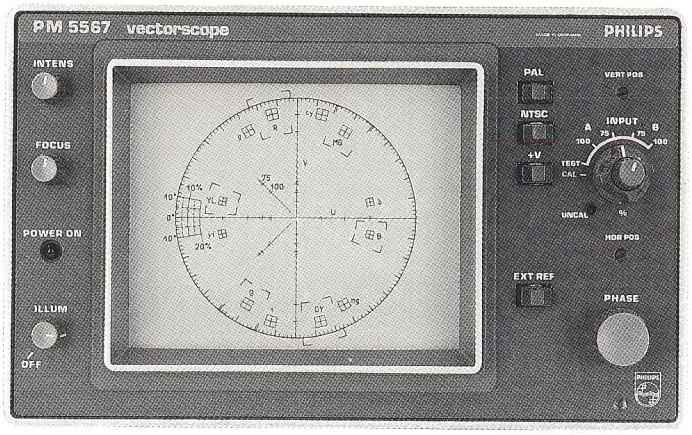
Complementary vectorscope: PM 5567.



Vectorscope

PM 5567

Code no. PM 5567:
9449 055 67003 (G-version, 625-lines PAL)
9449 055 67008 (M-version, 525-lines PAL)
9449 055 67108 (M-version, 525-lines NTSC)
9449 055 67009 (N-version, 625-lines PAL)



Complementary to the PM 5565 waveform monitor

The PM 5567 vectorscope is a precision vectorscope designed primarily for broadcasting studios, OB vans, cable TV studios and educational TV studios. The instrument is ideal for integration into the test system of camera control units, video tape recorders, film and slide scanners, as well as other types of television equipment.

Together with the PM 5565 waveform monitor the vectorscope forms a complete colour set-up and test system for the aforementioned types of video equipment.

The vectorscope can be supplied in a NTSC version and three PAL versions, which all have the following important features:

- 2 equal inputs (A and B) with fixed gain positions for display of colour bar signals of 75% and 100% contrast (nominal signal level of 1 V pp or 140 IRE).
- variable gain control with a wide regulation range (+ 15 dB to - 6 dB).
- test position for checking the decoding and deflection system of the instrument.
- external synchronization from either the continuous colour subcarrier or the colour burst of a composite video signal.
- phase control knob adjusts the phase of the vector display with reference to the selected reference signal (INT REF or EXT REF).
- + V display only, rejects all the -(R-Y) vectors of a phase alternated signal (PAL-versions only).
- NTSC display turns all the -(R-Y) vectors positive (PAL versions only).

Available for both NTSC and PAL systems

These features make it easy to do the following two important tests: subcarrier phasing and PAL phasing. In both cases an external synchronization signal is needed (f.inst. a black burst signal from the master SPG). To do the subcarrier phasing, ext. ref. is selected and the phase knob is adjusted to give correct display of f. inst. the input A signal. When switching to the input B signal any phase difference between the two signals can immediately be seen. If an external synchronization signal is not available, the input A signal can be looped-through to the ext. ref. input, and thus serve as external synchronization signal. The PAL phasing is checking by using the + V button with external reference. If the vectors on the screen are the positive ones, the displayed signal has the correct PAL phase (the negative vectors are displayed in case of incorrect phasing).

Internal graticule means that parallax errors are eliminated

Low weight, low power consumption and excellent serviceability

Mechanically compatible with other brands of vector scopes

Two inputs with nominal sensitivity for 75% and 100% contrast colour bars

Input for external synchronization, either continuous colour subcarrier or composite colour signal

Accurate and stable display

Technical description

The vectorscope has two looped-through video inputs A and B (75Ω base).

The combined input selector/sensitivity selector selects any of the two inputs at two fixed calibrations 75% or 100%, as well as input A in the special TEST position, where the vectors of signal A rotate to form circles. The variable control knob (centre shaft of input selector) provides continuous control of the sensitivity.

In its CAL position the sensitivity



corresponds to the 75% and 100% contrast of colour bars, as selected by the input selector knob.

A third looped-through input (EXT REF) allows the display to be referred to an external signal, which can be either continuous colour subcarrier or a composite video signal (selection by internal jumber). The synchronization of the vectorscope is possible in the following ways:

1. Colour subcarrier: from the selected signal, input A or input B, or from an external source (EXT REF button pushed).
2. Horizontal synchronization: from the selected signal, input A or input B, irrespective of the position of the EXT REF button, or from the external source as well, when the EXT REF button is pushed. The EXT REF signal can in this case only be a composite video signal. The mode of horizontal synchronization is programmed with an internal jumber.

The selected video signal is passed through a band-pass filter which removed the luminance content of the signal. The colour burst of the resulting chrominance signal is used for synchronization of the internal colour subcarrier oscillator, while the chrominance signal is fed to two decoder circuits. In principle the decoder circuits are controlled from the internal colour subcarrier generator with signals of 180° and 90° referred to the incoming colour burst. However, a phase shift circuit is inserted between the subcarrier generator and the decoders, so that by the turning of the PHASE knob the operator can decode at any other set of angles. The effect of turning the phase knob is therefore that of rotating the displayed vectors. The PHASE knob can shift the phase infinitely.

The decoded colour signals (U and V) are fed to the horizontal and vertical deflection plates of the cathode ray tube (CRT). When PAL signals are displayed each colour will be represented by two dots or lines on the screen. By pushing the + V button the operator can suppress all lines having negative V phase, so that the display looks like a NTSC display.

In the test mode input A is automatically selected, however the internal subcarrier oscillator is kept free-running and the V signal is phase alternated asynchronously. Consequently the vectors rotate quickly in a circular pattern, which reveals immediately any loss of tracking between the two colour decoders as well as between the horizontal and vertical deflection amplifiers of the vectorscope.

The graticule of the CRT contains a circle calibrated from 0 - 360° in steps of 10° with 2° subdivisions. Furthermore the six colours of standard colour bars and the colour burst are indicated, in PAL versions also the alternated ones. Each colour mark is surrounded by two tolerance "boxes" corresponding to errors of (± 3°, ± 5%) and (± 10°, ± 20%) respectively. In the left hand side of the circle there is a graticule for differential gain and phase measurements.

In addition to the already mentioned controls, the vectorscope has the usual oscilloscope type of controls, like vertical and horizontal position, intensity, focus and graticule illumination, the latter is combined with the main power switch.

The vectorscope is delivered in a so-called Nextel treated cabinet. A special locking mechanism, which can be released from the front, keeps the unit fastened in the cabinet. A 19" rack cabinet PM 8510 can house two vectorscopes or a vectorscope and a waveform monitor.

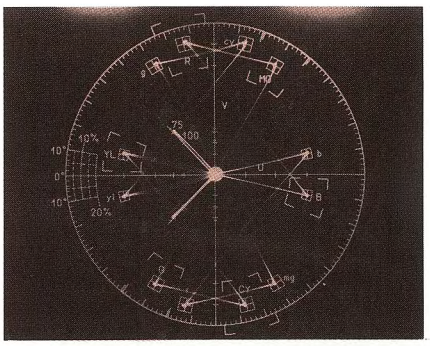


Fig.1. Normal 75% contrast colour bar at nominal display (calibrated gain position).

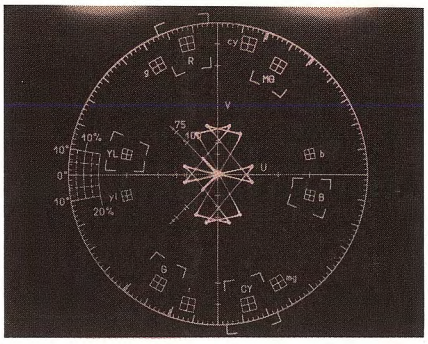


Fig.2. Same signal as above, however with the gain control in its minimum position.

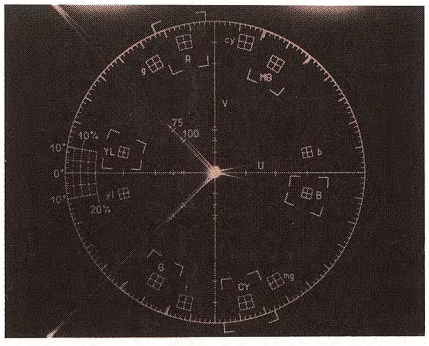


Fig.3. Same signal as above, however with the gain control in its maximum position (all dots are outside the screen area, only the burst vectors can be seen).



PM 5567

TECHNICAL DATA (all versions)

Deflection characteristics

VIDEO INPUTS — Number of inputs: 2 on the rear (A and B). Type of input signals: encoded colour signals. Maximum input level: 5 Vp-p ac on max. ± 5 V dc. Input impedance: 75 Ω looped-through. Return loss: > 46 dB up to 7 MHz. Gain inequality of inputs: < 1% at colour subcarrier frequency. Phase inequality of inputs: < 0.5° at subcarrier frequency. Crosstalk between inputs: < -60 dB at subcarrier frequency. Connector type: BNC.

CHROMINANCE FILTER — Characteristics: band-pass filters before decoding combined with low-pass filters after decoding. Bandwidth: ± 500 kHz ± 100 kHz.

CHROMINANCE PATH — Calibrated gain: 75% contrast and 100% contrast colour bars at nominal video level. Variable gain: -6 dB to +15 dB referred to calibrated gain. Gain stability: better than ± 0.5% in the specified temperature range. Differential gain: < 1%, differential phase: < 1°.

DISPLAY — Centre spot control range: ± 10 mm with horizontal and vertical screwdriver controls. Stability of centre spot: better than ± 3 mm. Centre spot stability versus phase control rotation: better than 0.2 mm. Phase shift of vectors versus change of subcarrier frequency: < 0.5° for up to ± 50 Hz. Phase shift versus amplitude variations of the burst: < 2° for -6 dB to +6 dB of nominal level. Phase shift versus variable gain control variations: < 1°.

TEST CIRCLE — Input: always input A. Gain: corresponding to the 75% position. Characteristics: free-running subcarrier oscillator, V decoder output alternated asynchronously.

Synchronization

SYNCHRONIZATION — Internal synchronization: colour burst and composite sync of the displayed signal. External synchronization: colour burst or continuous colour subcarrier from the EXT REF input (selection by internal jumper), composite sync from EXT REF input or the displayed signal (selection by internal jumper). EXT REF input: 75 Ω looped-through. Return loss: > 46 dB up to 7 MHz. Sensitivity: a) with composite signal: colour burst 300 mV +6 dB/-12 dB, max. ± 5 V dc superimposed, b) with continuous subcarrier: 2 Vp-p + 6 dB/-12 dB, max. ± 5 V dc superimposed. Type of connector: BNC.

SUBCARRIER REGENERATOR — Type: crystal controlled oscillator, which can be synchronized to incoming colour burst or continuous colour subcarrier. Pull-in range: nominal frequency ± 50 Hz. Locking time: max. 1 sec. Jitter of regenerated subcarrier: < 0.5°. Subcarrier frequency: 3.579 545 MHz (M/NTSC), 3.575 611 MHz (M/PAL), 3.582 056 MHz (N/PAL), 4.433 619 MHz (G/PAL).



Fig.9. The PM 5567 forms a plug-in unit that can be plugged into either a half 19" rack table cabinet or a full 19" rack mount cabinet. The instrument is very easy to service, because the all signal circuitry is located on the main board, which in itself forms a plug-in board in the vector scope. Due to the use of modern components and integrated circuits the power consumption is less than 23 watts. The low power dissipation inside the unit during operation means low heating of ambient equipment and guarantees a long life of the instrument.

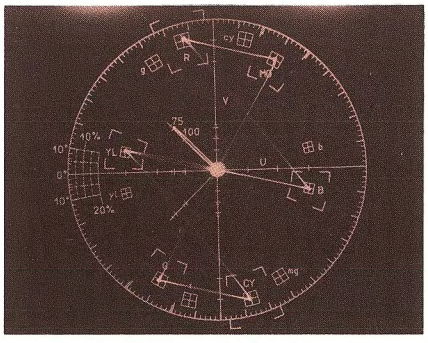


Fig.4. Signal as in fig.1, however the + V only button has been pushed (only PAL versions have the "+ V only" button).

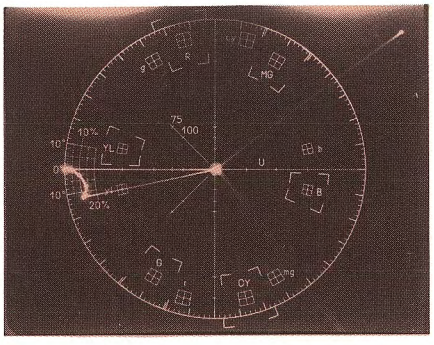


Fig.6. Staircase with chroma illustrates the use of the differential gain and phase part of the graticule (diff. gain ~ 14%, diff. phase ~ 12°).

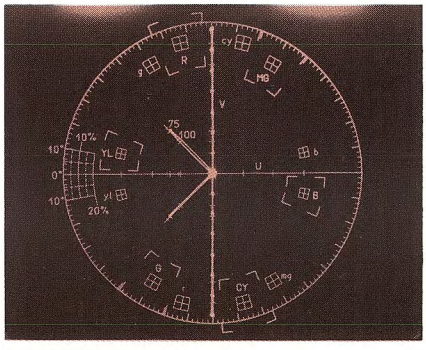


Fig.5. Chroma staircase demonstrates the linearity and phase stability of the PM 5567.

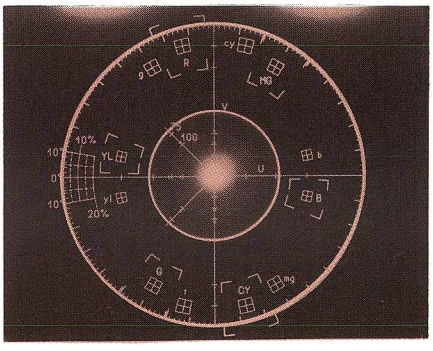


Fig.7. Test mode. The input signal is here a chroma bar, which produce only a single circle. A colour bar produces a set of concentric circles.

Cathode ray tube

Screen area: 8 x 10 cm^2. Phosphor type: P31 (GH). Acceleration voltage: 4 kV. Graticule: internal.

Electromagnetic interference

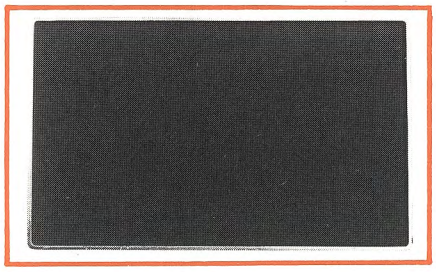
In accordance with VDE störgrad K (German standard for electronic measuring equipment).

Power supply

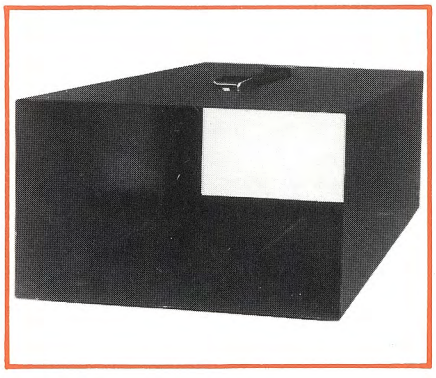
Voltage: 92/110/127 V ± 10% (M/NTSC version), 220/240 V ± 10% (other versions) by internal selection. Frequency: 48 - 65 Hz. Consumption: ≤ 23 W at 220 V. Safety: acc. to IEC 348 class I.

Environmental conditions

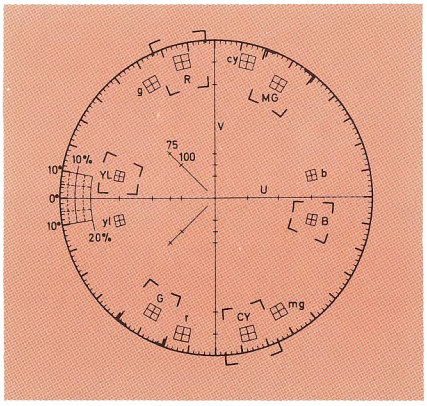
Operating: 5° - 40° C ambient. Limit range: 0° - 55° C. Storage and transport: -40° - 70° C. Altitude: < 5000 metres (operation, < 15.000 metres (transport).



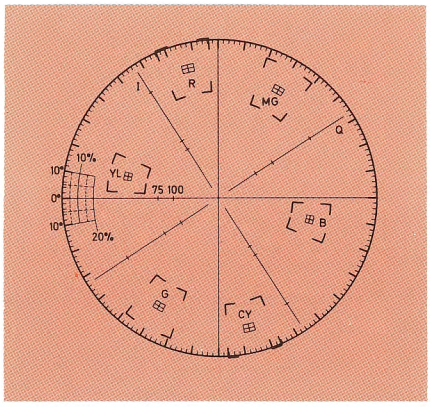
PM 8517 Blind plate



PM 8518 Carrying case



Graticule PAL versions



Graticule NTSC version

Mechanical data

Plug-in unit for table cabinet/19" rack cabinet.
Height : 133 mm (3U)
Width : 216 mm (half rack width)
Depth : 465 mm
Weight : 5.8 kg

Standard accessories: combined operation and service manual.

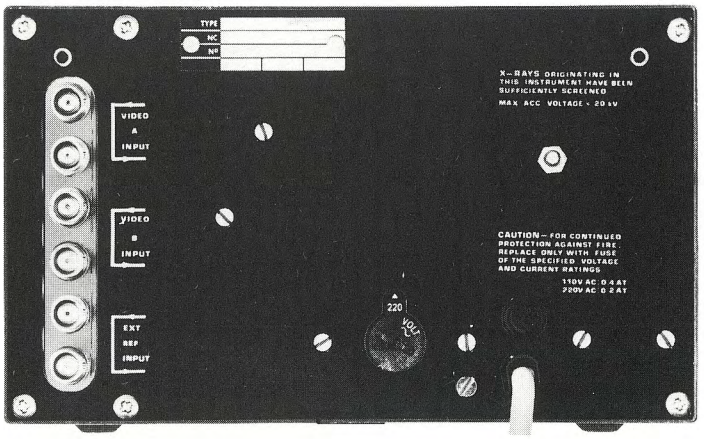
Cabinet

The PM 5567 is supplied in a cabinet without handle and feet. Cabinet with handle and feet, see under options.

Options

PM 8510: 19" rack cabinet for two vector scopes or two waveform monitors or one of each.
PM 8517: Blind plate for the PM 8510 19" rack cabinet.
PM 8518: Table cabinet with handle and feet for one PM 5565 or one PM 5567.
PM 9366: Collapsible viewing hood.
PM 9381: Oscilloscope camera.

Complementary waveform monitor: PM 5565.

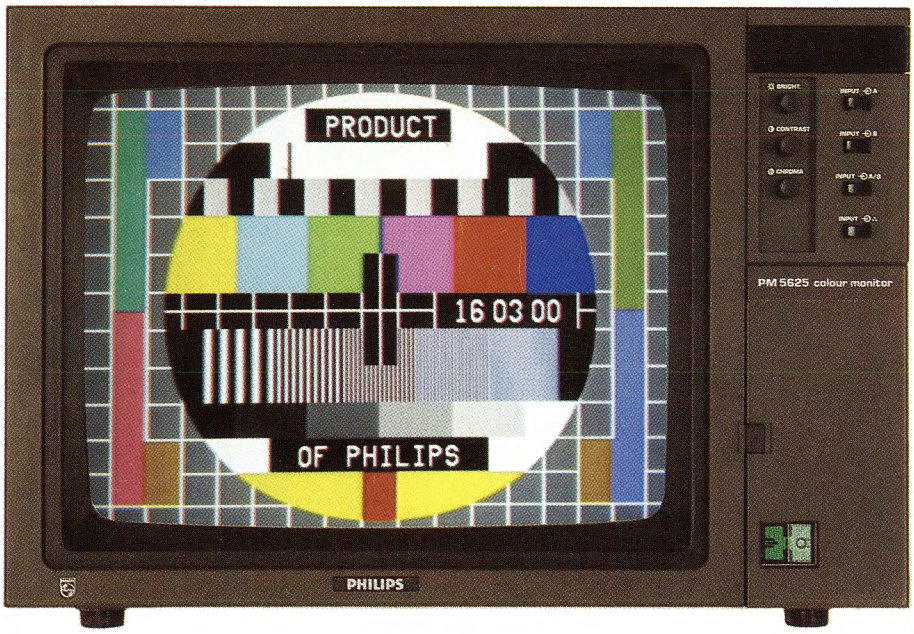


Colour monitor

PM 5625

NEW

Code no. PM 5625:
9449 056 25003 (G-version, 625-lines PAL)
9449 056 25108 (M-version, 525-lines NTSC)
SECAM: G-version with PM 8529 PAL/SECAM decoder



Low cost, high performance colour monitor with 14" In-Line, "HiBri", self-converging CRT

Two inputs for encoded signals and one for RGB signal

Split-screen display of the two encoded signals

User controls easily accessible from the front, test and set-up controls behind front panel door

Pulse cross display mode

Reduced picture size display mode

Internal and external synchronization

Available for NTSC, PAL and SECAM

The Philips PM 5625 colour monitor has been designed to meet all monitoring needs in television systems where high quality is required. The colour monitor has a modern 14" In-Line picture tube with a fine pitch of 0.65 mm which gives an excellent resolution and colour quality.

The extensive range of features includes things like:
- Two inputs A and B for encoded signals
- RGB input
- Internal/external synchronization
- Pulse cross
- Split-screen display of A and B
- Colour subcarrier notch (switchable)
- Switchable 75 ohm termination resistors on the A and B inputs

These convenient features which are complemented by advanced, up-to-date circuitry design make the PM 5625 very suitable for broadcasting studios, outside broadcasting vans (EFP) and video production houses. It is ideal for production check and monitoring of the signals from cameras, video tape recorders, film and slide scanners, etc.

The PM 5625 is ruggedly made, and is housed in a strong steel cabinet which is designed to withstand usage in the wide range of applications mentioned above.

Technical description

The colour monitor has two inputs for encoded signals A and B, which may be looped-through or terminated internally with 75 ohms resistors (switchable by delectors located at the rear). The inpur signals are normally composite colour signals, but monochrome signals or signals without sync are also permissible. Front panel push-buttons select either input A or input B or both. In the last case an internal switching pulse generates a vertical split-screen display on the two input signals. More complicated splits can be obtained with an externally generated switching pulse.

A third input is available for an RGB signal. There are three terminated input sockets for the signal that normally has no sync pulses. An external sync signal therefore has to be supplied to the external sync input. This is also the case if a signal without sync is applied to input A or input B.

The selected signal A or B (or both) is passed to the colour decoder circuit that decodes the composite colour signal into its three RGB components. From there the signal is passed to the RGB processing module (together with the external RGB signal). Here the selected RGB signal (external or from the decoder) is dc-restored by means of a keyed back-porch clamping circuit. This ensured that the black level on the screen is independant of the selected input and the signal content (APL).

A number of controls influence the parameters of the displayed colour picture. The colour decoder has saturation (and hue) control(s), which in-

fluence the colour characteristics of the encoded signals, but not the RGB signal. The RGB processor module and the circuitry around the CRT has gain controls (contrast and preset gain), black level controls (brightness and black level presets).

It should be noted that a colour monitor can only be used as a measuring instrument when all the above mentioned controls (and other internal controls) are correctly adjusted. The Philips PM 5630/31/32/33/34 series of colour generators produce the necessary test signals for an objective, scientificly based set-up of colour monitors. A special RGB colour analyser PM 5539 is used to display the colour temperature of white, which is also a very important parameter.

A number of testing features are hidden behind the hinged door under the input selector buttons:
- Beam switches for the three primary colours R, G and B. These are very useful when setting-up the monitor
- Contour. This function improves the sharpness of the picture
- VCR. This button switches the time constant of the synchronization circuitry. In VCR mode the time constant is small in order to make time base variations less visible on the monitor
- Pulse cross allows the operator to study the details of the horizontal and vertical blanking intervals
- Scanning size gives the choice of a normal sized picture and reduced size
- Colour off allows black/white display of colour pictures
- Ext. sync selects external sync when the displayed signal has no sync information in itself

The PM 5625 also has a dual tally light system controlled via a plug at the rear.

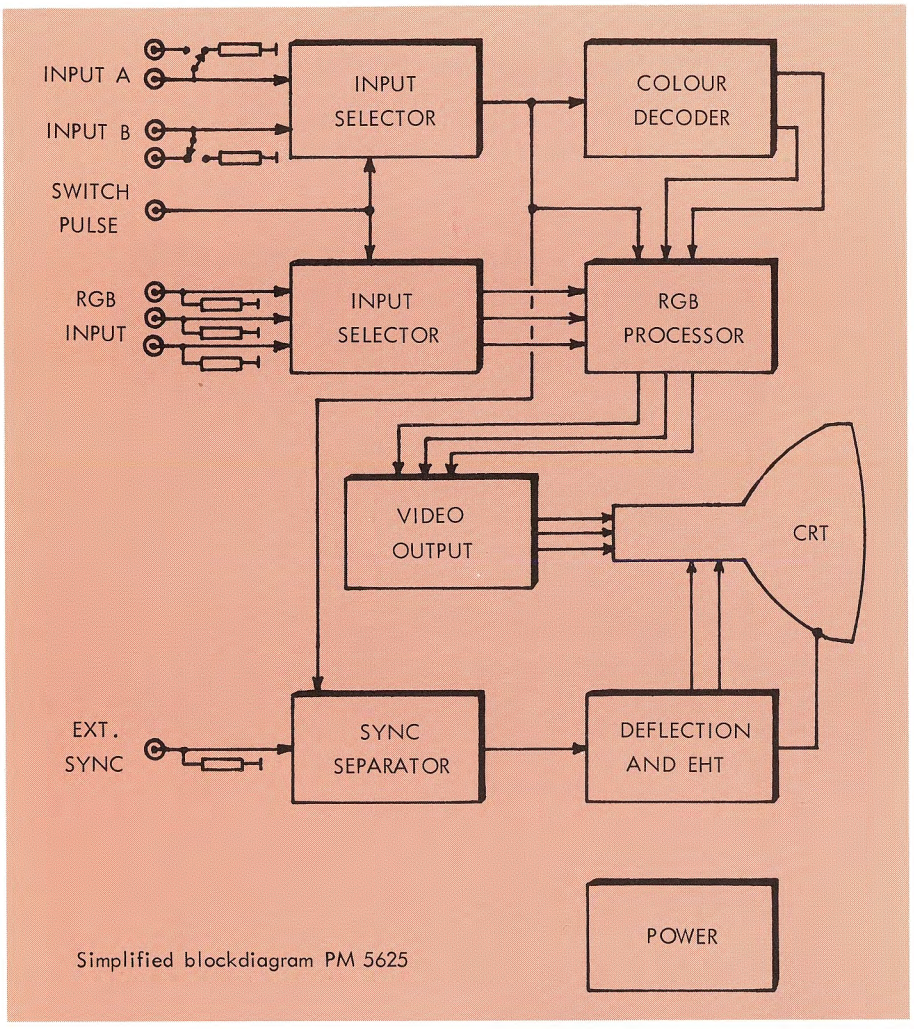
Applications

The PM 5625 colour monitor is used in broadcast and CATV studios, outside broadcast vans, post production centres, and in the professional manufacturing industry. The high quality of the display, the large amount of extremely useful features, and a very attractive price has made this Philips product very popular. In fact this monitor fits into a very advanced and yet reasonably priced calibration system for TV studios consisting of the following TV measuring instruments:
- PM 5630 Sync pulse generator with genlock and a number of valuable line-up signals
- PM 5646 TV test signal generator with a number of measuring signals
- PM 5625 Colour monitor
- PM 5565 Waveform monitor
- PM 5567 Vectorscope
- PM 5539 Colour analyser

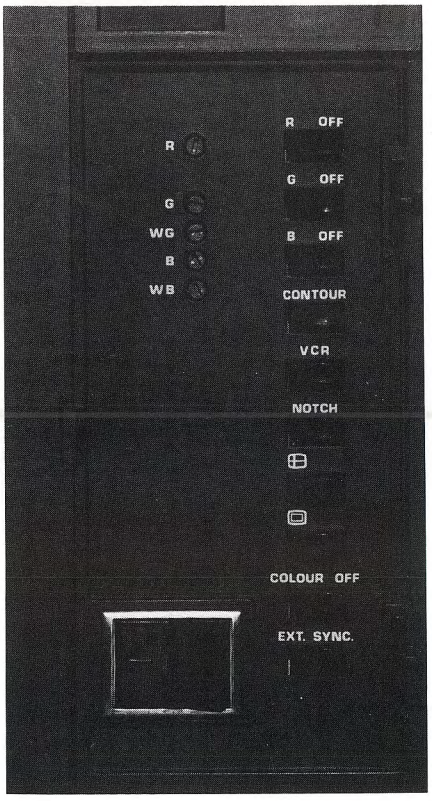
The use of this calibration system improves the picture quality in terms of picture fidelity and repeatability enormously.

The low cost of the monitor makes it ecomomically feasible to use it in quantities in TV studios instead of the usual mixture of expensive colour monitors and monochrome monitors.

The PM 5625 is available for the TV systems 625 lines PAL and 525 lines NTSC. A SECAM version can be made with a special PAL/SECAM module that is inserted instead of the standard decoder (625-line version). The monitor then selects automatically the proper decoder system in accordance with the supplied signal.



Simplified blockdiagram PM 5625



Right: the photo shows the controls that are hidden behind the small door. These controls are normally only operated when special tests or aligments are being performed.

PM 5625



The Philips studio line-up and calibration system consisting of master SPG (PM 5630), test signal generator (PM 5646), waveform monitor / vectorscope (PM 5565/67), colour monitor (PM 5625), and colour analyser (PM 5539). Apart from synchronizing the entire studio installation, this set-up performs all tests and calibrations of the studio and its equipment, both at routine basis and maintenance / repair basis. The set-up ensures that such parameters as signal levels, colour fidelity, definition and other picture characteristics are optimal and consistent.

TECHNICAL DATA

Inputs

COMPOSITE VIDEO — Number of inputs: 2 (A and B). Input connectors: 2 sets of two BNCs. Type of signal: composite colour signal (CVBS), monochrome signal (VBS), and same signals without sync (CVB and VB). Input impedance: 75 Ω looped-through system. Termination: 75 Ω resistors (switchable). Return loss: > 40 dB up to 5 MHz. Input levels: 1 Vpp ± 0.5 Vpp (composite), 0.7 Vpp ± 0.5 Vpp (without sync). Polarity: sync (black) negative.

RGB SIGNAL — Number of inputs: 1. Input connectors: 1 set of three BNCs. Type of signal: RGB non-composite. Input impedance: 75 Ω. Return loss: > 40 dB up to 5 MHz. Input levels: 0.7 Vpp ± 0.5 Vpp. Polarity: black negative.

EXTERNAL SYNC — Number of inputs: 1 BNC. Type of signal: composite sync. Input impedance: 75 Ω. Return loss: > 40 dB up to 5 MHz. Input levels: 1 Vpp - 4 Vpp. Polarity: negative.

SWITCH PULSE — Number of inputs: 1 BNC. Input impedance: 75Ω. Type of signal: logic signal (squarewave). Levels: 0 V + 0.3 V/- 0.5 V selects encoded signal (A, B or A/B), 1 V + 0.5 V/- 0.1 V selects RGB input. Application: to key-in text or other information into the encoded picture.

Performance characteristics

DISPLAY CHARACTERISTICS — Resolution: 0.65 mm. Geometric distortion: error less than 2% of screen height. Black level stability: variation less than 2% for APL 0-100%. Chromaticity stability: variation less than 2% for APL 0-100%. Colorimetry: factory adjusted to white-D (6500° K). Convergence: better than 0.5 mm in central screen area (equal to 50% of screen height), better than 1.5 mm at the corners. Picture size stability: variation less than 1% for APL 0-100% at 100 NIT luminance level. Maximum luminance levels: 150 NITs average, 500 NITs peak. Retrace times: sufficiently short to allow display of all active picture elements. Screen size: minimum 280 x 210 mm.

ELECTRICAL CHARACTERISTICS — Video bandwidth: up to 5 MHz (-3 dB) without notch filter, up to 3 MHz with notch filter. Notch filter: subcarrier suppression > 10 dB. Squarewave response: better than 3% field tilt and 2% line tilt. Chrominance/luminance delay inequality: < 40 ns. Range of contrast control: permits nominal display of input signals having - 15 dB to + 3 dB of nominal contrast. Range of saturation control: permits nominal display of input signals having - 20 dB to + 6 dB of nominal saturation. Range of brightness: ± 50% of nominal brightness. Range of hue control (NTSC only): - 40° to + 40°.

SYNCHRONIZATION CHARACTERISTICS — Sync modes: internal or external (front panel switch). Horizontal synchronization: phase-locked loop. Pull-in range: ± 600 Hz. Time constants: 2.1 ms (slow) or 0.8 ms (fast) by front panel switch. Vertical scanning: by division or horizontal frequency.

Front panel controls and indicators

- Power on/off
- Input A selector
- Input B selector
- Input A/B split-screen selector
- Input RGB selector
- Brightness control
- Contrast control
- Hue control (NTSC only)

- R beam off/on
- G beam off/on
- B beam off/on
- Contour on/off
- Sync time constant VCR on/off
- Notch filter on/off
- Pulse cross display on/off
- Reduced picture size on/off
- Colour off/on (colour killer)
- Sync ext./int.
- RGB black level preset (screw driver controls)
- GB gain preset (screw driver controls)
- Power on indicator (in power switch)
- Dual tally indicators

Power requirements

Voltage: 110/127/220/240 V ± 10%. Frequency: 48-65 Hz. Consumption: 85 W at 220 V.

Environmental conditions

Operating temperature: 0-45°C ambient.

Safety

In accordance with IEC 65 and BS 415.

Mechanical data

19" table cabinet.
Height : 282 mm (298 mm incl. feet)
Width : 427 mm
Depth : 370 mm
Weight : 18 kg

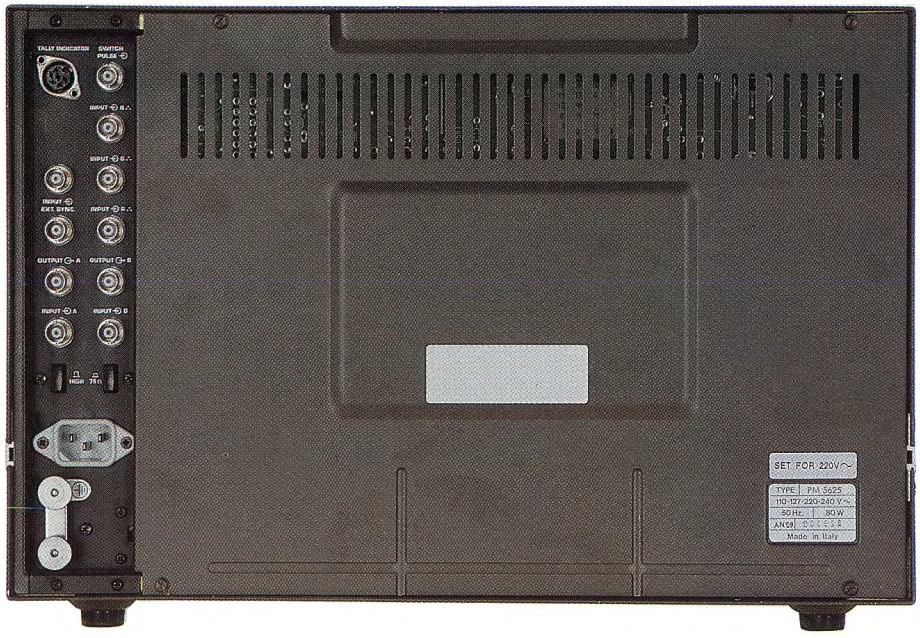
Standard accessories:
- Service manual
- Mains cord
- Selection of text plates for the tally lights

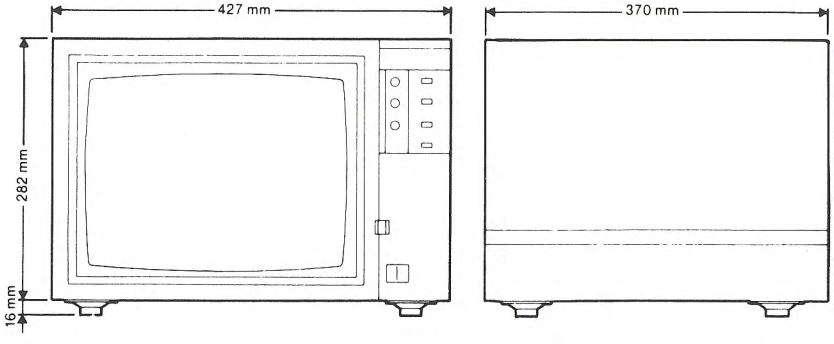
Options

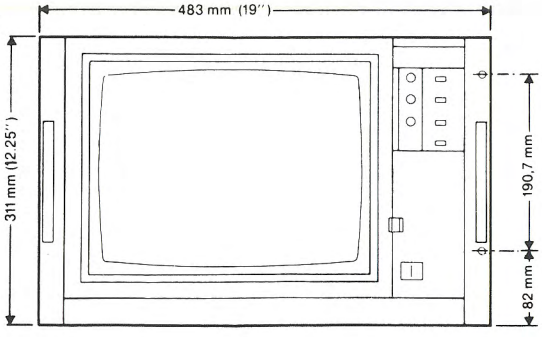
- PM 8529 PAL/SECAM decoder module
- PM 8531 19" rack mount frame (height of the rack mount frame is 311 mm)

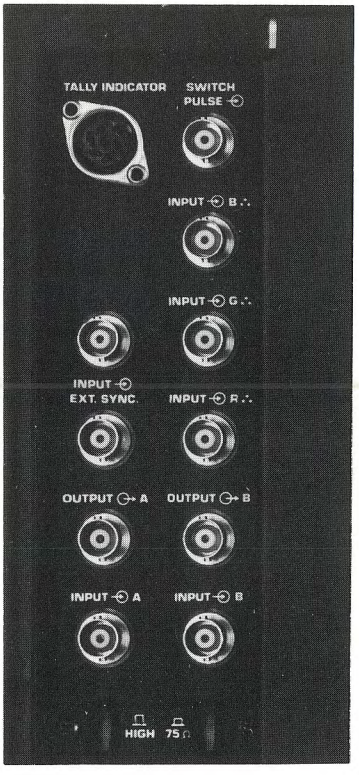
Other Philips colour monitors

- LDH 6200 (similar to PM 5625)
- LDH 6220 20" colour monitor
- LDK 7020 20" high resolution colour monitor



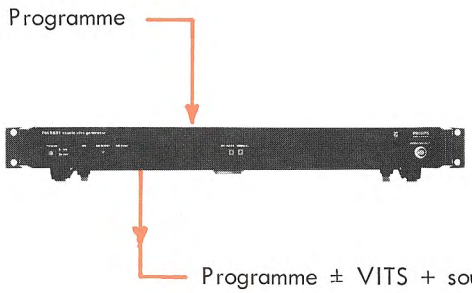




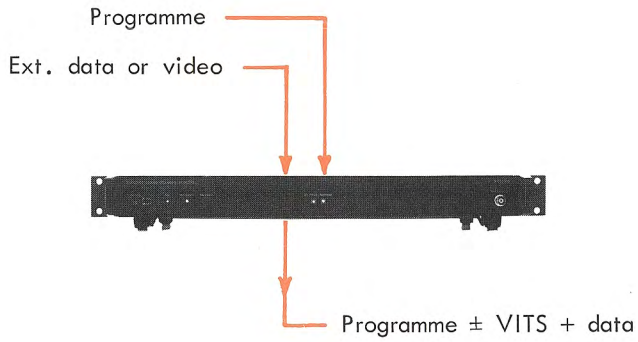


VITS equipment

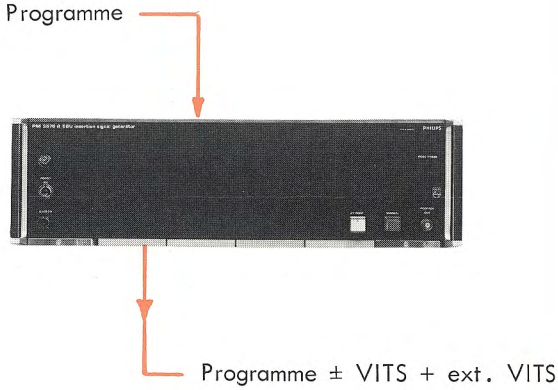
PM 5651 Studio VITS generator



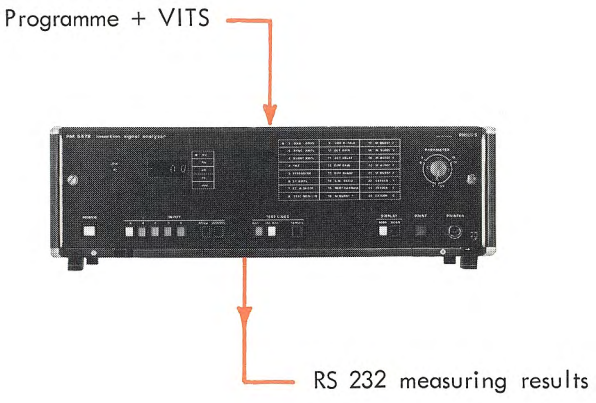
PM 5652 Studio VITS generator, ED



PM 5576 Insertion signal generator



PM 5578 Insertion signal analyser



Type no.	Description	Page
Intro	ITS and VITS technology	100
PM 5651	Studio VITS generator	101
PM 5652	Studio VITS generator, ED	101
PM 5576 A	Insertion signal generator	107
PM 5578 G	Insertion signal analyser	110

Philips, of course.

Introduction to VITS and ITS

The picture of a television screen (CRT) is generated by one (in colour TV three) intensity-modulated electron beam(s) that excites the phosphorous layer on the inner side of the screen. To cover the whole area of the screen, the electron beam is deflected horizontally by the line frequency and vertically by the field frequency. Picture information is only "written" on the screen during the forward scans of the beam (from left to right and from top to bottom).

Because magnetic deflection is used in most TV receivers and monitors, the retrace periods are relatively long (almost 20% of the horizontal scanning period and 10% of the vertical period). An exact calculation shows that only 75% of a 625-line TV signal and 76% of a 525-line signal carry active picture information.

The horizontal blanking interval holds synchronization pulses and colour burst, but still quite some transmission capacity is available. In the Eurovision network, the sound channel is coded into the horizontal sync pulses in the form of a digital signal (sound-in-syncs). Even stereo is now possible.

The vertical blanking interval has a number of "empty" lines (25 in the 625-line system, 21 in the 525-line system). Today these lines are used for a number of purposes:
- Transmission of special test signals for measuring purposes (VITS)
- Transmission of data to the viewers (Teletext, Antiope, etc.)
- Transmission of data for internal use of the broadcaster (remote control, source identification, timing codes, programme timing codes, etc.)

The advantage in using the empty lines in the blanking interval are the following:
- The transmission of the information is free of charge.
- The information is invisible to the viewer.
- Additional services can be made available to the viewer.
- The broadcaster can do maintenance to a certain extent during programme time, i.e. in normal working hours.

Nomenclature

VITS = Vertical Interval Test Signals are single-line test signals that are basically inserted into the programme signal at the point of origination. Since the VITS follow the programme all the way to the point of destination, the distortion of the VITS is a measure for the distortion of the programme signal.

ITS = Insertion Test Signals are the European version of VITS (mainly because "VITS" in some European languages means "a joke").

IDS = Insertion Data Signals. These are digital codes used in the Eurovision network to identify programme originators and sources.

VIRS = Vertical Interval Reference Signal is a simple VITS used in North America.

SID = Source IDentification codes = Source ID. Data information like IDS.

Quiet lines = lines that have been cleaned (erased) for the purpose of measuring noise in the transmission path.

Teletext (Oracle, Ceefax, Antiope and many more) = data signals transmitting newspaper-type information to the viewers. A special decoder is needed in the TV set to detect and display the information.

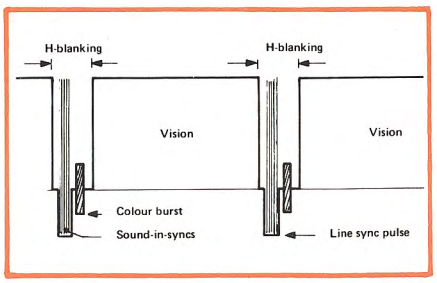
Time codes = digital signals usually recorded on video tape and used for editing tapes and programmes.

VITS equipment

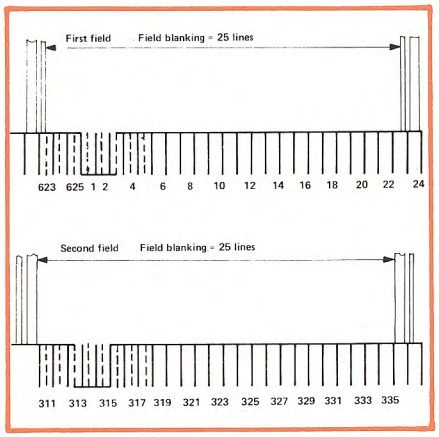
VITS equipment can be divided into generation/insertion type of equipment and analysing/correcting type of equipment.
A VITS inserter has an input for the programme signal and one or more inputs for video and data signals. The inserter adds or keys the video and data signals into the specified lines of the programme signal.
A VITS generator generates the specified test signals or test lines, usually only during the lines where they are inserted into the programme signal.

It is important that VITS inserters introduce very little distortion into the programme, since several inserters may be cascaded through the network. It is also important that the programme is protected against interruption by faulty VITS inserters.

VITS analysers are measuring instruments that analyse the quality of the receiving end and either display the amount of distortions or transmit them in the form of digital measuring results to a remote monitoring centre. Automatic VITS correctors measure certain distortions of the VITS and insert circuitry in the transmission path to compensate for previously introduced distortions.



Details of the horizontal interval (PAL or NTSC). The pulses "standing" on sync bottoms are "sound-in-syncs". They are not broadcast to the viewers.



Details of the vertical interval (625-line system). In 525-line systems the interval is often 21 lines. The line numbering is also different. Line no. 1 starts after field blanking (3 lines before the vertical sync pulse) and line 263 is often called line no. 1 in field 2.

Philips VITS equipment

Philips has a range of VITS generators that are in fact combined VITS generators/VITS inserters. Combining the generator and the inserter gives a number of advantages:
- Lower price
- Less cabling
- Better accuracy and stability
- More compact equipment.

All Philips VITS generators have full programme protection and introduce such small distortions into the programme signal that several units must be cascaded to make them measurable. All VITS (internal or external) are keyed into the programme lines, so that previous VITS or noise is erased before insertion takes place. It is also possible to erase lines without inserting new VITS.

The Philips VITS analyser measures 21 parameters (distortions) from the standard 625-line VITS. The measuring results are shown on a front panel display or transmitted via an RS 232 data transmission channel.

Studio VITS generator

Studio VITS generator, ED

PM 5651/52

NEW

Code no. PM 5651:
9449 056 51003 (G-version, 625-lines CCIR (EBU))
9449 056 51005 (I-version, 625-lines UK national)
9449 056 51108 (M-version, 525-lines NTC-7)

Code no. PM 5652:
9449 056 52003 (G-version, 625-lines CCIR (EBU))
9449 056 52005 (I-version, 625-lines UK national)
9449 056 52108 (M-version, 525-lines NTC-7)



Full performance VITS generator and VITS inserter

Digital generation of the VITS gives high accuracy and stability

The program is protected with by-pass and sync comparison circuit

Low weight and small size make the generator ideal for mobile use

Generation of both the two NTC-7 VITS and the VIRS

Lines may be deleted without insertion of VITS or VIRS

Insertion and deletion from line 11 to 21 in both fields

Easy service by use of plug-in circuit boards accessible from the front

Ideal for VITS insertion at machine level in large studio systems

Easy programming with internal matrix board

PM 5651: optional source identification code generator PM 8523

PM 5652: input for external data signal, such as teletext.

The PM 5651 and PM 5652 studio VITS generators are combined VITS generators and VITS inserters that are designed for use in television production centres like TV studios, video tape centres, telecine and slide centres, post - production centres, and in switching and continuity centres.

The main function of the instruments is that of generating VITS signals and inserting them into the programme signal in the vertical blanking interval. In addition, already inserted information in the blanking interval may be removed (deleted) without insertion of new VITS. The PM 5651 has an optional source code generator that can be programmed to insert a digital code in one of the vertical lines in order to identify the source of the programme signal. The PM 5652 has an input for external data signals (or video), such as for instance teletext, time codes, or external source identification codes. Source identification codes (SIDs) are often used to label the programme signals in complex television facilities to ensure that they are not mixed up. Source codes may have formats like STUDIO 5, VTR 24, EFP 11, etc.

Functional description

In the normal mode, the PM 5651 and PM 5652 loop the incoming programme signal (video signal) through the inserter/deleter circuit, which may be programmed by the user to insert VITS, to insert SID or external data, and/or to delete lines in the vertical interval. Insertions and deletions can take place from line no. 8 up to the start of the active field and may be programmed separately for field 1 and field 2.

In order to protect the programme signal from interruption by malfunction of the VITS generator, a by-pass protection circuit has been incorporated in the instrument. This circuit (by-pass relay circuit) loops the programme signal directly from the input socket to the output socket when one or more of the following conditions occur:

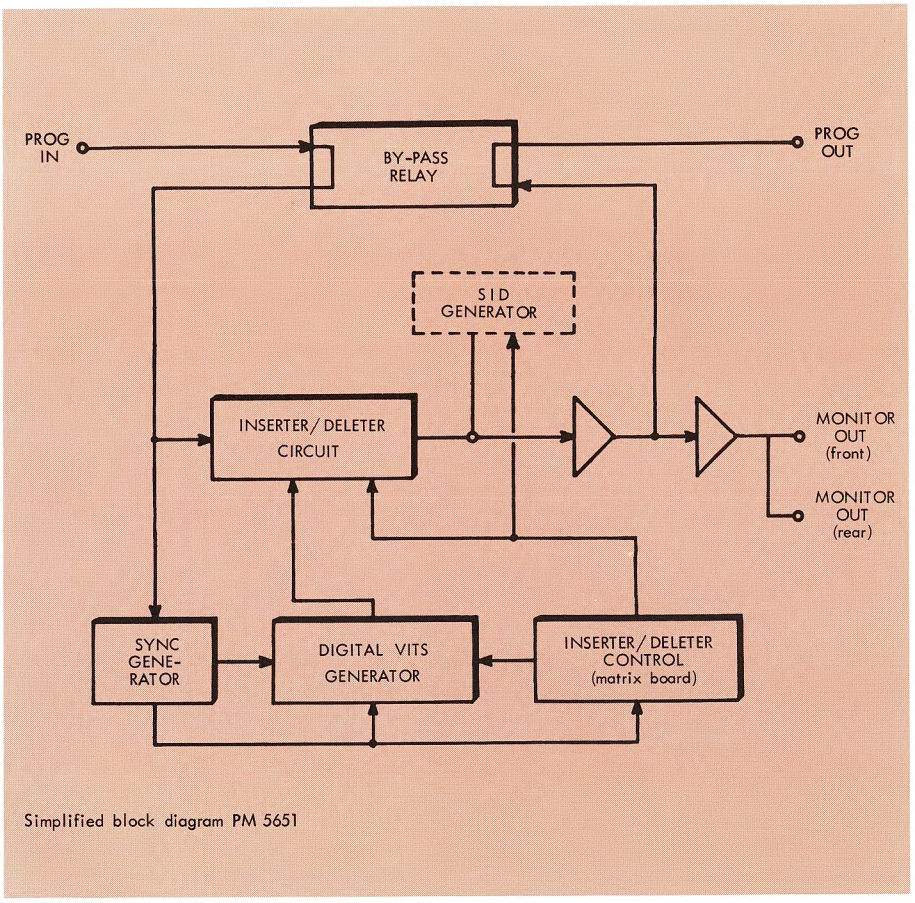
- There is a mains failure.
- The PM 5651/52 are switched off.
- The internal power supply of the instrument fails.
- The PM 5651/52 fail to synchronize (genlock) to the programme signal. Reasons may be failure of the programme signal, too low level, non-standard sync, or irregular sync.
- The PM 5651/52 are switched deliberately into the by-pass mode (can be done with the front panel push-button or remotely via a plug at the rear).

The inserter/deleter circuit resembles that of a 3-pole switch selecting one of the following signal sources:
- The programme signal (after dc-restoration). This is the normal position of the switch.
- The internal VITS generator. This happens during the active part of the VITS lines, where test signals are generated.
- Neutral. This happens during the active part of VITS lines to be deleted or when SID or ext. data are added.

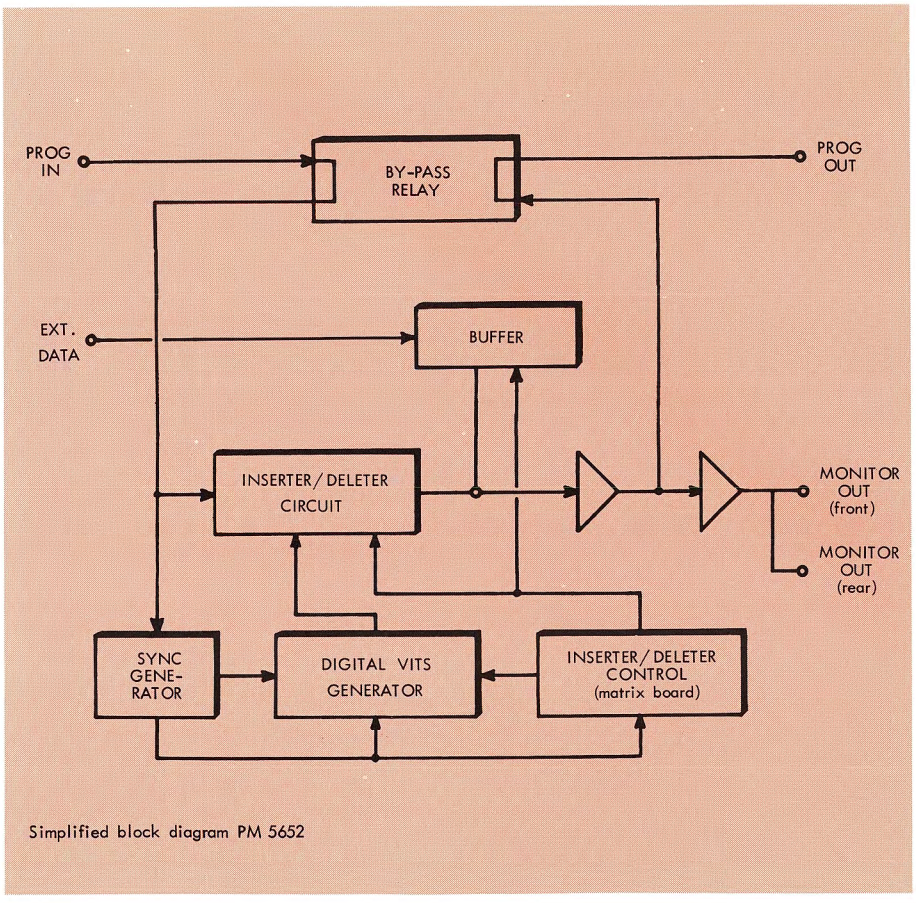
This concept obviously excludes the possibility of double-insertions or noise on the VITS or data lines. The programming of insertions and deletions is done with a matrix board on one of the circuit boards.

Great care has been taken to avoid false insertion or deletion in the active part of the programme signal. This might otherwise happen when the inserter loses synchronization because of irregular sync (VTR tracking errors, switching of non-synchronous signals, etc.). The PM 5651/52 therefore have built-in SPGs that are genlocked to the programme signal. Only when the internal sync coincides with programme sync, do insertions and deletions take place.

The digital VITS generator part generates the test signals by means of PROMs (Programmable Read-Only Memories) and D/A converters (Digital-to-Analog). This principle minimizes the content of analog circuitry and thereby reduces the risk of instability and drift of amplitudes and waveforms. In addition the digital circuitry is less costly to manufacture and maintain.



Simplified block diagram PM 5651



Simplified block diagram PM 5652

Source identification codes

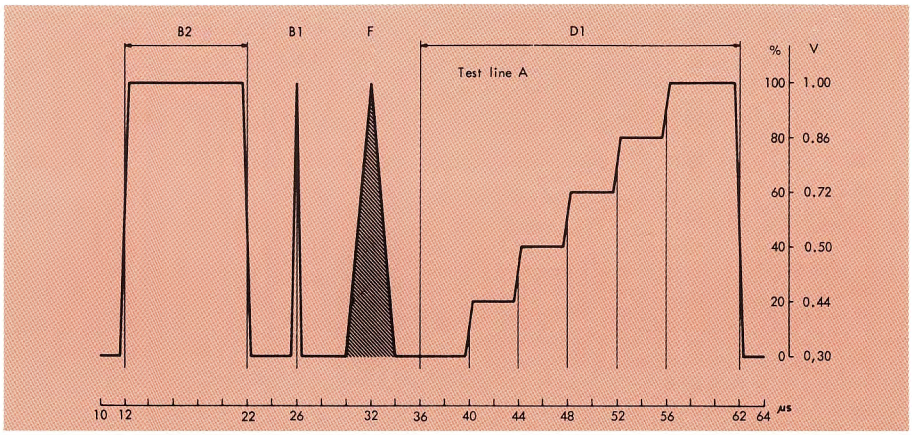
The source code identification generator of the PM 5651 consists of an optional circuit board that adds a digital signal in one or more of the lines in the vertical interval. The code is programmed in a PROM that is clocked by a 5 MHz clock pulse. Any code that can be derived from the 5 MHz can be made according to customer specification. The IDS system used in the Eurovision network is in this category.

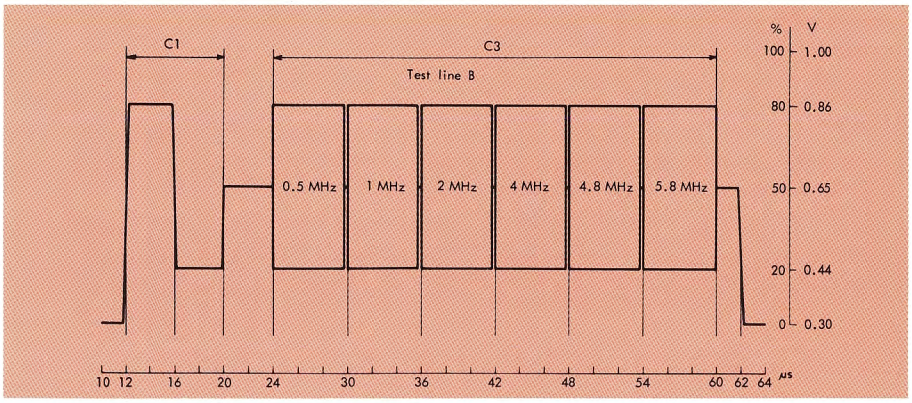
Applications

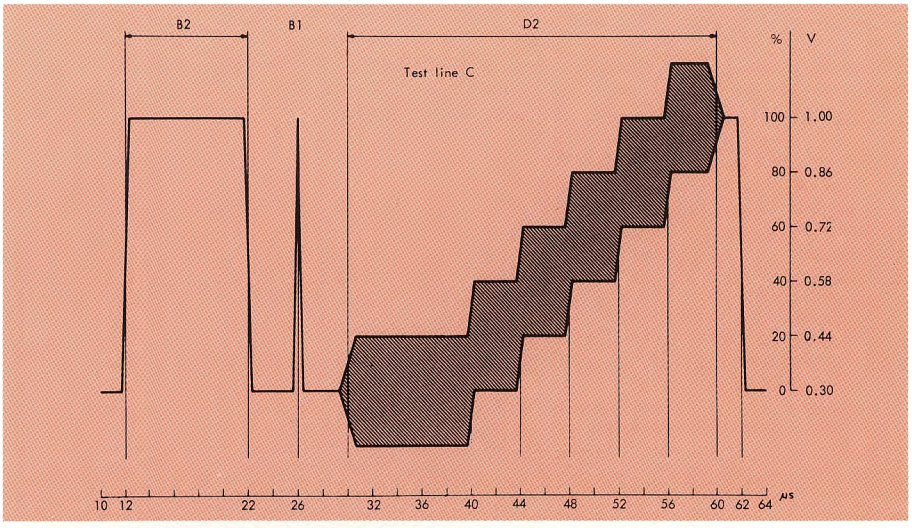
The PM 5651/52 are designed for use in all sorts of television facilities, where TV programmes are originated, copied, dubbed, transcoded or editted. The small size and low weight of the units make them particularly attractive

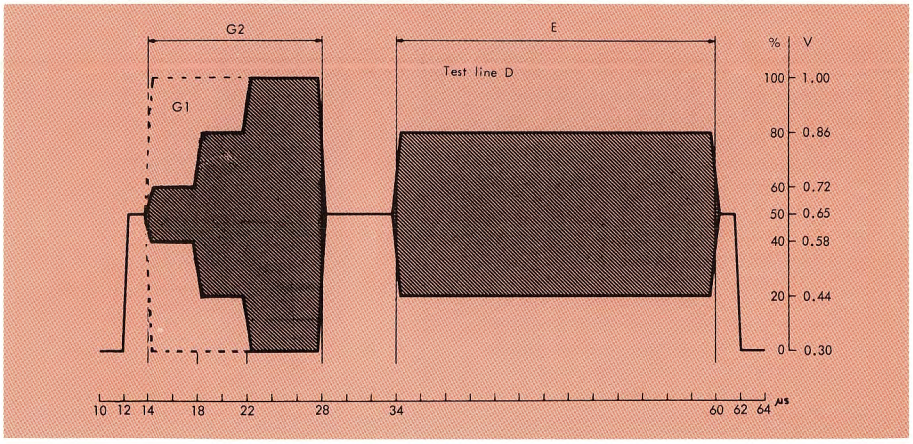
for installation in mobile vans and wherever space considerations play an important role. The affordable price makes it feasible to utilize VITS technology in a much wider scale than previously. Even relatively small production facilities may now include the professional VITS measuring and quality control concept. In the large studio complex, the programme signals are often routed over a long cumulative distance and through complicated equipment. The VITS and SID technology offers a solution to the well-know problem of keeping track of the sources of the various signals, their routings and their impairments.

The simple concept, the incorporation of several protection measures, and the intensive use digital circuitry make the PM 5651/52 very reliable and safe. This is important because elsewise the insertion of VITS equipment in the programme path creates a new problem in itself. The PM 5651/52 add very little distortion of their own; in fact several units have to be cascaded before the impairment of the programme signal can be measured. The PM 5651/52 can therefore safely be used in quantities in large studio complexes without any impairment and loss of reliability.









TECHNICAL DATA

VITS lines, G-version

LINE 17 SIGNAL (test line A) —
1) White reference bar (B2). Amplitude: 0.700 Vpp ± 0.5%. Rise and fall time: 200 ns ± 20 ns. Tilt: < 0.5%.
2) 2T sine-squared pulse (B1). Amplitude: 0.700 Vpp ± 1%. Width: 200 ns ± 6 ns. K-factor: < 0.25%.
3) 20 T composite sine-squared pulse (F). Amplitude: 0.700 Vpp ± 1%. Width: 2000 ns ± 60 ns. Bottom curvature: < 0.5%. Residual subcarrier: < 3.5 mVpp. Subcarrier distortion: < 1%.
4) 6-level staircase (D1). Amplitude: 0.700 Vpp ± 1%. Rise time: 235 ns ± 15 ns. Inequality of the steps: < 0.5%.

LINE 18 SIGNAL (test line B) —
1) Positive and negative peak reference bar (C1). Amplitude: 80% and 20% of 0.700 Vpp ± 1%. Rise and fall time: 200 ns ± 20 ns.
2) Sine wave bursts (C3). Frequencies: 0.5 - 1.0 - 2.0 - 4.0 - 4.8 and 5.8 MHz. Amplitude: 60% of 0.700 Vpp ± 1%. Rise and fall time (envelope): 200 ns. Pedestal: 50% of 0.700 Vpp. Rise and fall time of pedestal: 200 ns ± 20 ns.

LINE 330 SIGNAL (test line C) —
1) White reference bar (B2). Amplitude: 0.700 Vpp ± 0.5%. Rise and fall time: 200 ns ± 20 ns. Tilt: < 0.5%.
2) 2 T sine-squared pulse. Amplitude: 0.700 Vpp ± 1%. Width: 200 ns ± 6 ns. K-factor: < 0.25%.

3) 6-level staircase with superimposed chrominance (D2). Amplitude of staircase: 0.700 Vpp ± 1%. Rise and fall time: 235 ns ± 15 ns. Inequality of steps: < 0.5%. Amplitude of chrominance: 0.280 Vpp. Rise and fall time: 1000 ns ± 50 ns. Phase of chrominance referred to the colour burst (135°/225°): 60° ± 5°. Inherent differential gain: < 0.5%. Inherent differential phase: < 0.2°.

LINE 331 SIGNAL (test line D) —
1) 3-level chrominance staircase (or chrominance bar) (G1). Amplitudes: 20%, 60% and 100% of 0.700 Vpp ± 1% (or just 100%). Inherent chrominance/luminance intermodulation: < 0.5%.
2) Chrominance reference (E). Amplitude: 60% of 0.700 Vpp ± 1%. Rise and fall time of both signals: 1000 ns ± 50 ns. Pedestal: 50% of 0.700 Vpp ± 1%. Rise and fall time of pedestal: 200 ns ± 20 ns.

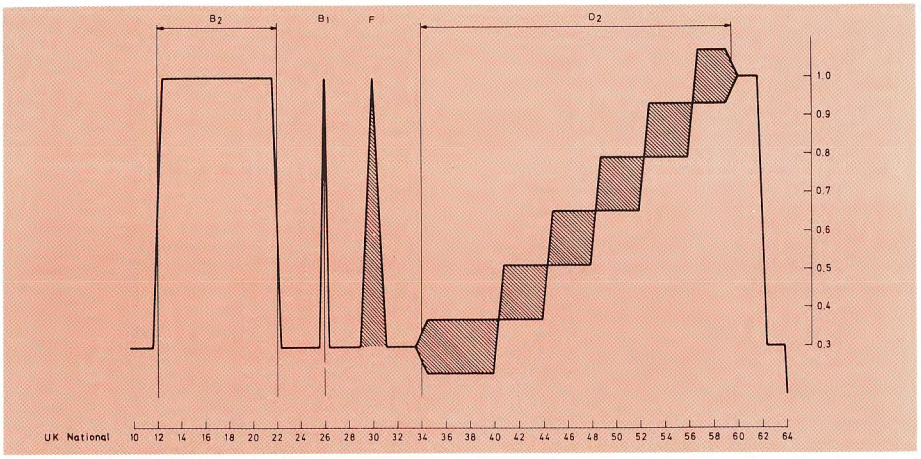
VITS lines, I-version

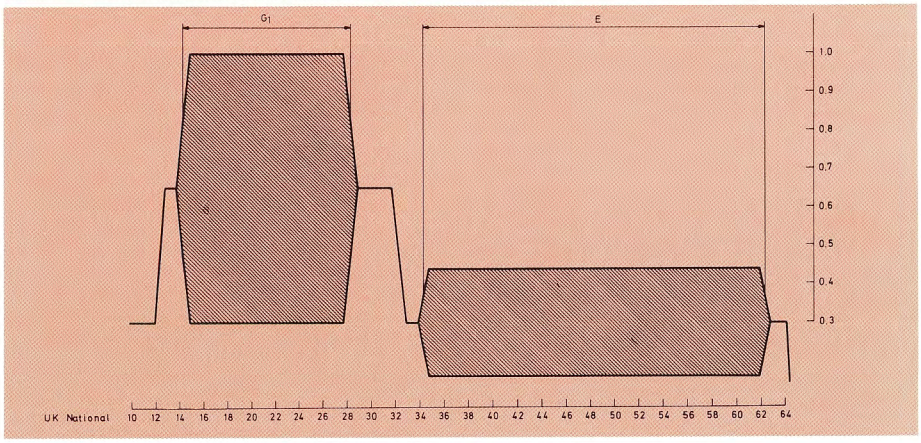
LINE 19 SIGNAL (test line A) —
1) White reference bar (B2). Amplitude: 0.700 Vp-p. Rise and fall time: 200 ns ± 10 ns. Tilt: < 0.5%.
2) 2T sine-squared pulse (B1). Amplitude: 0.700 Vp-p (within ± 0.5% of B2). Width: 200 ns ± 6 ns. K-factor: < 0.25%. Undershoot: < 0.3%.
3) 10T composite sine-squared pulse (F). Amplitude: 0.700 Vp-p (within ± 1% of B2). Width: 1000 ns ± 30 ns. Bottom curvature: < 0.5%, < ± 10 ns. Modulation unbalance: < 3 mVp-p. Subcarrier distorrion: < 1%.
4) 5-riser staircase with chroma. Amplitude: 0.700 Vp-p (within 1% of B2). Rise time: 235 ns ± 15 ns by means of Thomson filter. Step inequality: < 0.5%. Amplitude of chroma: 0.140 Vp-p. Rise and fall time of chroma: 1 µs ± 3%. Phase of chroma relative to colour burst: 60° ± 5°. Differential gain: < 0.5%. Differential phase: < 0.2°.

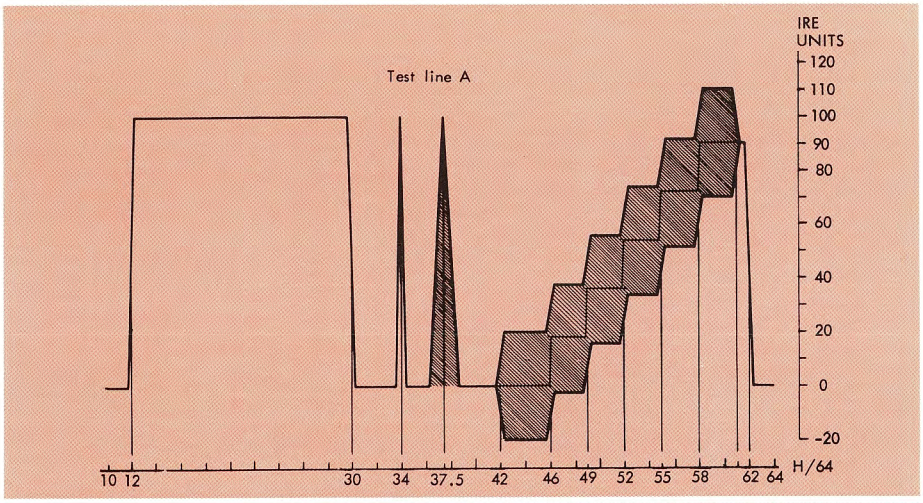
LINE 20 SIGNAL (test line B) —
1) Chrominance bar (G). Amplitude: 0.700 Vp-p (within ± 1% of B2). Pedestal level: 50% of 0.700 Vp-p.
2) Extended burst (E). Amplitude: 0.300 V p-p. Both signals: rise and fall time of chroma signals: 1 µs ± 5%. Chroma phase: 60° ± 1° referred to the colour burst.

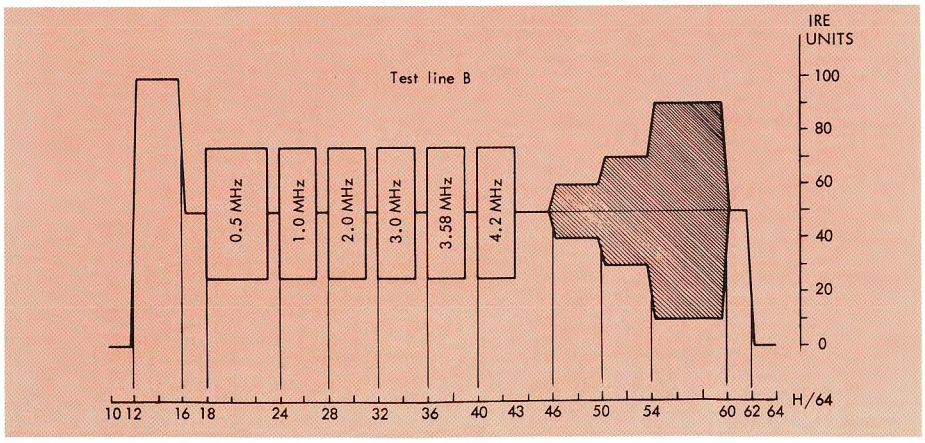
VITS lines, M-version

COMPOSITE TEST SIGNAL (test line A) —
1) Line bar (B2). Amplitude: 100 IRE ± 0.5 IRE. Line time distortion: < 0.3 IRE. Rise and fall time: 125 ns ± 5 ns.
2) 2T sine-squared pulse (B1). Amplitude: 100 IRE, within ± 0.5 IRE of B2. HAD (half amplitude duration): 250 ns < 10 ns. K-factor: < 0.25 IRE.
3) 12.5 T composite sine-squared pulse (F). Amplitude: 100 IRE, within 0.5 IRE of B2. HAD: 1570 ns ± 50 ns. Inherent chrominance/luminance gain and delay inequalities: < 0.5 IRE and ± 5 ns. Residual subcarrier: < 0.5 IRE. Subcarrier distortion: < 1%.
4) 5-riser modulated staircase (D2). Staircase amplitude: 90 IRE ± 1 IRE. Rise and









fall time: 250 ns ± 10 ns. Step inequality: < 0.5 IRE. Chrominance amplitude: 40 IRE ± 0.4 IRE. Rise and fall time (envelope): 400 ns ± 25 ns. Inherent differential gain and phase: < 0.25% and 0.2°. Chrominance phase: within 1° of color burst.

COMBINATION TEST SIGNAL (test line B) —
1) White flag (C1). Amplitude: 100 IRE ± 0.5 IRE. Rise and fall time: 125 ns ± 25 ns. Overshoot: < 1 IRE. Tilt: < 1 IRE.
2) Multiburst (C2). Amplitude: 50 IRE ± 2 IRE. Frequencies: 0.5 - 1.0 - 2.0 - 3.0 - 3.58 and 4.2 MHz ± 1%. Shape: sinusoidal. Harmonic distortion: < 1%. Pedestal level: 50 IRE ± 0.5 IRE.
3) 3-level chrominance signal (G). Amplitudes: 20, 40 and 80 IRE ± 1 IRE. Chrominance phase: 90° ± 1°. Phase inequality of the three steps: < 0.2°. Rise and fall time: 400 ns ± 25 ns. Inherent CLIM (chr/lum intermodulation): < 0.25 IRE.

VIRS (test line C) —
1) Chrominance reference. Chrominance amplitude: 40 IRE ± 1 IRE. Rise and fall time (envelope): 1.0 µs ± 0.25 µs. Phase: within 1° of the color burst. Harmonic distortion: < 1%. Pedestal level: 70 IRE ± 0.5 IRE.
2) Luminance reference. Level: 50 IRE ± 0.5 IRE. Rise and fall time of luminance: 250 ± 50 ns.
3) Black reference. Level: 7.5 IRE ± 0.5 IRE.

Modes of operation

BY-PASS MODE — A relay in the inserter/deleter section loops the incoming programme signal directly to the output connector under the following circumstances:
1) There is no power to the unit or the power has been switched off.
2) Failure of the internal power supply.
3) The VITS generator fails to lock to the incoming programme signal.
4) The VITS generator has been switched into the by-pass mode.

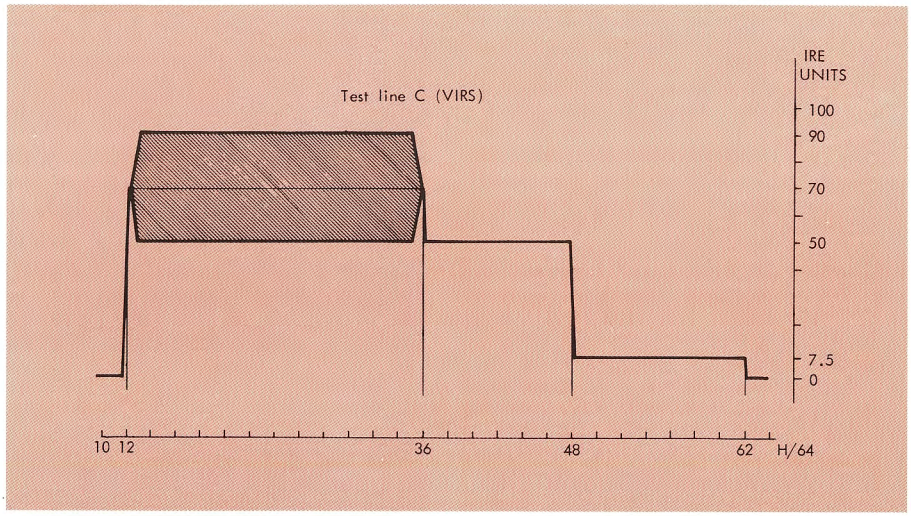
NORMAL MODE — The programme signal is passed through the inserter/deleter circuit. VITS (and SIDs) are inserted and lines are erased in accordance with the programming of the matrix board. Insertion of signals is preceded with erasure of the lines involved before insertion takes place.

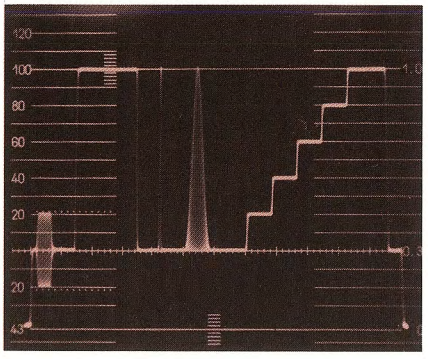
Programme channel

INPUT — Composite video signal. Amplitude: 1.00 Vpp or 140 IRE nominal (sync 300 mVpp or 40 IRE). Acceptable input level: nominal + 3 dB/- 6 dB. Return loss: > 34 dB up to 7 MHz.

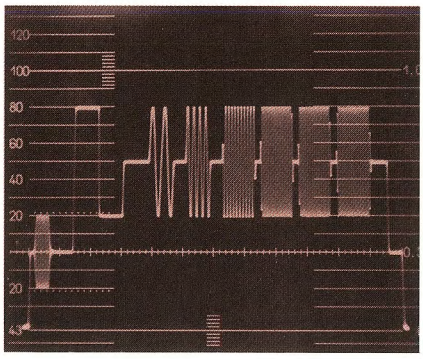
OUTPUT — Same as input signal. Output impedance: 75 Ω ± 0.5%. Return loss: > 34 dB up to 7 MHz.

DELAY — A delay line is inserted in series with the by-pass relay in order to equalize the delay through the VITS generator in the normal mode and the by-pass mode. Maximum deviation: < 1.5 ns.

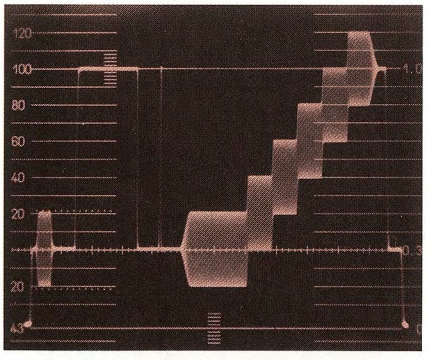




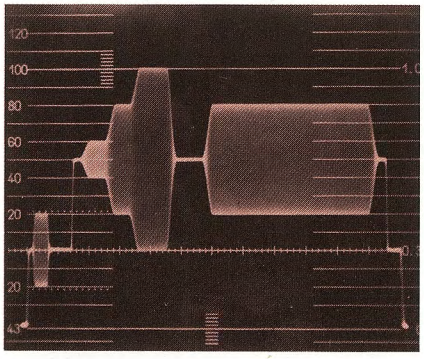
G-version, test line A



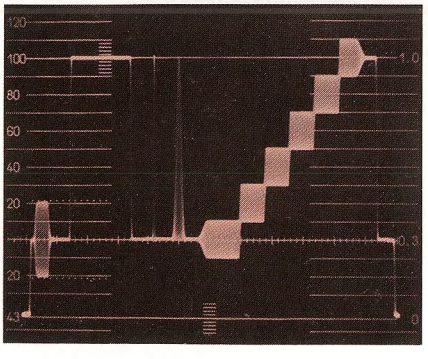
G-version, test line B



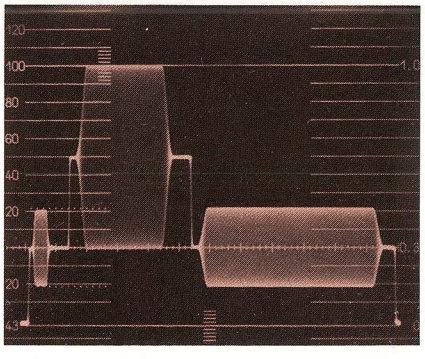
G-version, test line C



G-version, test line D



I-version, test line A



I-version, test line B

PM 5651/52

TRANSMISSION CHARACTERISTICS — Gain: 1.00 ± 1%. Frequency response: ± 1% up to 6 MHz, + 1% to - 5% from 6 - 10 MHz. Chrominance/luminance gain inequality: < 0.5%. Chrominance/luminance delay inequality: < ± 5 ns. 2 T pulse-to-bar ratio: 100% ± 0.25%. 2 T pulse overshoot: does not differ from input signal by more than 0.5% of the luminance bar amplitude. Field time distortion: < 0.5%. Line time distortion: < 0.25%. Differential phase: < 0.15° at standard level, < 0.3° at + 3 dB. Differential gain: < 0.2% at standard level, < 0.4% at + 3 dB. Line time non-linearity: < 0.25%. Random HF noise (weighted): < - 75 dB rms. Residual subcarrier: < 60 dBpp on programme lines. Hum and lower order harmonics: < - 60 dBpp. Spurious transients during active lines: - 60 dBpp up to 5 MHz. Isolation between transmission and auxiliary outputs: up to 1 MHz > 46 dB. At 4.43 MHz > 36 dB. Signal attenuation in erase mode: > 70 dB for 2 T pulse, > 60 dB for subcarrier. Crosstalk into programme signal: < 70 dBpp for 2 T pulse, < 60 dBpp for subcarrier.

Monitor output

Number of outputs: 1 on the front, 1 on the rear. Type of signal: identical with programme output (in by-pass mode, however, with VITS). Output impedance: 75 Ω ± 0.5%. Return loss: > 34 dB. Transmission characteristics (from programme input): within twice the figures stated for the programme channel.

Source code generator

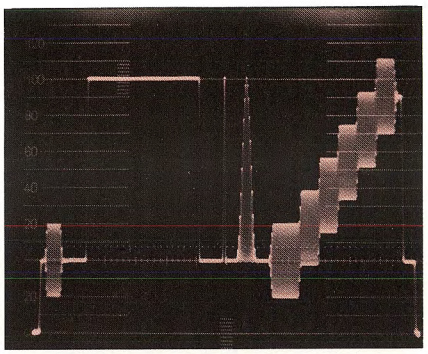
The PM 5651 is prepared for an optional source code identification (SID) generator that can be programmed to the users wishes. The clock frequency is 5 MHz. The PM 5651M can be supplied with a colour bar VITS instead of the source code generator (can only be installed in the factory).

External data input

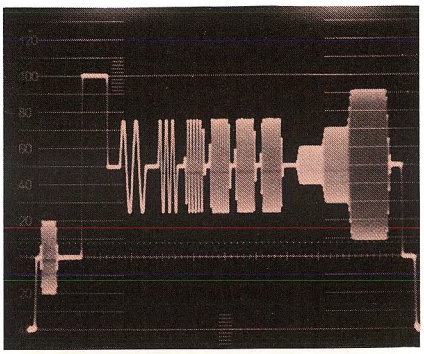
The PM 5652 has input for an external data (video) signal. Input level: 0.70 Vpp or 100 IRE nominal. Input impedance: 75 Ω. Return loss: > 34 dB up to 7 MHz.

Front panel controls and indicators

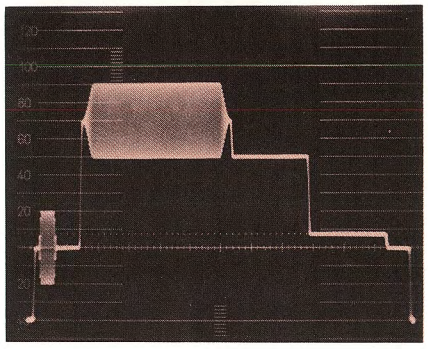
- Power on/off
- By-pass mode (illuminated push-button, yellow LED)
- Normal mode (illuminated push-button, green LED). Note: if both LEDs light, it means that the normal mode has been selected, but due to abnormal input conditions the instrument has automatically switched to the by-pass mode
- Power on indicator (green LED)
- No burst in programme signal (yellow LED)
- No sync in programme signal or no programme at all (red LED).



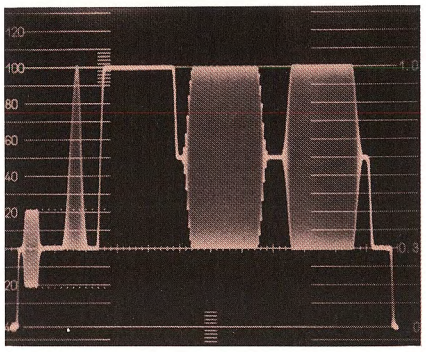
M-version, test line A.



M-version, test line B.



M-version, test line C.



G-version, calibration signal.

Remote control

Functions that can be controlled: by-pass mode and normal mode. Levels: + 5 V logic (TTL).

Power requirements

Voltage: 100/120/220/240 V + 10%/- 15 %. Frequency: 48 - 65 Hz. Consumption: 30 W at 220 V.

Environmental conditions

Operating temperature: 5 - 45°C ambient. Storage temperature: - 30 to + 70°C. Climatic conditions: Philips class C1. Mechanical conditions: Philips class M1. Supply conditions: Philips class S2.

Safety

Safety: IEC 348 class I.

Mechanical data

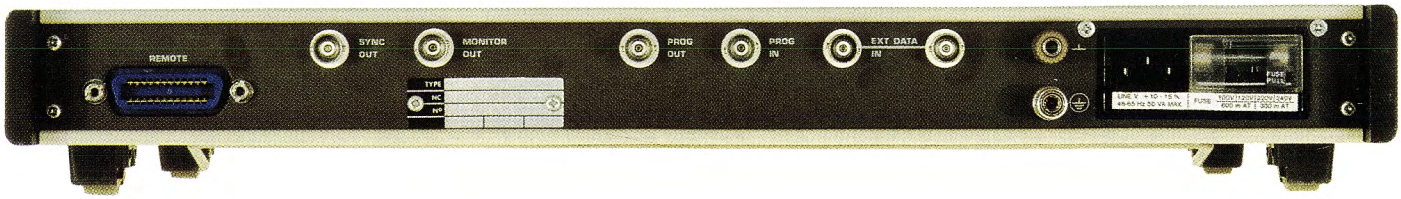
19" rack/table cabinet, 1 unit high.
Height : 44 mm
Width : 440 mm (excl. brackets)
Depth : 460 mm
Weight : 5.0 kg

The cabinet has handles and rackmount brackets (integral part of the cabinet) as well as rubber feet and a tilt bracket (both removable). When rack mounted the instrument should be supported at the rear.

Standard accessories:
- Operation and service manual.
- Mains cord.
- Test and calibration fixture (small pcb).

Options

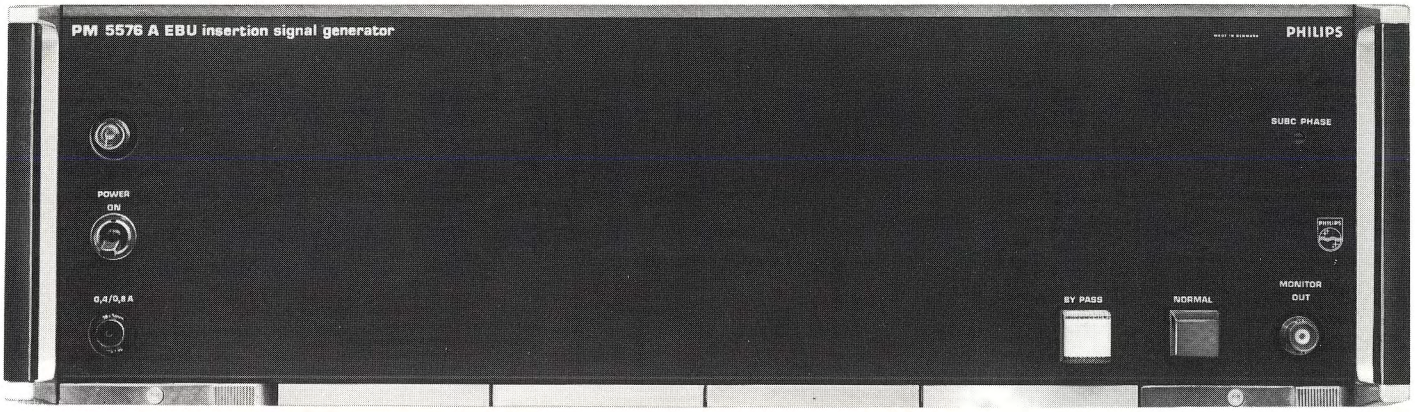
PM 8523 Source ID generator. Specification: EBU source code or similar (special codes on request).



Insertion signal generator

PM 5576 A

Code no. PM 5576 A:
9449 055 76103 (G-version, 625-lines EBU signals)



In conformity with the EBU performance specification insertion signal equipment

Ideal for large TV studios and mobile vans, where reliable operation is important

Inputs for external signals, such as data signals, external ITS, or command codes

Easy programmability via internal matrix board

Externally mounted by-pass relay unit allows the ITS generator to be disconnected without interruption of the programme path

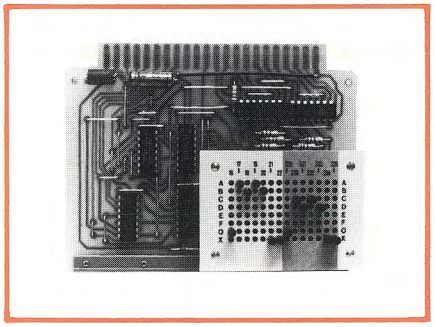
Protection against sync disturbances through selective line frequency and field frequency separation

The PM 5576A insertion signal generator has been developed for those applications, where insertion signals are inserted into programme signals as routine operations that require no attention nor operation of the inserting equipment. The PM 5576A can be considered a simplified version of a fully EBU-specified ITS generator. Only the full-field signal part is omitted in the PM 5576A.

The PM 5576A is particularly useful in outside broadcast vans, TV studios and switching centres because of its reliable and sturdy construction and simple operation. Once the routine of using insertion signals within a broadcast authority has been established, the setting of the ITS generator is very rarely changed. The equipment should therefore only have a few controls to be operated by the operational staff. Apart from the mains button, the PM 5576A has only two buttons, one for "Normal" operation, and one for "By-pass", the latter to be used only in an emergency. However, when changes do occur, the PM 5576A can quickly be reprogrammed (without carefully studying the manual) to a new insertion programme. A special version of the PM 5576A has ITS and source ID detectors and automatic substitution of same signal.

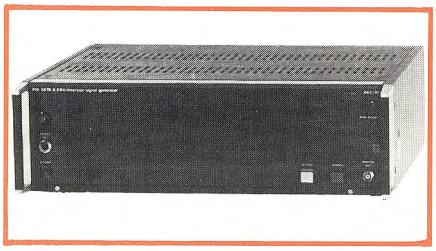
Signals

The PM 5576A generates all four test signals prescribed by the EBU (European Broadcasting Union). By means of the internal matrix board, any test signal or externally supplied signal can be inserted on any of the lines 16 - 22 and 329 - 335. The externally supplied signals are keyed into the programme signal by switching circuits, so that they need not be blanked for unwanted lines.



The internal matrix board of the PM 5576A. This circuit controls insertion and erasure of ITS and external signals.

PM 5576 A



TECHNICAL DATA

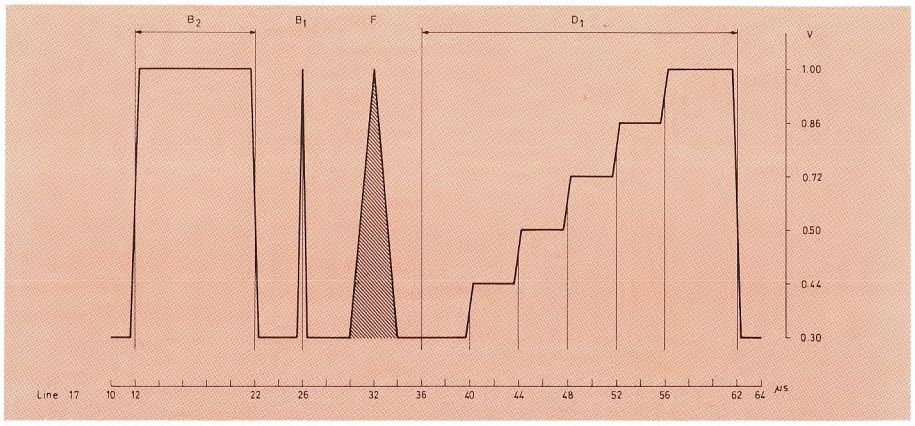
Test signals PM 5576 G.

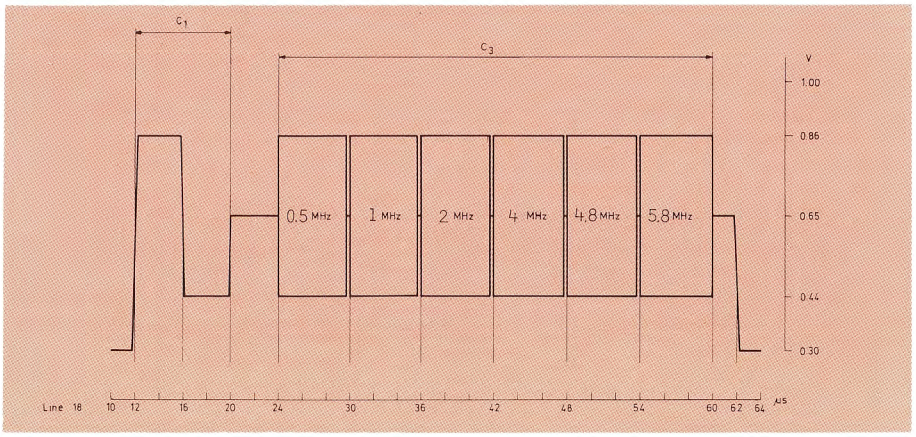
LINE 17 SIGNAL (test line A) —
1) White reference bar (B2). Amplitude: 0.700 Vp-p ± 0.5%. Rise and fall time: 200 ns ± 10 ns. Tilt:< 0.5%.
2) 2T sine-squared pulse (B1). Amplitude: 0.700 Vp-p (within ± 0.5% of B2). Width: 200 ns ± 6 ns. K-factor: < 0.25%. Undershoot: < 0.3%.
3) 20T composite sine-squared pulse (F). Amplitude: 0.700 Vp-p (within ± 1% of B2). Width: 2000 ns ± 60 ns. Bottom curvature: < 0.5%, < 10 ns. Modulation unbalance: < 3 mVp-p. Subcarrier distortion: < 1%.
4) 6 level staircase (D1). Amplitude: 0.700 Vp-p (within 1% of B2). Rise time: 235 ns ± 15 ns by means of Thomson filter. Step inequality: < 0.5%.

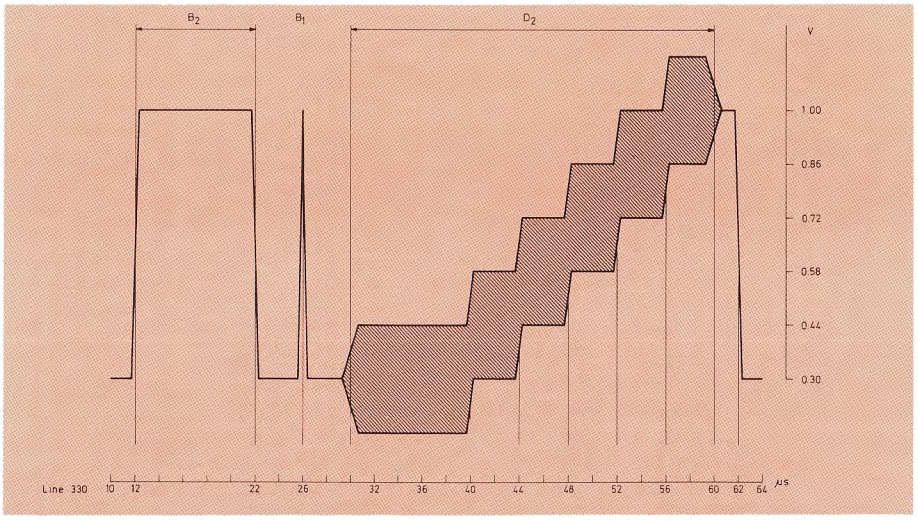
LINE 18 SIGNAL (test line B) —
1) Positive and negative peak reference bar (C1). Amplitude: 80% and 20% of 0.700 Vp-p ± 1%. Rise and fall time: 200 ns ± 10 ns.
2) Sine wave bursts (C3). Frequencies: 0.5 - 1.0 - 2.0 - 4.0 - 4.8 and 5.8 MHz ± 2% (the frequency of bursts no. 2 to 4 is adjustable within the intervals: 1.0 to 1.5, 2.0 to 2.5 and 4.0 - 4.43 MHz). Amplitude: 60% of 0.700 Vp-p ± 1% (0.420 Vp-p) or 100% of 0.700 Vp-p. Start/stop: Zero phase.

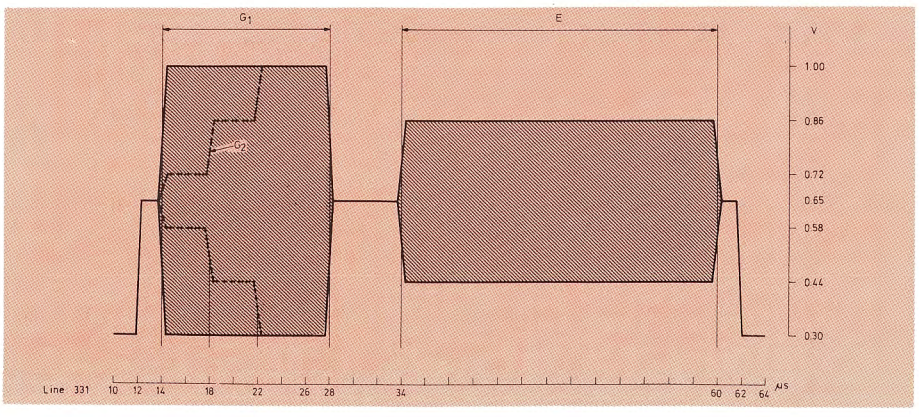
LINE 330 SIGNAL (test line C) —
1) White reference bar (B2). Amplitude: 0.700 Vp-p ± 0.5%. Rise and fall time: 200 ns ± 10 ns. Tilt: < 0.5%.
2) 2T sine-squared pulse. Amplitude: 0.700 Vp-p (within ± 0.5% of B2). Width: 200 ns ± 6 ns. K-factor: < 0.25. Undershoot: < 0.3%.
3) 6 level staircase with chroma (D2). Amplitude: 0.700 Vp-p (within 1% of B2). Rise time: 235 ns ± 15 ns by means of Thomson filter. Step inequality: < 0.5%. Amplitude of chroma: 0.280 Vp-p. Rise and fall time of chroma: 1 µs ± 5%. Phase of chroma relative to colour burst: 60° ± 5°. Differential gain: < 0.5%. Differential phase: < 0.2°.

LINE 331 SIGNAL (test line D) —
1) One or three level chrominance bar (G 1 and G2) by internal selection. Amplitude of chroma (one level bar): 0.700 V p-p (within ± 1% of B2). Amplitudes of chroma (three level bar): 20%, 60% and 100% of 0.700 Vp-p, i.e. 0.140, 0.420 and 0.700 Vp-p (within 1% of B2).
2) Chrominance reference (E). Amplitude: 60% of 0.700 Vp-p, i.e. 0.420 Vp-p (within ± 1% of B2). Rise and fall time for all chroma signals: 1 µs ± 5%. Pedestal: 50% of 0.700 Vp-p. Rise and fall time of pedestal: 200 ns ± 10 ns.









Modes of operation

BY-PASS MODE — A relay built into the special input-output connector loops the incoming program signal directly to the output connector under the following circumstances: 1) The "by-pass button" is pressed (locally or remotely). 2) Power line fails or is switched off. 3) Internal power supply fails. 4) The instrument is pulled out of the cabinet (fixed rearplate version) or by-pass relay box is detached from the instrument.

NORMAL MODE — The programme signal is passed through the instrument. Internally generated and/or externally supplied test signals are inserted into the programme signal according to the programming of the matrix board. Besides incoming insertion signals can be erased from the programme.
NB. All "old" information in lines to be inserted upon is automatically erased before new insertion takes place.

Programme channel

TRANSMISSION CHARACTERISTICS — Gain: 1.00 ± 1%. Frequency response: ± 1% up to 6 MHz, + 1% to - 5% from 6 - 10 MHz. Chrominance/luminance gain inequality: < 0.5%. Chrominance/luminance delay inequality: < ± 5 ns. 2T pulse-to-bar ratio: 100% ± 0.25%. 2T pulse overshoot: does not differ from input signal by more than 0.5% of the luminance bar amplitude. Field time distortion: < 0.5%. Line time distortion: < 0.25%. Differential phase: < 0.15° at standard level, < 0.3° at + 3 dB. Differential gain: < 0.2% at standard level, < 0.4% at + 3 dB. Line time non-linearity: < 0.25%. Random HF noise (weighted): < - 75 dB rms. Residual subcarrier: < - 60 dBp-p on programme lines. Hum and lower order harmonics: < - 60 dBp-p. Spurious transients during active lines: - 60 dBp-p up to 5 MHz. Isolation between transmission and auxiliary outputs: up to 1 MHz > 46 dB. At 4.43 MHz > 36 dB. Signal attenuation in erase mode: > 70 dB for 2T pulse, > 60 dB for subcarrier. Crosstalk into programme signal: < 70 dBp-p for 2T pulse, < 60 dBp-p for subcarrier.

Input signals

EXTERNAL ITS OR DATA SIGNALS — Mode of insertion: active keying-in during selected line(s). Number of inputs: 2. Amplitude: 0.700 Vp-p nominal. Input impedance: 75 Ω looped-through. Return loss: > 34 dB up to 7 MHz.

Output signals

MONITOR OUT — Number: 1 x at the front, 1 x at the rear. Amplitude: 1.00 Vp-p within 1% of the programme. Impedance: 75 Ω ± 0.5%. Other characteristics: better than twice the stated tolerances for programme channel.

COMPOSITE SYNC OUT (regenerated from programme) — Amplitude: 4 V ± 0.4 Vp-p. Impedance: 75 Ω. Return loss: > 34 dB up to 5 MHz. Rise and fall time: 200 ns ± 20 ns.

SUBCARRIER OUT (regenerated from programme) — Amplitude: 2 V ± 0.2 Vp-p. Impedance: 75 Ω. Return loss: > 34 dB at 4.43 MHz.

Remote control

The function of the two push-buttons can be controlled remotely via a multi-pole connector at the rear. Levels: + 5 V TTL logic levels.

Power supply

Voltage: 230 V (115 V) ± 20% (Internal selection). Frequency: 48 - 65 Hz. Consumption: 50 W at 220 V.

Temperature range

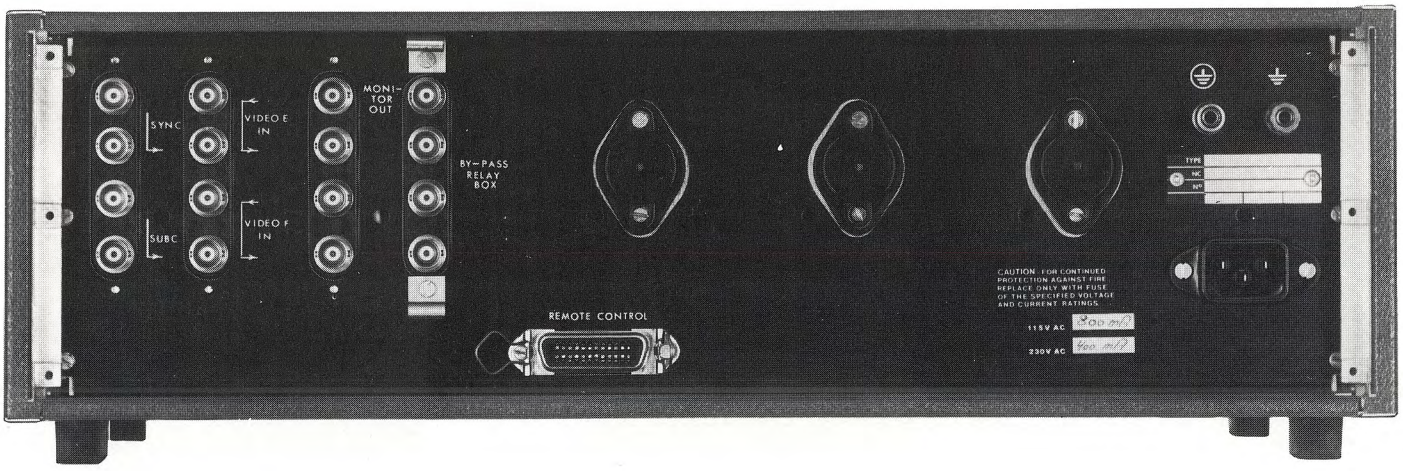
Operating: 0° - 45° C ambient. Specification is valid in that range, when adjusted to nominal values at 20° - 25° ambient.

Mechanical data

6/6 plug-in unit for the PHILIPS 19" rack/table cabinet.
Height : 132 mm
Width : 444 mm
Depth : 400 mm
Weight : 13.7 kg (with cabinet).

Cabinet

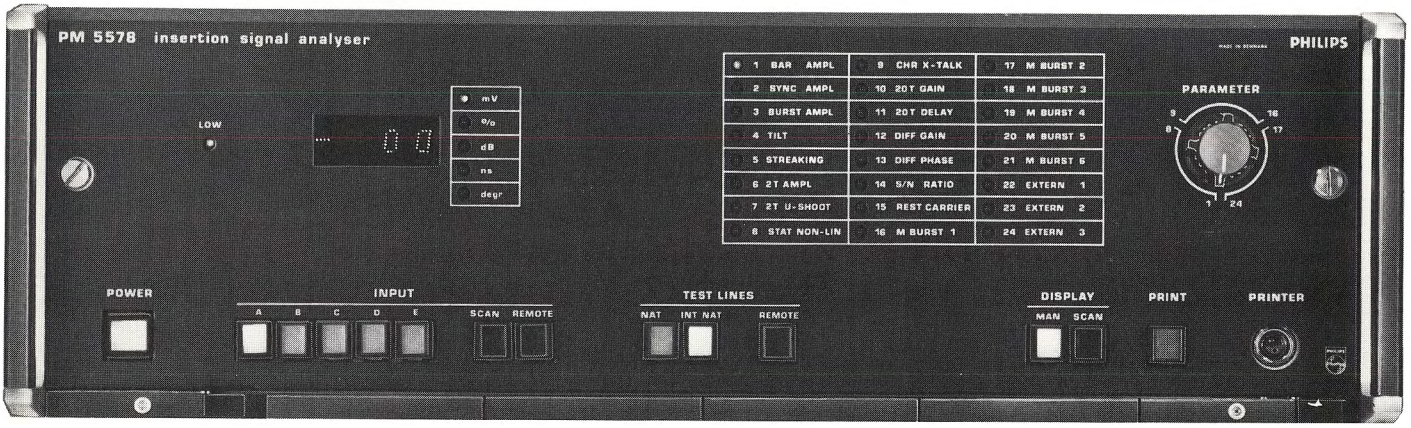
The PM 9716 A rack/table cabinet is supplied with the PM 5576.



Insertion signal analyser

PM 5578G

Code no. PM 5578 G:
9449 055 78503 (G-version, 625-line EBU signals)



Unique specification includes the measurement of 21 parameters, out-of-tolerance checking, analogue-digital conversion and display, as well as ASCII coded output for data transmission

Two sets of ITS can be selected for analysis, allowing both the total and the point-to-point distortions to be measured

Only available ITS analyser that has all functions in one compact unit

Designed for analysis of the international insertion signals as standardized by the EBU

Two inputs with possibility for automatic input/output supervision

Broad selection of auxiliary equipment turns the Philips analyser into an extremely efficient tool in the fields of testing, adjusting and maintaining all TV systems

Three inputs for external dc voltages allow extra parameters or ''housekeeping'' functions to be fed into the A/D conversion and data transmission system

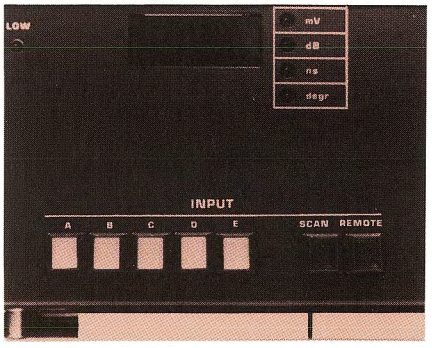
The PM 5578 insertion test signal analyser is a precision measuring instrument performing continuous measurements of the distortion on television chains or other television equipment. The function is based on transmission of the so-called ITS (insertion test signals), which are inserted in the field blanking interval at the signal source. Therefore the measurements are performed during programme hours as well as outside the active service time of the equipment involved.

An "out-of-limits" alarm function is incorporated so that excess of preset limits is indicated by the instrument. Auxiliary equipment is available for automatic monitoring of networks, data reduction, print outs and remote control from the network centre.

Application

The instrument is used wherever video equipment (from amplifiers and equalizers to transmission links and transmitters of the whole network from programme makers to the transmitters) has to be checked, adjusted or constantly supervised, i.e. in switching centres, transmitter stations, broadcasting organizations, TV workshops laboratories, and factories for professional television equipment.

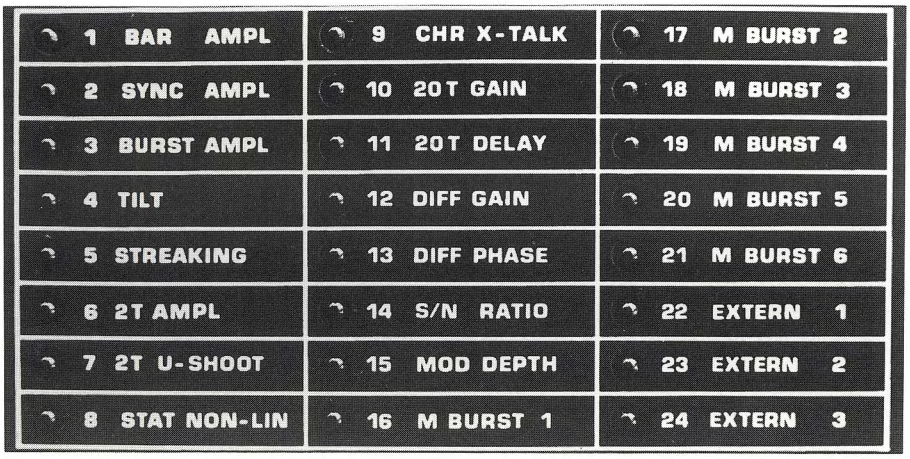
Each parameter, selectable by a rotary switch, may be read directly on the instrument via a built-in digital display. The LED in front of the selected parameter will light-up and will flash if the parameter is "out-of-limits". A teletypewriter or strip printer may be used for printing out the measuring results. The analyser also incorporates a special data out-



The PM 5578 has 5 inputs which can be selected manually, remotely or scanned automatically. "Empty" inputs are bypassed.

put for transmitting the measuring results and alarm signals to a distant centre for remote monitoring.

A special useful feature of the PM 5578 is that one out of two possible sets of ITS can be selected for analysis. Lines 17, 18, 330 and 331 are normally carrying the original ITS, while lines 19, 20, 332 and 333 are carrying reinserted ITS. Selecting the first or the second set of lines means measuring the total distortion from the point of origin or the distortion from just the previous point of reinsertion in the network.



Parameter display. The PM 5578 measures 21 parameters namely 19 from the insertion test signals and 2 from the programme signal. In addition the analysers analogue/digital - alarm - and data transmission systems can handle 3 external parameters. The LED indicators show which parameter is presented by the digital display. If the parameter is outside preset limits, the LED will flash instead of lighting steadily.

Technical description

The analyser has five inputs, A-B-C-D and E, which can be selected manually with push-buttons or remotely. The inputs can also be scanned automatically. In the scan mode "empty" inputs are quickly bypassed.

The selected signal is fed to a number of level and distortion "detectors", in principle one per parameter. The outputs from the detectors are dc voltages proportional to the levels and distortions respectively. The dc voltages may be subject to certain processing, for instance , subtraction of nominal levels, subtraction of one parameter from another parameter, before they are converted into digital information (BCD parallel). During the A/D conversion, relative parameters are produced i.e. level independent parameters. In this way a variable gain video amplifier with its inherent distortions is avoided. During the A/D conversion, the digital programmable out-of-limits detector checks whether the converted value is falling inside the selected interval. If that is consistently not the case, an alarm condition (fine alarm) is initiated.

The converted data are fed to the digital display and to the data transmission unit. The latter converts the BCD coded parameters into an ASCII serial code, which can be fed direct to a teletypewriter or a modem.

The digital display shows both the measured value and the unit, in which it is measured. By means of a rotary switch, the operator can select the parameter, he wants to see, or let the parameters be shown one after the other at an adjustable rate. A small LED ("LOW") will light when the measurements are invalid due to absense of ITS or too low ITS (or too low signal at all).

Print-outs can be obtained from any printer, which accepts an ASCII coded RS 232 data signal. This is the case with the Philips PC 1409 teletype writer. The data from the PM 5578 include carriage return and line feed codes, so that a complete sequence of 24 parameters is automatically printed in one line on the paper. The analyzer has two data outputs, one which supplies the measuring results continuously (for data transmission), and one which supplies only one sequence of parameters at the push of the button or a remote control signal (for local print-outs).

Fully automatic systems (network supervision, automatic logging systems) are best made using modern standard computers. Most computers accept the RS 232 data or have optional interface boards for the RS 232. For monitoring systems, video display units with print-out facilities may be preferred, in order to minimize print-outs to what is needed for logging purposes.

TECHNICAL DATA

Input signals

VIDEO INPUT — Number of inputs: 5 (can be selected manually or remotely, or can be scanned automatically). Type of input signals: 625-lines composite video signals with EBU specified insertion test signals (ITS). Amplitude: 1 Vpp ± 3 dB (± 6 dB with reduced accuracy). Input impedance: 75 Ω ± 0.1 %. Return loss: > 34 dB up to 7 MHz. International test lines: 17, 18, 330 and 331 (set of four test signals). National test lines: 19, 20, 332 and 333 (can be modified by internal programming).

EXTERNAL PARAMETERS — 3 externally applied dc voltages have access to the internal scanning, A/D converting and data transmission circuits, so that they can be displayed and transmitted to the monitoring centre with the other parameters. The three inputs can be used to monitor parameters not measured by the PM 5578 (house-keeping parameters f.inst.). Level: - 999 to + 999 mV. Input impedance: 100 kΩ.

Parameters

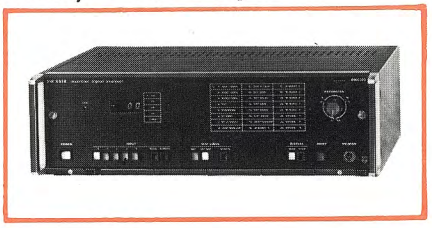
1. BAR AMPLITUDE — Amplitude of the centre of the white bar, expressed in mV or in percentage deviation from 700 mV. Measuring accuracy: ± 2 mV ± 1 digit.

2. SYNC AMPLITUDE — Amplitude of the sync pulses (peak detected in order to allow SIS), expressed in mV or in percentage deviation from 300 mV or 3/7 of white bar amplitude. Measuring accuracy: ± 5 mV ± 1 digit.

3. BURST AMPLITUDE — Peak-to-peak amplitude of the band-pass filtered colour burst, expressed in mV or in percentage deviation from 300 mV or 3/7 of white ref. amplitude. Measuring accuracy: ± 10 mV ± 1 digit.

4. TILT — The difference in bar amplitude near the leading and trailing edges, expressed in percentage of white reference level. Measuring accuracy: ± 0.5% ± 1 digit.

5. STREAKING — Base line 400 ns after the white bar, expressed in percentage of white reference level. Measuring accuracy: ± 1% ± 1 digit.



6. 2T AMPLITUDE — Amplitude of the 2T pulse referred to the amplitude of the bar, expressed in percentage deviation from white reference level. Measuring accuracy: ± 0.5% ± 1 digit.

7. 2T UNDERSHOOT — Largest undershoot after the 2T pulse, expressed in percentage of 2T amplitude. Measuring accuracy: ± 1% ± 1 digit.

8. STATIC NON-LINEARITY — Inequality of the steps in the staircase, expressed in percentage. Measuring accuracy: ± 1% ± 1 digit.

9. CHROMINANCE/LUMINANCE CROSS-TALK — Change of the pedestal level after removal of the chroma, expressed in percentage of white reference level. Measuring accuracy: ± 0.25% ± 1 digit.

10. 20T PULSE GAIN INEQUALITY — Amplitude of the chroma part referred to the amplitude of the luminance part, expressed in percentage. Measuring accuracy: ± 1% ± 1 digit.

11. 20T PULSE DELAY INEQUALITY — Delay of the chroma part referred to the luminance part, expressed in ns. Measuring accuracy: ± 10 ns ± 1 digit.

12. DIFFERENTIAL GAIN DISTORTION — Expressed in percentage. Measuring accuracy: ± 1% ± 1 digit.

13. DIFFERENTIAL PHASE DISTORTION — Expressed in degrees. Measuring accuracy: ± 0.5° < ± 1 digit.

14. SIGNAL-TO-NOISE RATIO — RMS noise measured on a "quiet" line, expressed in dBrms below white reference level. Measuring accuracy: ± 2 dB ± 1 digit.

15. REST CARRIER — Expressed in percentage of sync peak level. Measuring accuracy: ± 0.5% ± 1 digit.

16 - 21. MULTIBURST 1 - 6 (amplitude response) — Amplitude of each burst in percentage deviation of white and black references in multiburst signal. Measuring accuracy: ± 1% ± 1 digit.

22 - 24. EXTERNAL DC INPUTS 1 - 3 — Expressed in mV. Rating: - 999 to + 999 mV. Measuring accuracy: ± 5 mV ± 1 digit.

Note: Accuracies refer to nominal level ITS with less noise than 30 dBp-p (appr. 40 dBrms).

Alarm system

FINE ALARM — The various parameters may be supervised by an internal alarm system, detecting if the distortions are exceeding the preset limits. These limits can be preset to plus and minus deviations from nominal or zero by means of jumpers in steps of 10 mV, or 1%, or 5 dB, or 10 ns, or 1 degree.

COARSE ALARM — The coarse alarm circuit detects absence of sync pulses at the selected input (absence of signal).

"LOW-ITS" ALARM — The indicator lights when the amplitude of the ITS is below - 6 dB of nominal.

Display

TYPE — Three-and-a-half digit solid state display shows the measuring results.

Operation mode MANUAL: by rotary switch each parameter can be selected. LED indicates which parameter has been selected (flashing if parameter is out-of-limits).

Operation mode SCAN: fully automatic scanning of system parameters, with parameter "out-of-limits" indication by flashing LED.

Output signals

DIRECT PRINT OUT FOR TELETYPEWRITER (front side) — Code: CCITT no.5 (ASCII). Level: ± 10 V (in accordance with V 24 specification). One print-out is obtained when the "Print" button at the front is pressed. The instrument supplies automatically "carriage return" and "line feed" to the teletypewriter.

DATA TRANSMISSION OUTPUT — Code CCITT no. 5 (ASCII). Level: ± 10 V (in accordance with V 24 specification). The measuring results are transmitted continuously to monitoring centre. Codes for parameter "out-of-limits" indication, coarse alarm and input indication are included.

MONITORING OUT — The video signal being analysed is fed to an output terminal. Amplitude: ∼ 1 Vp-p. Impedance: 75 Ω.

Power supply

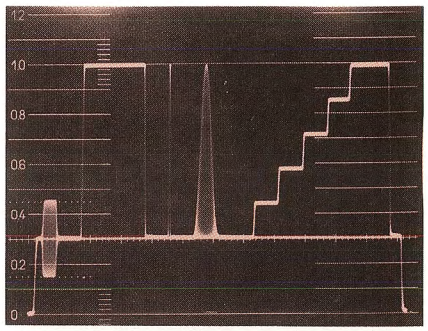
Voltage: 230 V (115 V) ± 20% (Internal selection). Frequency: 48 - 65 Hz. Consumption: 50 W at 220 V.

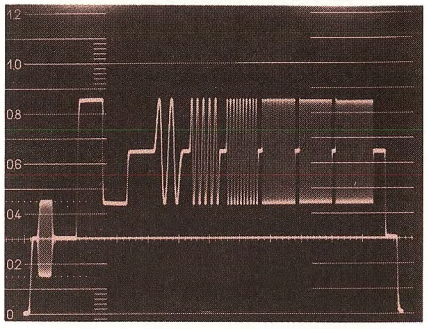
Temperature range

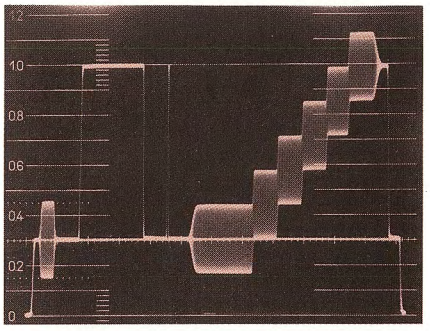
The instrument works inside specification limits in the temperature range of 20 - 40° C ambient. In the range 0 - 45° C, the tolerances are twice the stated figures.

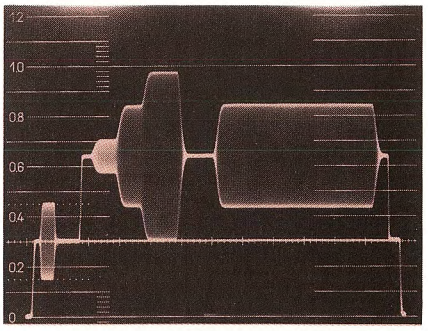
Mechanical data

Full 19" rack/table cabinet.
Height : 132 mm
Width : 444 mm
Depth : 435 mm
Weight : 14 kg (incl. cabinet).

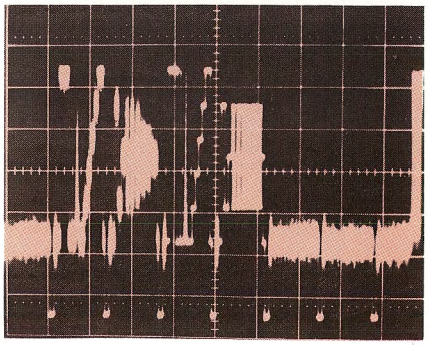




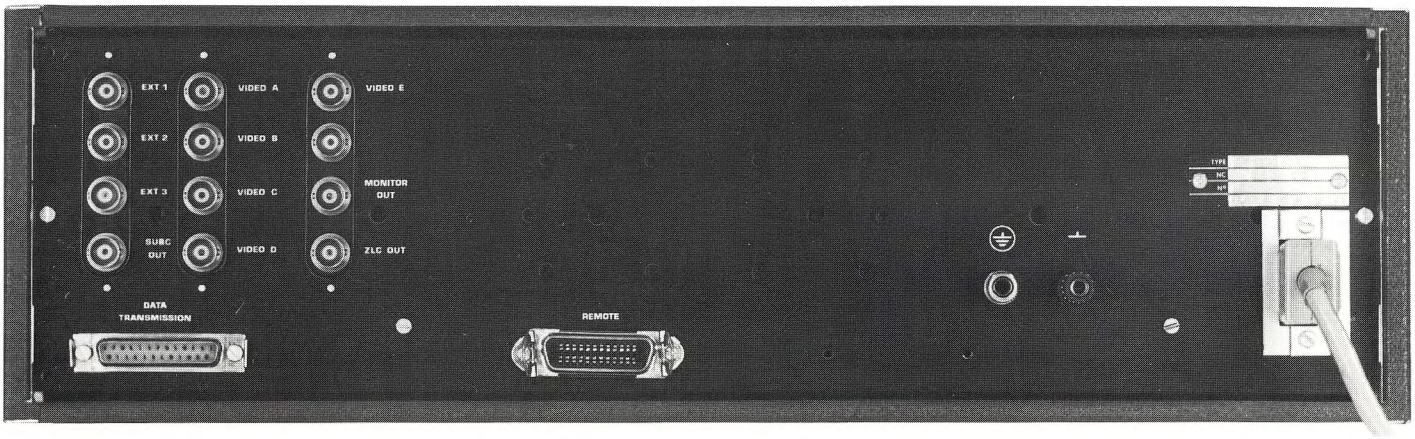




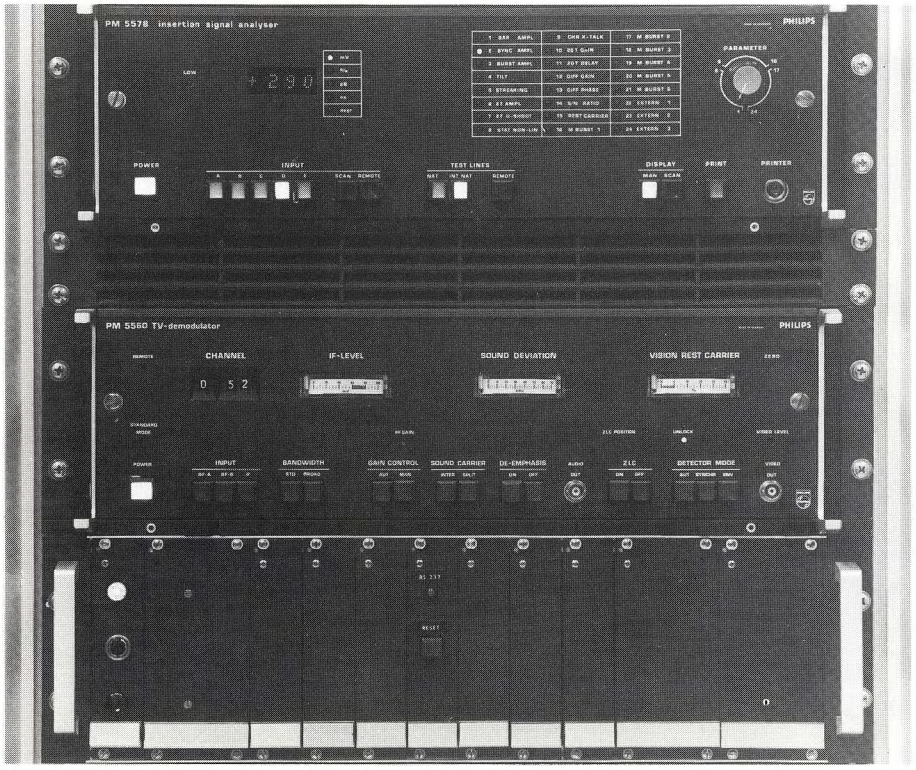
The four EBU ITS lines.



Detail of the vertical blanking interval showing two sets of ITS: the original ones on lines 17 - 18 and re-inserted ITS on lines 19 - 20. The PM 5578 can analyse both sets of lines. →



Auxiliary equipment

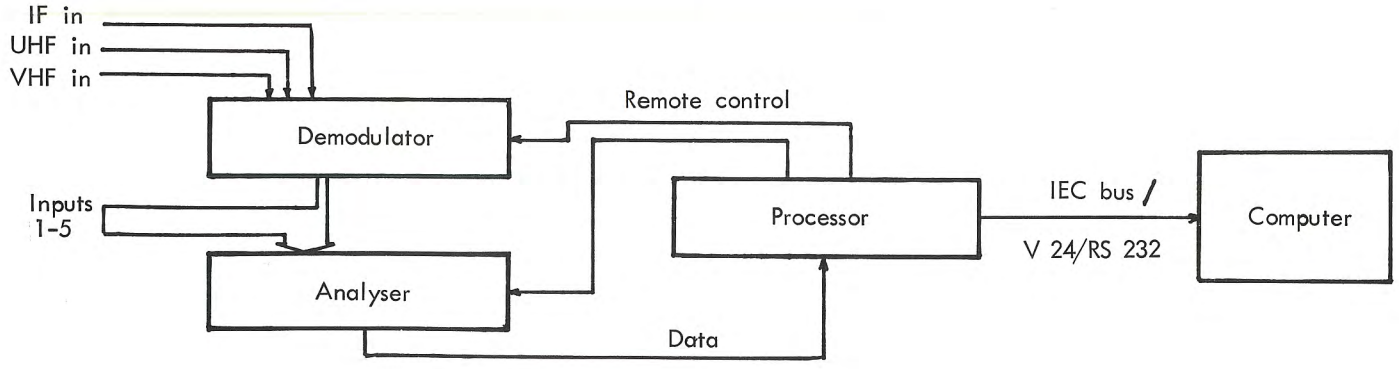


Philips has a full range of equipment for automatic monitoring of television equipment and television networks. Formerly the automatic print-out unit PM 5579 was used. This unit has, however, been superseded by a customer-made processor system.

The processor acts as an interface unit between a standard computer and the the system PM 5560 TV demodulator - PM 5578 ITS analyser. The processor "talks" with the computer via an IEC-bus interface, if the computer is located near the analyser; or via a V 24/RS 232 interface, if the computer is located in a distant monitoring centre. The processor can exercise remote control of the demodulator and the analyser, - functions such as:

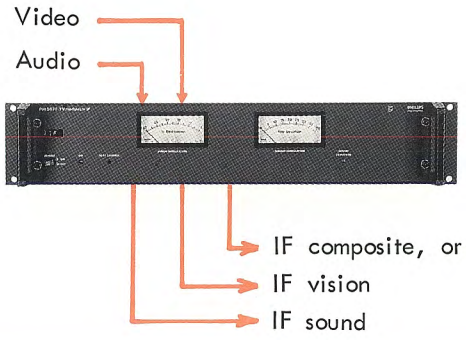
- channel selection of the demodulator
- input selection of the demodulator and the analyser
- other front-panel controls.

For further information contact our project department.

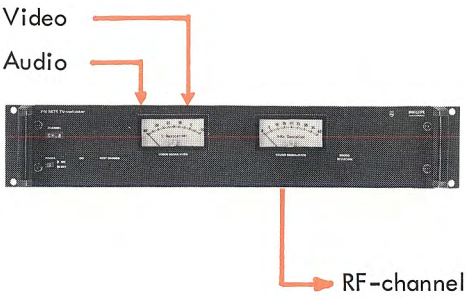


TV modulators

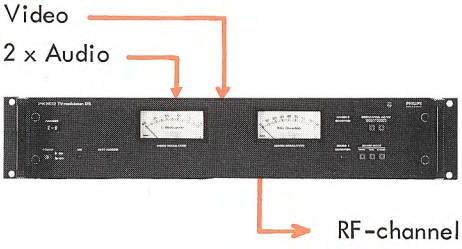
PM 5670 TV modulator, IF
(VSB-t_g)



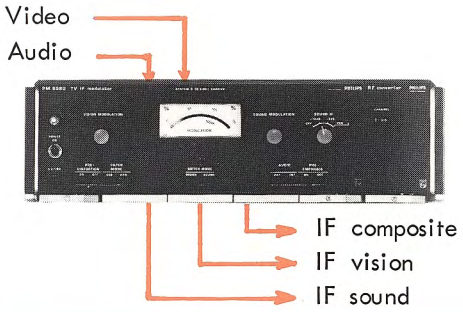
PM 5671 TV modulator
(VSB-t_g)



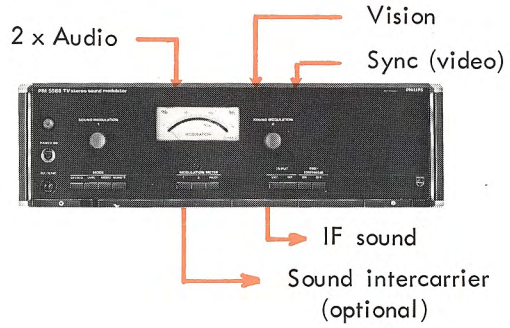
PM 5672 TV modulator, DS
(VSB-t_g-stereo)



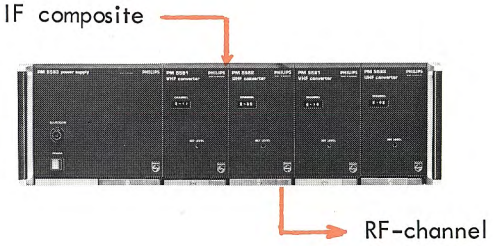
PM 5580 IF modulator
(VSB-DSB-t_g-flat)



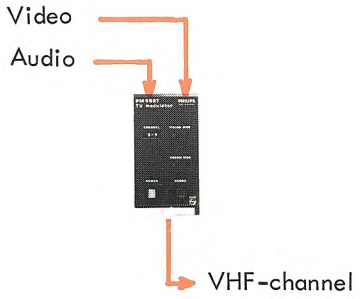
PM 5588 TV stereo modulator



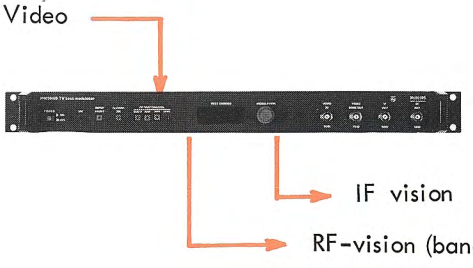
PM 5581/82/83 RF converters



PM 5597 TV modulator
(SVSB-flat)



PM 5669 TV test modulator
(DSB-t_g-flat)



Type no.	Description	
Intro	TV modulation principles	116
	Channel frequencies	117
PM 5670-72	TV modulators	118
PM 5670	TV modulator, IF	122
PM 5671	TV modulator	124
PM 5672	TV modulator, DS (stereo)	126
	TV distribution principles	128
PM 5580	IF modulator	129
PM 5588	TV stereo modulator	135
PM 5597	TV modulator	138
PM 5581-83	RF converters and power supply	139
PM 5669	TV test modulator	142
PM 5560	TV demodulator	146
	Synchronous detection	153
PM 5691-94	Power amplifiers	154

Philips, of course.

TV modulation

PHILIPS PTV produces modulators and RF converters in full conformity with international RF broadcasting standards. However, for testing and less critical distribution applications, PHILIPS PTV provides simpler and less costly equipment.

Carrier harmonics and other spurious products are present in the output of these simpler, tunable modulators which do not filter the modulated signal. Of course modulators with crystal-controlled carriers are tuned to one specific channel. Filters can then be inserted to remove harmonic and spurious content. The PM 5597 modulator contains these filters which also partly suppress the lower side-band of the desired channel (fig.2). This allows several signals to be transmitted simultaneously without mutual disturbance.

The PHILIPS PTV broadcast modulators have highly efficient filters which suppress most of the lower side-band and all components above the upper nominal bandwidth (fig.3). Moreover, PHILIPS PTV broadcast modulators have group delay pre-correction. This pre-correction facility compensates for the group delay distortion of the IF filters in the average TV receiver.

Advanced filtering and double conversion techniques have been applied to PHILIPS PTV top-line PM 5580 IF modulator and PM 5581/82 RF up-converters. These are tunable modulators with both low harmonic and low spurious content.

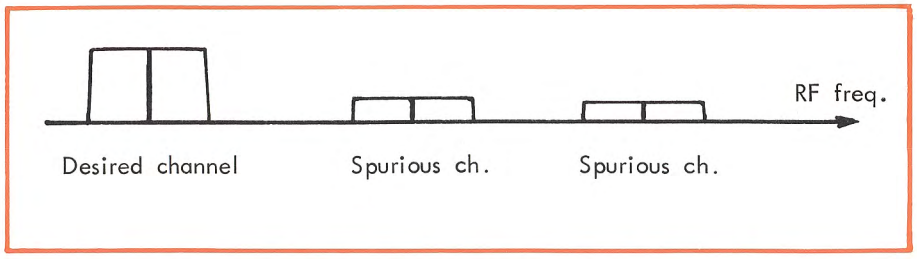


Fig.1. Spectrum of a simple DSB modulator. In addition to the desired channel, harmonic and spurious signals are generated in the spectrum above and sometimes below the desired channel. Such modulators may have excellent modulation characteristics, however, the spurious contents prohibit the use in most professional applications.

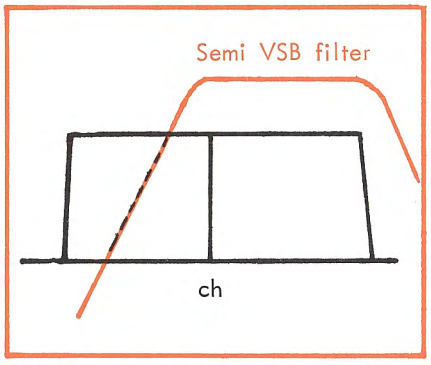


Fig.2. Spectrum of a (crystal-controlled) SDSB modulator. A filter removes the harmonic and spurious signals and partly also the lower side-band. This kind of modulation (semi-DSB) is acceptable in most professional test applications and in cable networks without adjacent channel transmission.

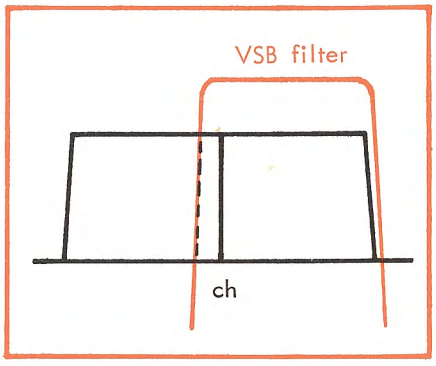


Fig.3. Spectrum of a standard broadcast modulator. Extremely sharp cut-off filters are used to limit the bandwidth to the standard broadcast requirements. Such filters introduce group-delay distortion, which has to be compensated. In addition group-delay pre-correction is mostly included. In practice broadcast modulators utilize the IF principle (intermediate frequency), where modulation and filtering takes place at a fixed frequency, whereafter the IF signal is up-converted to the required RF channel.

Characteristics	TV system										
	B VHF	D VHF	G UHF	H UHF	I V/UHF	K UHF	K_1 V/UHF	L' VHF	L UHF	M V/UHF	N V/UHF
Lines per picture	625	625	625	625	625	625	625	625	625	525	625
Video bandwidth (MHz) (upper side-band)	5.0	6.0	5.0	5.0	5.5	6.0	6.0	6.0	6.0	4.2	4.2
Vestigial side-band (MHz)	0.75	0.75	0.75	1.25	1.25	0.75	1.25	1.25	1.25	0.75	0.75
Vision/sound spacing (MHz)	5.5	6.5	5.5	5.5	6.0	6.5	6.5	6.5	6.5	4.5	4.5
Vision modulation (type and polarity)	AM neg	AM neg	AM neg	AM neg	AM neg	AM neg	AM neg	AM pos	AM pos	AM neg	AM neg
Group delay pre-correction applies	+	(+)	+	+	-	(+)	(+)	-	-	+	+
Sound modulation	FM	FM	FM	FM	FM	FM	FM	AM	AM	FM	FM
Pre-emphasis (µs)	50	50	50	50	50	50	50	-	-	75	75
Channel spacing (MHz)	7	8	8	8	8	8	8	8	8	6	6
Power ratio vision/sound	10:1	2:1-5:1	10:1	5:1-10:1	5:1	2:1-5:1	2:1-5:1	(8:1)	8:1	10:1-4:1	10:1-5:1

Channel frequencies

Channel frequencies for most television systems. Below: VHF band I and band III channels. At the bottom: special cable TV channels. Right: UHF channels. Note: for a given channel the vision carrier frequency for systems I, G, H, K and L is 1.25 MHz higher than the "lower limit" frequency, the sound carrier is X MHz lower than the "upper limit" frequency, where X is 1.25 MHz for systems G, H, 0.75 MHz for system I and 0.25 MHz for system K, L.

	B and C		D		K and K1		M and N	
Channel	Vision	Sound	Vision	Sound	Vision	Sound	Vision	Sound
1			49.75	56.25				
2	48.25	53.75	59.25	65.75			55.25	59.75
3	55.25	60.75	77.25	83.75			61.25	65.75
4	62.25	67.75	85.25	91.75	175.25	181.75	67.25	71.75
5	175.25	180.75	93.25	99.75	183.25	189.75	77.25	81.75
6	182.25	187.75	175.25	181.75	191.25	197.75	83.25	87.75
7	189.25	194.75	183.25	189.75	199.25	205.75	175.25	179.75
8a								
8	196.25	201.75	191.25	197.75	207.25	213.75	181.25	185.75
9	203.25	208.75	199.25	205.75	215.25	221.75	187.25	191.75
10	210.25	215.75	207.25	213.75			193.25	197.75
11	217.25	222.75	215.25	221.75			199.25	203.75
12	224.25	229.75	223.25	229.75			205.25	209.75
13							211.25	215.75
14								

	AUSTRALIA (B)			IRELAND (I)			ITALY (B)	
Ch	Vision	Sound	Ch	Vision	Sound	Ch	Vision	Sound
0	46.25	51.75	IA	45.75	51.75	A	53.75	59.25
1	57.25	62.75	IB	53.75	59.75	B	62.25	67.75
2	64.25	69.75	IC	61.75	67.75	C	82.25	87.75
3	86.25	91.75	ID	175.25	181.25	D	175.25	180.75
4	95.25	100.75	IE	183.25	189.25	E	183.75	189.25
5	102.25	107.75	IF	191.25	197.25	F	192.25	197.75
5a	138.25	143.75	IG	199.25	205.25	G	201.25	206.75
6	175.25	180.75	IH	207.25	213.25	H	210.25	215.75
7	182.25	187.75	IJ	215.25	221.25	L	217.25	222.75
8	189.25	194.75						
9	196.25	201.75						
10	209.25	214.75						
11	216.25	221.75						

	JAPAN (M)		MOROCCO (B)		
Ch	Vision	Sound	Ch	Vision	Sound
J1	91.25	95.75	M4	163.25	168.75
J2	97.25	101.75	M5	171.25	176.75
J3	103.25	107.75	M6	179.25	184.75
J4	171.25	175.75	M7	187.25	192.75
J5	177.25	181.75	M8	195.25	200.75
J6	183.25	187.75	M9	203.25	208.75
J7	189.25	193.75	M10	211.25	216.75
J8	193.25	197.75			
J9	199.25	203.75			
J10	205.25	209.75			
J11	211.25	215.75			
J12	217.25	221.75			

	NEW ZEALAND (B)		SOUTH AFRICA (I)		
Ch	Vision	Sound	Ch	Vision	Sound
1	45.25	50.75	4	175.25	181.25
2	55.25	60.75	5	183.25	189.25
3	62.25	67.75	6	191.25	197.25
4	175.25	180.75	7	199.25	205.25
5	182.25	187.75	8	207.25	213.25
6	189.25	194.75	9	215.25	221.25
7	196.25	201.75	10	223.25	229.25
8	203.25	208.75	11	231.25	237.25
9	210.25	215.75	13	247.43	253.43

Band	Channel*	Vision	Sound	Band	Channel	Vision	Sound
I	S1	69.25	74.75	III	U1/S11	231.25	236.75
I	S2	76.25	81.75	III	U2/S12	238.25	243.75
I	S3	83.25	88.75	III	U3/S13	245.25	250.75
III	M1 /S1	105.25	110.75	III	U4/S14	252.25	257.75
III	M2 /S2	112.25	117.75	III	U5/S15	259.25	264.75
III	M3 /S3	119.25	124.75	III	U6/S16	266.25	271.75
III	M4 /S4	126.25	131.75	III	U7/S17	273.25	278.75
III	M5 /S5	133.25	138.75	III	U8/S18	280.25	285.75
III	M6 /S6	140.25	145.75	III	U9/S19	287.25	292.75
III	M7 /S7	147.25	152.75				
III	M8 /S8	154.25	159.75				
III	M9 /S9	161.25	166.75				
III	M10/S10	168.25	173.75				

S channels in band I are only used in Belgium

SYSTEMS : M, N and Japan		
Chann. No.	Vision carrier MHz	Sound carrier MHz

SYSTEMS : I, G, H, K and L		
Chann. No.	Lower limit MHz	Upper limit MHz
21	470	478
22	478	486
23	486	494
24	494	502
25	502	510
26	510	518
27	518	526
28	526	534
29	534	542
30	542	550
31	550	558
32	558	566
33	566	574
34	574	582
35	582	590
36	590	598
37	598	606
38	606	614
39	614	622
40	622	630
41	630	638
42	638	646
43	646	654
44	654	662
45	662	670
46	670	678
47	678	686
48	686	694
49	694	702
50	702	710
51	710	718
52	718	726
53	726	734
54	734	742
55	742	750
56	750	758
57	758	766
58	766	774
59	774	782
60	782	790
61	790	798
62	798	806
63	806	814
64	814	822
65	822	830
66	830	838
67	838	846
68	846	854
69	854	862
70	862	870
71	870	878
72	878	886
73	886	894
74	894	902
75	902	910
76	910	918
77	918	926
78	926	934
79	934	942
80	942	950
81	950	958

14		471.25	475.75
15		477.25	481.75
16		483.25	487.75
17		489.25	493.75
18		495.25	499.75
19		501.25	505.75
20		507.25	511.75
21		513.25	517.75
22		519.25	523.75
23		525.25	529.75
24		531.25	535.75
25		537.25	541.75
26		543.25	547.75
27		549.25	553.75
28		555.25	559.75
29		561.25	565.75
30		567.25	571.75
31		573.25	577.75
32		579.25	583.75
33		585.25	589.75
34		591.25	595.75
35		597.25	601.75
36		603.25	607.75
37		609.25	613.75
38		615.25	619.75
39		621.25	625.75
40		627.25	631.75
41		633.25	637.75
42		639.25	643.75
43	Japan	645.25	649.75
44		651.25	655.75
45		657.25	661.75
46	45	663.25	667.75
47	46	669.25	673.75
48	47	675.25	679.75
49	48	681.25	685.75
50	49	687.25	691.75
51	50	693.25	697.75
52	51	699.25	703.75
53	52	705.25	709.75
54	53	711.25	715.75
55	54	717.25	721.75
56	55	723.25	727.75
57	56	729.25	733.75
58	57	735.25	739.75
59	58	741.25	745.75
60	59	747.25	751.75
61	60	753.25	757.75
62	61	759.25	763.75
63	62	765.25	769.75
64	Japan	771.25	775.75
65		777.25	781.75
66		783.25	787.75
67		789.25	793.75
68		795.25	799.75
69		801.25	805.75
70		807.25	811.75
71		813.25	817.75
72		819.25	823.75
73		825.25	829.75
74		831.25	835.75
75		837.25	841.75
76		843.25	847.75
77		849.25	853.75
78		855.25	859.75
79		861.25	865.75
80		867.25	871.75
81		873.25	877.75
82		879.25	883.75
83		885.25	889.75

TV modulators

PM 5670/71/72

NEW

PM 5670: IF output
PM 5671: RF channel output
PM 5672: RF channel output, stereo sound



Professional quality with vestigial side-band and group delay pre-correction characteristics

Ideal for low power TV transmitters and distribution systems in TV factories

Separate precision meters for vision and sound modulation

Easy service with plug-in units accessible from the front

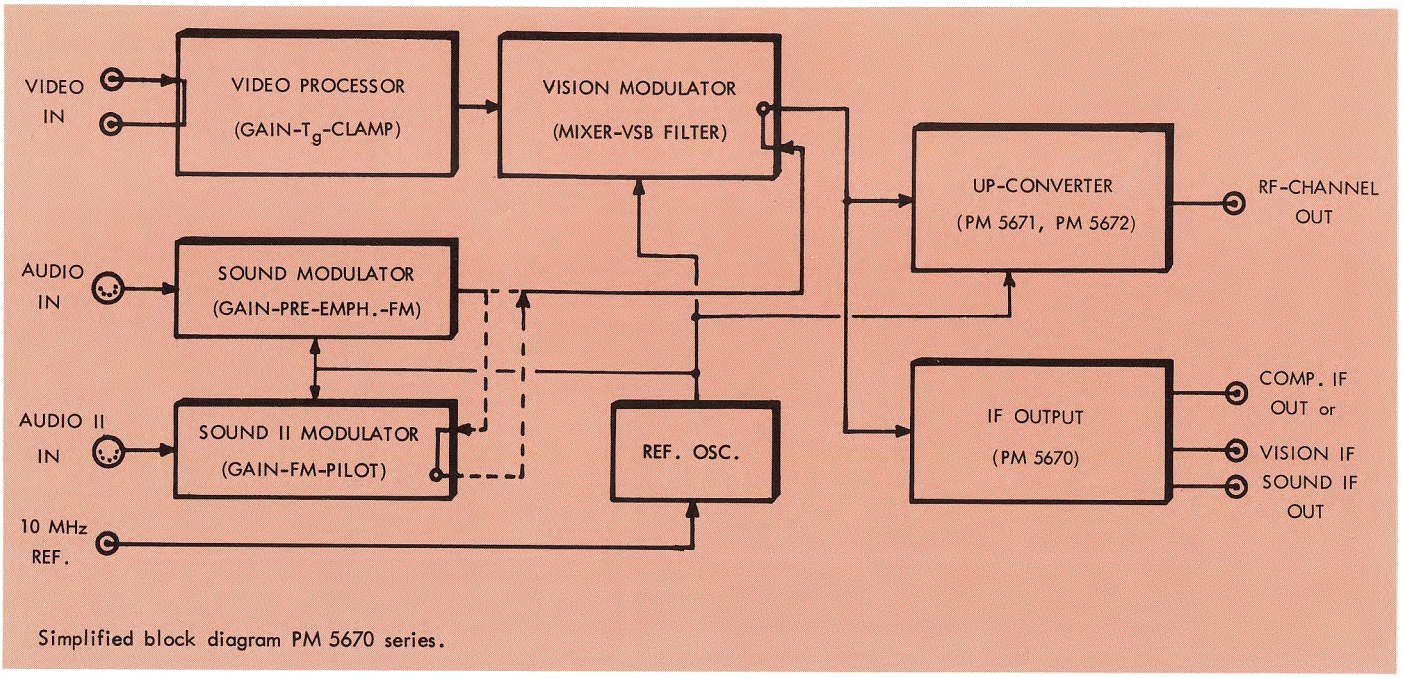
Very low content of harmonics and spurious at output

High stability guaranteed by SAW filters and synthesized carrier generators

External synchronization possible for high precision and common reference applications

The PM 5670 family of TV modulators forms a range of high quality television modulators featuring vestigial side-band characteristics, group delay pre-correction, FM sound modulation and IF or RF channel output on a fixed channel. The modulators are available for most TV systems and for all channels, i.e. from the lowest VHF channel, through the S-channels, up to the highest UHF channels.

High stability and high suppression of spurious signals outside the desired channel are obtained with a combination of a surface-acoustic-wave (SAW) filter in the IF section and band-pass filters in the up-converter section (PM 5671 and 72). These modulators can therefore be used in cable TV systems applying adjacent channel operation. The PM 5670 has the same SAW filter in the IF section, however, an external up-converter is needed to bring the signal into an RF channel.



Simplified block diagram PM 5670 series.

The PM 5672 has two sound modulators which can be used for transmission of two separate audio channels or for stereophonic sound. Two sound carriers are used to transmit the two audio signals (German two-carrier system). This system is officially defined for system B/G, however, any other TV system may use the same principle. For further information about the two-carrier system, see also description of the PM 5588 TV stereo modulator on page 135.

All carriers in the modulators are derived from a common reference oscillator by means of synthesizer circuits. This ensures accurate and stable frequencies, plus the possibility of locking the carriers to an external reference standard. The PM 5670 family has its own built-in crystal reference oscillator which is sufficently accurate for most applications. An optional TCXO (temperature compensated crystal oscillator) can be supplied under the code number PM 8524, when precision carriers are necessary.

Technical description

The three modulators use the same basic circuitry and modules. The PM 5672 has an extra sound modulator and the necessary combiner to generate the composite IF signal. The PM 5670 has an IF output module instead of the RF up-converter module.

The composite video signal is applied to the video processing module via a high impedance looped-through input, so that several modulators can be fed from the same video source. The video signal is amplified to a level corresponding to the required modulation depth and passed through the group-delay pre-correction circuitry, and then finally clamped (back-porch or sync tip) to a fixed dc-level. The modulation depth is displayed on a front panel meter and controlled by a front panel screw-driver control.

The vision modulator module receives the processed video signal and converts it into IF frequency (38.9 or 45.75 MHz). The module contains a synthesizer that generates the vision carrier for the IF mixer. The output signal of the mixer is passed through the VSB (vestigial side-band) filter, which is an oven-controlled SAW filter. SAW filters have very steep filter characteristics, and are very stable (when oven-controlled) and require no re-calibration in their life-time.

The audio signal is applied to the modulator via a DIN socket. The required modulation index (peak frequency deviation) is adjusted from a front panel screw-driver control. A front panel meter indicates the modulation conditions. The sound module includes sound pre-emphasis and an FM modulator that brings the audio signal into an FM modulated sound signal on IF basis. The IF sound carrier is locked to the internal reference signal. The PM 5672 has an extra sound module that includes some additional circuitry for identification of the type of transmission (mono-stereo-dual sound).

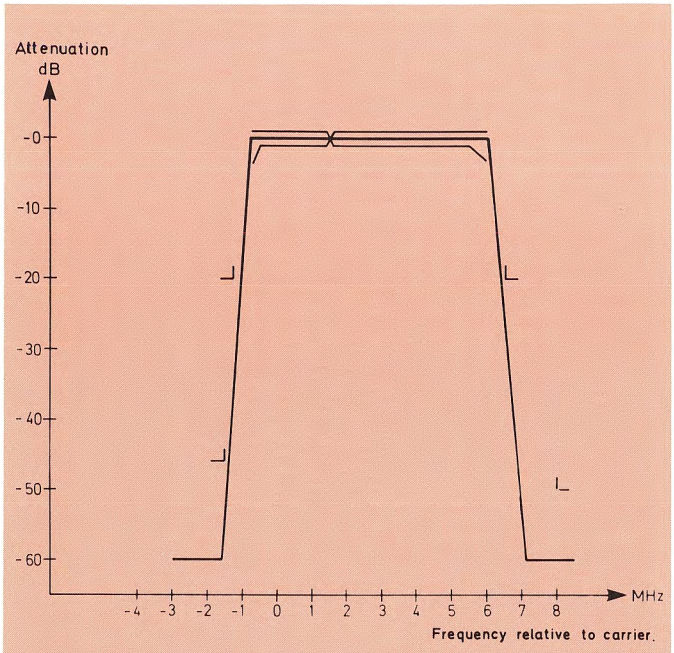
The RF up-converter module (PM 5671 and PM 5672) has a double-balanced mixer and two band-pass filters. The specific output frequency (channel number) is determined by the frequency of the local oscillator of the module. This oscillator is synthesizer controlled by the internal reference frequency. The PM 5671/72 are ordered to a specific TV channel and in general it is not recommended to change channel frequency at a later stage. Frequent channel shifts can best be realized with a set of different up-converters.

Mechanical design

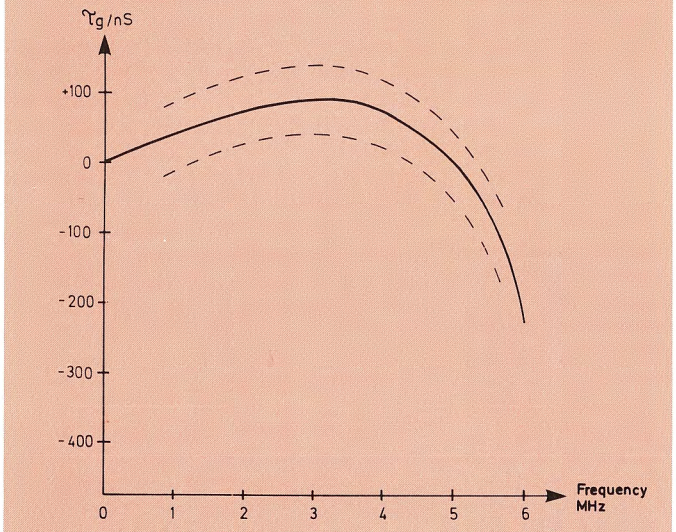
The PM 5670 series consists of a main frame with a mother-board and a number of plug-in units (modules). The mother-board houses the power supply and the 5 MHz reference oscillator. The front panel is hinged to the main frame. When it is lowered, the plug-in units are accessible from the front. This servicefriendly system enables service and repair without having to remove the modulator from the rack.

Technical data

The technical data of the three modulators are listed in the following sections, however, the amplitude response and the group delay characteristics, which are the same for all three types, are shown on the following two pages.

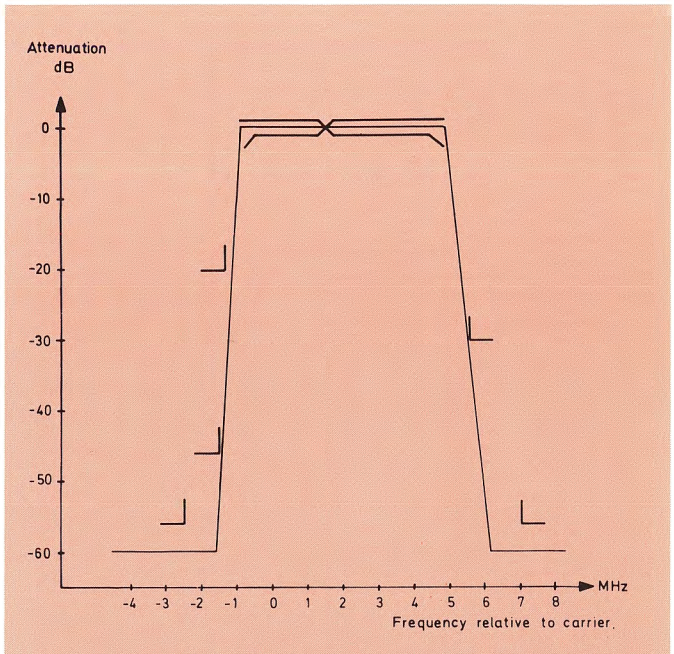


Frequency/MHz	<-1.5	-1.5	-1.25	-0.75	-0.5	1.5	5.5	6	6.5	8	>8
Attenuation/dB	-60	<-46	<-20	0^{+1}_{-4}	0±1	0	0±1	0^{+1}_{-3}	<-20	<-50	-60

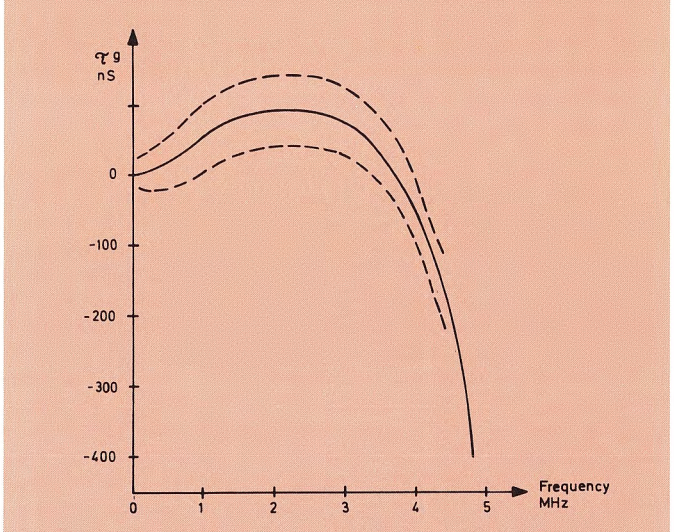


Video frequency/MHz	0	1	2	3	4	5	5.5	6
Group delay/nS	0	40±50	75±50	90±50	70±50	0±50	-80±50	-225

Nominal amplitude and group delay response plus tolerances for system D/K.

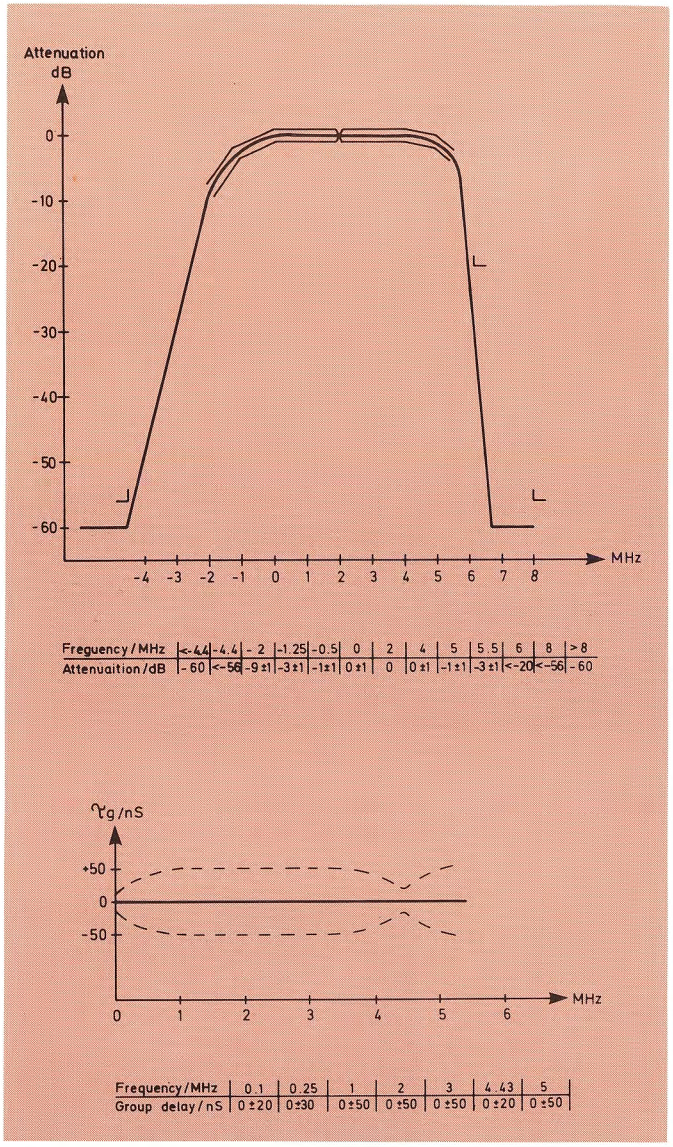


Frequency/MHz	<-2.5	-2.5	-1.5	-1.25	-0.75	-0.5	+1.5	+4.5	+4.8	+5.5	+7	>+7
Attenuation/dB	-60	<-56	<-46	<-20	0^{+1}_{-3}	0^{+1}_{-1}	0	0^{+1}_{-1}	0^{+1}_{-3}	<-30	<-56	-60



Frequency/ MHz	.1	.25	1	2	3	3.75	4.43	4.8
Group delay/nS	0	+5	+53	+90	+75	0	-170	-400
Tolerance/nS	±20	±30	±50	±50	±50	±50	±20	–

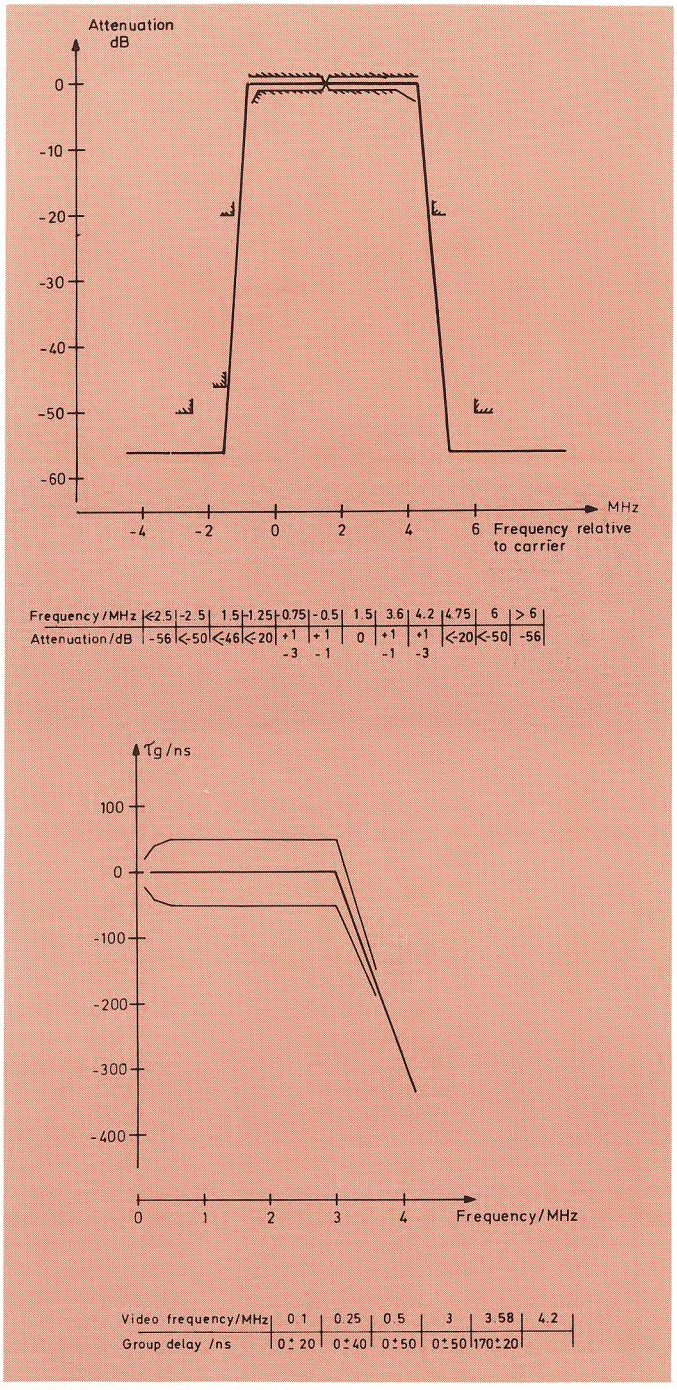
Nominal amplitude and group delay response plus tolerances for system B/G.



Freguency / MHz	<-4.4	-4.4	-2	-1.25	-0.5	0	2	4	5	5.5	6	8	>8
Attenuaition / dB	-60	<-56	-9±1	-3±1	-1±1	0±1	0	0±1	-1±1	-3±1	<-20	<-56	-60

Frequency / MHz	0.1	0.25	1	2	3	4.43	5
Group delay / nS	0±20	0±30	0±50	0±50	0±50	0±20	0±50

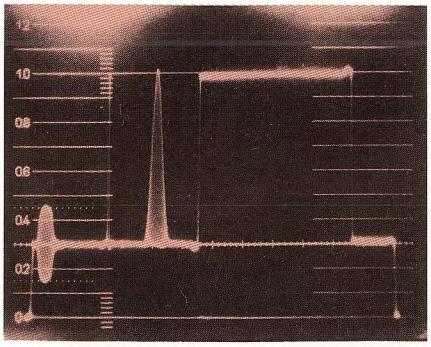
Nominal amplitude and group delay response plus tolerances for system I.



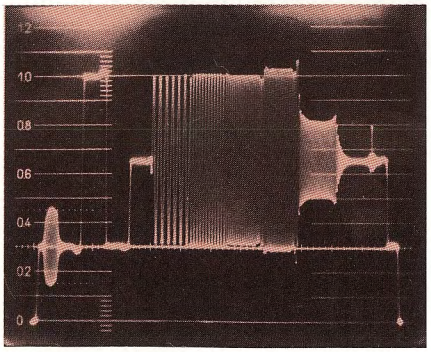
Frequency / MHz	<2.5	-2.5	1.5	-1.25	0.75	-0.5	1.5	3.6	4.2	4.75	6	> 6
Attenuation / dB	-56	<-50	<46	<20	+1 -3	+1 -1	0	+1 -1	+1 -3	<-20	<-50	-56

Video frequency/MHz	0.1	0.25	0.5	3	3.58	4.2
Group delay /ns	0±20	0±40	0±50	0±50	170±20	

Nominal amplitude and group delay response plus tolerances for system M.



CCIR line 17 signal modulated with PM 5671 and demodulated with precision demodulator PM 5560.



CCIR line 18 signal modulated with PM 5671 and demodulated with precision demodulator PM 5560.

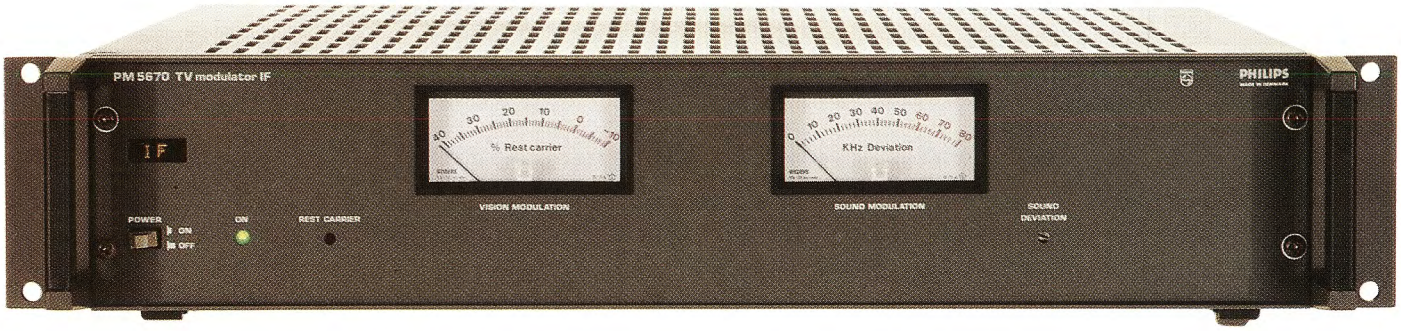
←

TV modulator, IF

PM 5670

NEW

Code no. PM 5670:
9449 056 70502 (D/K-version, 38.9 MHz IF)
9449 056 70003 (B/G-version, 38.9 MHz IF)
9449 056 70505 (I-version, 38.9 MHz IF)
9449 056 70008 (M-version, 45.75 MHz IF)
9449 056 70508 (M-version, 38.9 MHz IF)



Separate vision and sound IF outputs or combined vision/sound IF output

Ideal as modulator module for TV transmitters

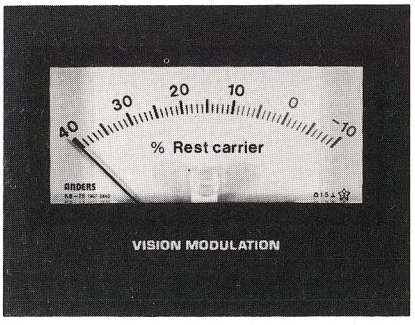
All carriers derived from internal or external 10 MHz reference signal

Applications

The PM 5670 TV modulator, IF is designed for TV factory distribution systems, and for low-power transmitters. The low content of harmonic and spurious signals and the effective SAW filter ensure that many modulators can be combined into a large system without mutual disturbance, even when adjacent channels are used in the distribution system. The feature of external reference makes it possible to synchronize all modulators in the system. This minimizes the visibility of interference in the receivers caused by intermodulation in the tuner and insufficient selectivity. The PM 5670 is preferred to the PM 5671, which has built-in up-converter, when a test signal is used on several TV channels. In this case one IF modulator and several separate up-converters are more cost effective than a number of RF modulators. Obviously PM 5670 is the choice, when TV signals are needed at IF frequency for test and aligment of the IF part of TV sets and video cassette recorders.

The small size, low power consumption and easy service of the PM 5670 make life easier for the system builder and system operator. The large modulation meters facilitates visual monitoring of the modulation conditions and operational status. Only essential controls are brought to the front panel, and most of them are screwdriver controls.

These characteristics are also important for the use of PM 5670 in TV transmitters. Depending on the type of transmitter, the PM 5670 can supply either combined or separate IF signal(s). Philips has more advanced modulators for that kind of applications, however, for transmitters serving only a small audience, the PM 5670 offers satisfactory transmission quality plus perhaps a better reliability and stability than the bigger, more complex broadcast modulators. Many efforts have been spent in minimizing the amount of circuitry and selecting the most reliable components, in order to achieve high reliability. High stability and accuracy are obtained by, amongst others, oven-control of the SAW filter, which in itself needs no alignment or re-calibration in its life-time. Easy service and repair is obtained with the plug-in system and the hinged front panel.



Vision modulation meter (rest carrier). The meter has suppressed zero point (corresponding to 100% rest carrier) in order to allow accurate setting of the modulation (typically 20-10%). Overmodulation, less than 10% rest carrier, is indicated with red scale marks.



Sound modulation meter (deviation). The scale has red marks for overmodulation (50 kHz for B/K, B/G and I-systems, 25 kHz for system M).

TECHNICAL DATA

Input signals

VIDEO — Type of signal: composite video. Input level: 1 Vpp ± 3 dB, max. hum 100% or 1 Vpp. Input impedance: high ohmic looped-through (75 Ω base). Return loss (terminated): > 34 dB up to 7 MHz. DC restoration: clamping at blanking level or sync bottom level by internal selection.

AUDIO — Type of signal: balanced. Input level: 0 dBm = 775 mVrms. Input impedance: 600 Ω. Input connector: DIN 5-pole.

EXTERNAL REFERENCE — Frequency: 10 MHz. Input level: 100 mVrms. Input impedance: 50 Ω. Input connector: BNC.

Output

IF OUTPUT — Type of signals: combined vision/sound IF signal, or separate vision IF signal and sound IF signal (by internal selection). Vision IF frequency: 38.9 MHz (all versions), 45.75 MHz (M-version only). Output level combined output: 1 Vrms. Sound/vision ratio: - 10 dB (adjustable - 7 to - 20 dB). Output level vision IF output: 1 Vrms. Output level sound IF output: 0.316 Vrms (- 10 dB referred to vision output, adjustable). Output impedance: 50Ω. Return loss: VSWR < 1.2. Type of connectors: BNC.

Carrier data

VISION — IF carrier: 38.9 MHz (all versions) plus 45.75 MHz (M-version). Frequency accuracy: derived from the internal or external 10 MHz reference frequency by a synthesizer circuit.

SOUND — Sound IF carrier: 32.4 MHz (D/K-version) 33.4 MHz (B/G-version), 32.9 MHz (I-version), 34.4 or 41.25 MHz (M-versions). Frequency accuracy: the center frequency of the sound FM modulator is locked to the internal or external 10 MHz reference frequency by a synthesizer circuit. The sound carrier may be switched off with a selector located behind the front panel.

INTERNAL REFERENCE — Standard oscillator: 5 MHz crystal. Accuracy: ± 100 ppm (part per million). Ageing: ± 10 ppm per year. Temperature coefficient: ± 1 ppm per °K. Precision oscillator (optional): 10 MHz Temperature Compensated Crystal Oscillator (TCXO). Accuracy: ± 2 ppm absolute. Ageing: ± 1 ppm per year. Temperature coefficient: ± 0.01 ppm per °K.

EXTERNAL REFERENCE — For high precision applications and for phase locked cable TV systems, the carriers of the modulator can be controlled by an external reference. Frequency: 10 MHz or 5 MHz continuous waves (CW). Waveform: sinusoidal (not critical).

Modulation characteristics

VISION MODULATION — Type of modulator: double-balanced AM, negative modulation. Amplitude response: basically within ± 1 dB (see tolerance profiles for the relevant TV system).* Group delay response: basically within ± 50 ns (see response curve and tolerance profiles for the relevant TV system).* Deviating response curves are made on request.
Distortions (measured with precision demodulator): field time tilt < 2%, line time tilt < 2%, 2 T bar overshoot < 5%, 2 T pulse to bar ratio <± 5%, 2 T K-factor < 2%, chrominance/luminance gain inequality <± 5%, chrominance/luminance delay inequality <± 20 ns. Differential gain (5-riser staircase with 280 mV/40 IRE chroma) < 4%. Differential phase < 2°. Luminance non-linearity (5-riser staircase) < 5%. Chrominance/luminance intermodulation < 3%. Sync compression < 5%.
Noise and disturbances (relative to demodulated bl/wh level: signal to noise ratio: > 55 dB unweighted (~62 dB weighted). Periodic disturbances: < - 55 dB pp. Harmonics and other spurious signals (referred to sync peak level): < - 66 dB. Adjacent channel suppression: < 50 dB.

SOUND MODULATION — Type of modulator: voltage controlled oscillator (VCO) with synthesizer control, FM modulation. Amplitude response: within ± 1 dB (30 Hz - 15 kHz. Pre-emphasis: 50 µs (75 µs for system M), switchable by internal selection. Distortion: < 1%. Signal to noise ratio: > 60 dB weighted.

* see pages 120/121

Front panel controls and indicators

- Power on/off.
- Vision modulation: rest carrier (screw driver control).
- Sound modulation: peak deviation (screw driver control).
- Power on indicator (green).
- Vision modulation meter (40% to - 10% rest carrier, accuracy: 2% of fsd).
- Sound modulation meter (0-75 kHz (M: 0-50) peak deviation, accuracy: 2% of fsd).

Power requirements

Voltage: 100/120/220/240 V + 10% - 15%. Frequency: 48-65 Hz. Consumption: 25 W.

Environmental conditions

Operating temperature: 5-45 °C ambient. Storage temperature: - 30 to + 70°C. Climatic class: C1. Mechanical class: M1. Supply class: S2.

Safety and EMI

Safety: in accordance with IEC 348 class 1. Electro-magnetic interference: in accordance with CISPR 11 and 14.

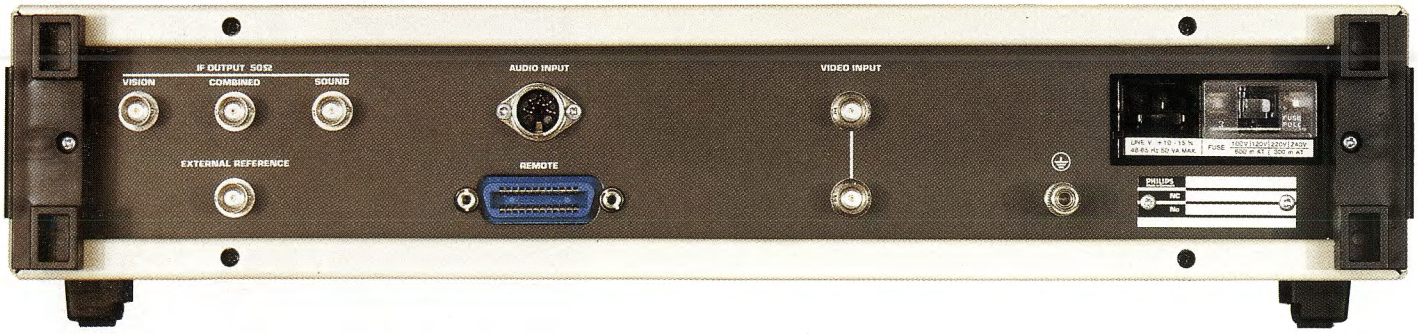
Mechanical data

19" rack/table cabinet, 2 rack units high.
Height : 88 mm
Width : 440 mm (excl. brackets)
Depth : 430 mm
Weight : 7.5 kg

The cabinet has handles and rackmount brackets (integral part of cabinet) as well as rubber feet and a tilt bracket (removable). When rack mounted, improved air circulation through the instrument can be obtained by removal of the top and bottom plates.

Option

PM 8524 TCXO (temperature controlled crystal oscillator). Frequency: 10.000 MHz. Accuracy: 0.25 ppm (25°C - 40°C), 0.50 ppm (10°C - 50°C). Ageing: < 0.1 ppm/month.



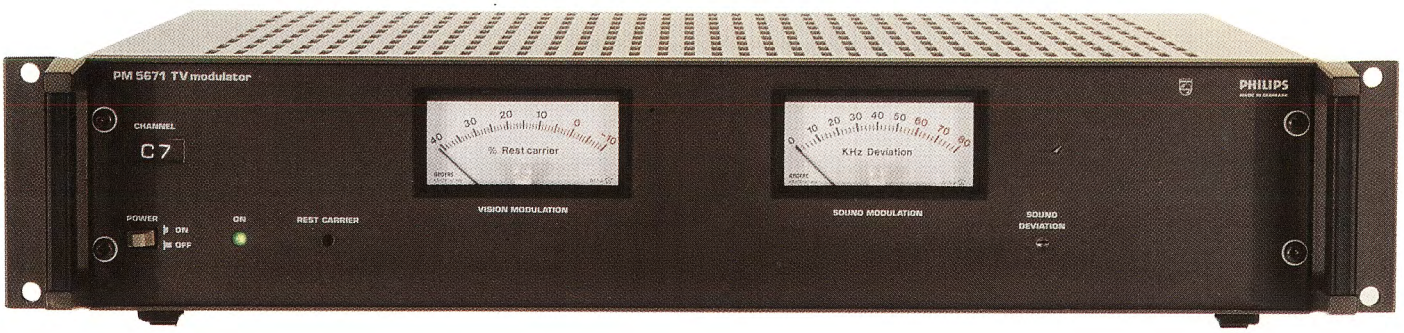
TV modulator

PM 5671

NEW

Code no. PM 5671:
9449 056 71502 (D/K-version)
9449 056 71003 (B/G-version)
9449 056 71505 (I-version)
9449 056 71508 (M-version)

Ordering: The PM 5671 is supplied fully adjusted to a specific TV channel. Channel no. or vision/sound frequencies as well as TV system therefore must be specified at the time of ordering.



Combined IF modulator and up-converter in a single unit

Very low content of harmonics and spurious signals at output

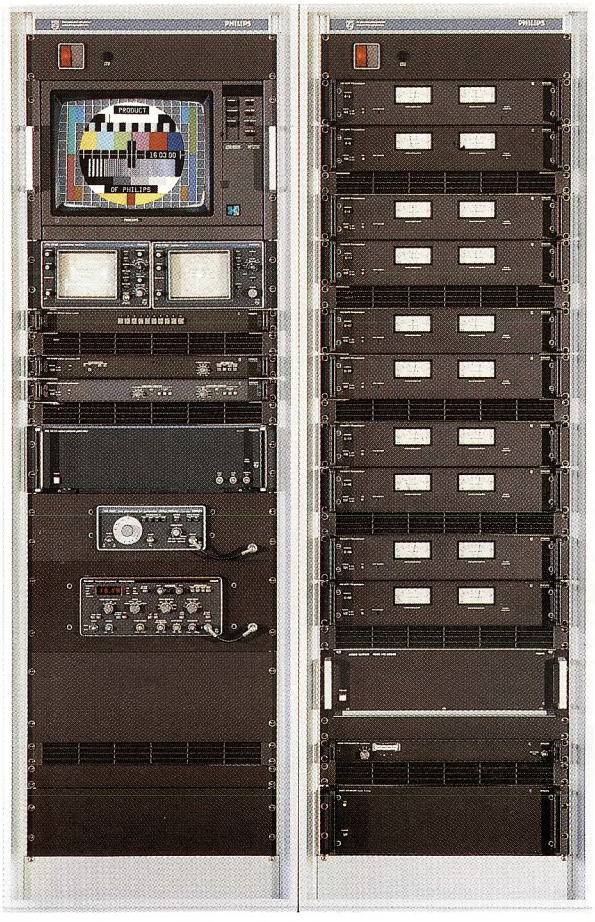
Small size, low weight and low power consumption

Applications

The PM 5671 TV modulator is designed for television distribution systems, such as cable TV systems, large closed-circuit systems, TV factory systems, and for low-power transmitters. The low content of harmonic and spurious signals and the effective SAW filter ensure that many modulators can be combined into a large system without mutual disturbance, even when adjacent channels are used. The feature of external reference makes it possible to lock all modulators in the system. This minimizes the visibility of interference in the receivers caused by intermodulation in the tuner and insufficient selectivity.

The small size, low power consumption and easy service of the PM 5671 make life easier for the system builder and system operator. The large modulation meters facilitates visual monitoring of the modulation conditions and operational status. Only essential controls are brought to the front panel, and all of them are screw-driver controls.

Great care has been taken to design a product with high reliability and high stability, important factors for large operational systems.



Right: typical "transmitter" for a medium-large TV factory, having 4 VHF and 6 UHF channels.

TECHNICAL DATA

Input signals

VIDEO — Type of signal: composite video. Input level: 1 Vpp ± 3 dB, max. hum 100% or 1 Vpp. Input impedance: high ohmic looped-through (75 Ω base). Return loss (terminated): > 34 dB up to 7 MHz. DC restoration: clamping at blanking level or sync bottom level by internal selection.

AUDIO — Type of signal: balanced. Input level: 0 dBm = 775 mVrms. Input impedance: 600 Ω. Input connector: DIN 5-pole.

EXTERNAL REFERENCE — Frequency: 10 MHz. Input level: 100 mVrms. Input impedance: 50 Ω. Input connector: BNC.

Output

RF CHANNEL — Type of signal: combined vision and sound RF at channel frequency, VHF or UHF. Frequency range: 45 - 890 MHz.
Note: the channel frequency cannot be changed after final factory adjustment. Channel shift is accomplished with insertion of a new up-converter unit. For IF frequencies order type no. PM 5670. Output level: max. 200 mVrms (sync peak level, adjustable). Sound/vision carrier ratio: -10 dB (adjustable between -7 and -20 dB). Output impedance: 75 Ω (50 Ω on request). Return loss: VSWR < 2 over the channel (7 MHz). Output connector: BNC. Output attenuator range: 0 - 14 dB.

Carrier data

VISION — Internal vision IF carrier: 38.9 MHz (always). Frequency accuracy: derived from the internal or external 10 MHz reference by synthesizer circuit. RF vision carrier: determined by local oscillator in up-converter unit. Local oscillator accuracy: derived from the internal or external reference by synthesizer circuit.

SOUND — Internal sound IF carrier: 33.4 MHz (B/G-version), 32.9 MHz (I-version), 32.4 MHz (D/K-version), 34.4 MHz (M-version). Frequency accuracy: the mean frequency is locked to the internal or external 10 MHz reference by synthesizer circuit. RF sound carrier: follows vision IF (see above). The sound carrier may be switched off by internal selection.

INTERNAL REFERENCE — Standard oscillator: 5 MHz crystal. Accuracy: ± 100 ppm (part per million). Ageing: ± 10 ppm per year. Temperature coefficient: ± 1 ppm per °K. Precision oscillator (optional): 10 MHz Temperature Compensated Crystal Oscillator (TCXO). Accuracy: ± 2 ppm absolute. Ageing: ± 1 ppm per year.

EXTERNAL REFERENCE — For high precision applications and for phase locked cable TV systems, the carriers of the modulator can be controlled by an external reference. Frequency: 10 MHz or 5 MHz continuous waves (CW). Waveform: sinusoidal (not critical).

Modulation characteristics

VISION MODULATION — Type of modulator: double-balanced AM, negative modulation. Amplitude response: basically within ± 1 dB (see tolerance profiles for the relevant TV system).* Group delay response: basically within ± 50 ns (see response curve and tolerance profiles for the relevant TV system).* Deviating response curves are made on request.
Distortions (measured with precision demodulator): field time tilt < 2%, line time tilt < 2%, 2 T bar overshoot < 5%, 2 T pulse to bar ratio <± 5%, 2 T K-factor < 2%, chrominance/luminance gain inequality <± 5%, chrominance/luminance delay inequality <± 20 ns. Differential gain (5-riser staircase with 280 mV/40 IRE chroma) < 4%. Differential phase < 2°. Luminance non-linearity (5-riser staircase) < 5%. Chrominance/luminance intermodulation < 3%.
Noise and disturbances (relative to demodulated bl/wh level: signal to noise ratio: > 55 dB unweighted (~62 dB weighted). Periodic disturbances: < - 55 dB pp.
Harmonics and other spurious signals (referred to sync peak level): < - 66 dB.
Adjacent channel suppression: < 50 dB.

SOUND MODULATION — Type of modulator: voltage controlled oscillator (VCO) with synthesizer control, FM modulation. Amplitude response: within ± 1 dB (30 Hz - 15 kHz. Pre-emphasis: 50 µs (75 µs for system M), switchable by internal selection. Distortion: < 1%. Signal to noise ratio: > 60 dB weighted.

* see pages 120/121

Front panel controls and indicators

- Power on/off.
- Vision modulation: rest carrier (screw driver control).
- Sound modulation: peak deviation (screw driver control).
- Power on indicator (green).
- Vision modulation meter (40% to - 10% rest carrier, accuracy: 2%).
- Sound modulation meter (0-75 kHz (M: 0-50) peak deviation, accuracy: 2% of fsd).

Power requirements

Voltage: 100/120/220/240 V + 10% - 15%.
Frequency: 48-65 Hz. Consumption: 25 W.

Environmental conditions

Operating temperature: 5-45 °C ambient. Storage temperature: - 30 to + 70°C. Climatic class: C1. Mechanical class: M1. Supply class: S2.

Safety and EMI

Safety: in accordance with IEC 348 class 1. Electro-magnetic interference: in accordance with CISPR 11 and 14.

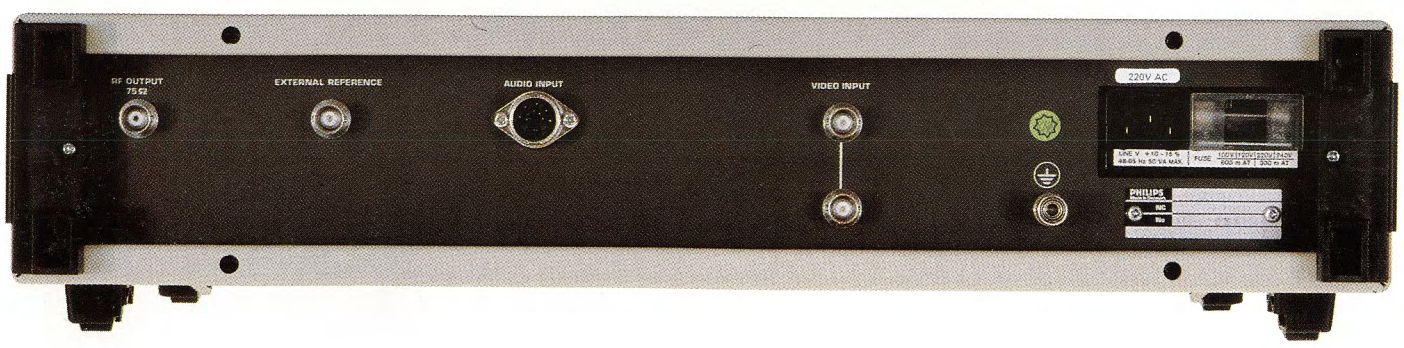
Mechanical data

19" rack/table cabinet, 2 rack units high.
Height : 88 mm
Width : 440 mm (excl. brackets)
Depth : 430 mm
Weight : 7.5 kg

The cabinet has handles and rackmount brackets (integral part of cabinet) as well as rubber feet and a tilt bracket (removable). When rack mounted, improved air circulation through the instrument can be obtained by removal of the top and bottom plates.

Option

PM 8524 TCXO (temperature controlled crystal oscillator). Frequency: 10.000 MHz. Accuracy: 0.25 ppm (25°C - 40°C), 0.50 ppm (10°C - 50°C). Ageing: < 0.1 ppm/month.



TV modulator, DS (dual sound)

PM 5672

NEW

Code no. PM 5672:
9449 056 72003 (B/G-version, German two-carrier system)
Two-carrier system for other TV systems on request

Ordering: The PM 5672 is supplied fully adjusted to a specific TV channel. Channel no. or vision/sound frequencies as well as TV system therefore must be specified at the time of ordering.



Self-contained sound modulator for 2-channel/stereo transmission

Ideal for final test of TV receivers with 2-channel/stereo reproduction facilities

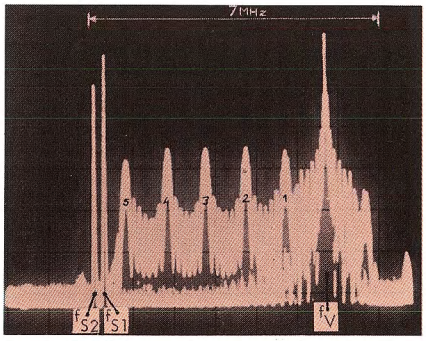
In conformity with German broadcast service

Applications

The PM 5672 TV modulator with two-channel/stereo sound is designed for television distribution systems, such as cable TV systems, large closed-circuit systems, TV factory systems, and for low-power transmitters. The low content of harmonic and spurious signals and the effective SAW filter ensure that many modulators can be combined into a large system without mutual disturbance, even when adjacent channels are used. The feature of external reference makes it possible to synchronize all modulators in the system. This minimizes the visibility of interference in the receivers caused by intermodulation in the tuner and insufficient selectivity.

The small size, low power consumption and easy service of the PM 5672 make life easier for the system builder and system operator. The large modulation meters facilitates visual monitoring of the modulation conditions and operational status. Only essential controls are brought to the front panel, and most of them are screwdriver controls.

In order to reduce heat, and thereby improve the reliability of the modulators, it is recommended to insert a number of air-flow units (type no. PM 9799) in the rack when many modulators are stacked. In this way forced air cooling of large systems is avoided.



Spectrum of a television signal with two-carrier sound. The vision carrier is modulated with a multiburst signal and the two two sound carriers are modulated with 1 kHz audio. Because the signal is on IF base the signal components are from left to right: sound carrier 2, sound carrier 1, multiburst 5 to 1 MHz, and vision carrier.

TECHNICAL DATA

Input signals

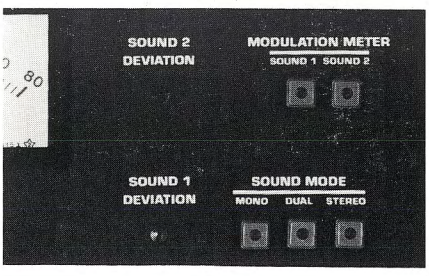
VIDEO — Type of signal: composite video. Input level: 1 Vpp ± 3 dB, max. hum 100% or 1 Vpp. Input impedance: high ohmic looped-through (75 Ω base). Return loss (terminated): > 34 dB up to 7 MHz. DC restoration: clamping at blanking level or sync bottom level by internal selection.

AUDIO — Type of signals: balanced. Input level: 0 dBm (775 mVrms). Input impedance: 600 Ω. Input connectors: 2 x DIN 5-pole.

EXTERNAL REFERENCE — Frequency: 10 MHz. Input level: 100 mVrms. Input impedance: 50 Ω. Input connector: BNC.

Output

RF CHANNEL — Type of signal: combined vision and sound RF at channel fre-



quency, VHF or UHF. Frequency range: 45 - 890 MHz.
Note: the channel frequency cannot be changed after final factory adjustment. Channel shift is accomplished with insertion of a new up-converter unit. For IF frequencies order type no. PM 5670. Output level: max. 200 mVrms (sync peak level, adjustable). Sound/vision carrier ratio: -13 dB and -20 dB resp. referred to vision carrier level (adjustable). Output impedance: 75 Ω (50 Ω on request). Return loss: VSWR < 2 over the full channel (7 MHz). Output connector: BNC. Output attenuator range: 0-14 dB.

Carrier data

VISION — Internal vision IF carrier: 38.9 MHz (always). Frequency accuracy: derived from the internal or external 10 MHz reference by synthesizer circuit. RF vision carrier: determined by local oscillator in up-converter unit. Local oscillator accuracy: derived from the internal or external reference by synthesizer circuit.

SOUND — Internal sound IF carriers: 33.400 MHz and 33.157 812 5 MHz. Frequency accuracy: derived from the horizontal line frequency by means of synthesizer circuits. The sound carriers may be switched off for measuring purposes (internal selectors). The PM 5672 is prepared for dual sound/stereo sound operation for TV systems D/K, I and M.

PILOT CARRIER — Frequency: 54.687 5 kHz (corresponding to 3.5 times the horizontal line frequency). The pilot carrier is modulated with a 117.5 Hz tone (stereo mode) or a 274.1 Hz tone (dual sound mode) and added to the audio signal modulating the second sound carrier (33.158 MHz).

STEREO MODE — Matrixing and modulation: the 33.400 MHz IF carrier is modulated with half the sum of the left and the right audio signals ((input I + input II)/2), and the 33.158 MHz IF carrier is modulated with the right signal (input II) plus the pilot carrier with 117.5 Hz tone.

DUAL SOUND MODE — Modulation: the 33.400 MHz IF carrier is modulated with the input I audio signal, and the 33.158 MHz IF carrier is modulated with the input II audio signal plus the pilot carrier with 274.1 Hz tone.

MONO SOUND MODE — Modulation: the 33.400 MHz IF carrier is modulated with the input I audio signal.

INTERNAL REFERENCE — Standard oscillator: 5 MHz crystal. Accuracy: ± 100 ppm (part per million). Ageing: ± 10 ppm per year. Temperature coefficient: ± 2 ppm per °K. Precision oscillator (optional): 10 MHz Temperature Compensated Crystal Oscillator (TCXO). Accuracy: ± 2 ppm absolute. Ageing: ± 1 ppm per year. Temperature coefficient: ± 0.02 ppm per °K.

EXTERNAL REFERENCE — For high precision applications and for phase locked cable TV systems, the carriers of the modulator can be controlled by an external reference. Frequency: 10 MHz or 5 MHz continuous waves (CW). Waveform: sinusoidal (not critical).

Modulation characteristics

VISION MODULATION — Type of modulator: double-balanced AM, negative modulation. Amplitude response: basically within ± 1 dB (see tolerance profile). Group delay response: basically within 50 ns (see tolerance profile).* Deviating response curves are made on request.
Distortions (measured with precision demodulator): field time tilt < 2%, line time tilt < 2%, 2 T bar overshoot < 5%, 2 T pulse to bar ratio <± 5%, 2 T K-factor < 2%, chrominance/luminance gain inequality <± 5%, chrominance/luminance delay inequality <± 20 ns. Differential gain (5-riser staircase with 280 mV/40 IRE chroma) < 4%. Differential phase < 2°. Luminance non-linearity (5-riser staircase) < 5%. Chrominance/luminance intermodulation < 3%. Sync compression < 5%.
Noise and disturbances (relative to demodulated bl/wh level: signal to noise ratio: > 55 dB unweighted (~62 dB weighted). Periodic disturbances: < - 55 dB pp. Harmonics and other spurious signals (referred to sync peak level): < - 66 dB. Adjacent channel suppression: < 50 dB.

SOUND MODULATION — Type of modulators: voltage controlled oscillator (VCO) with synthesizer control, FM modulation. Amplitude response: within ± 1 dB (30 Hz - 15 kHz). Pre-emphasis: 50 µs. Distortion: < 1%. Signal to noise ratio: > 60 dB weighted. Cross-talk between channels in stereo mode: < - 40 dB. Cross talk between channels in dual sound mode: < - 60 dB. Nominal modulation audio: ± 50 kHz deviation. Nominal modulation pilot carrier: ± 2.5 kHz deviation. Modulation of pilot carrier: 50% AM.

Front panel controls and indicators

- Power on/off.
- Vision modulation: rest carrier (screw driver control).
- Sound modulation: peak deviation (screw driver control).
- Power on indicator (green).
- Vision modulation meter (40% to - 10% rest carrier, accuracy: 2% of fsd).
- Sound modulation meter (0-75 kHz (M: 0-50) peak deviation, accuracy: 2% of fsd).
- Sound modulation meter selector (sound 1, sound 2).
- Sound mode selector: mono, dual or stereo.

Power requirements

Voltage: 100/120/220/240 V + 10% - 15%. Frequency: 48-65 Hz. Consumption: 25 W.

Environmental conditions

Operating temperature: 5-45 °C ambient. Storage temperature: - 30 to + 70°C. Climatic class: C1. Mechanical class: M1. Supply class: S2.

Safety and EMI

Safety: in accordance with IEC 348 class 1. Electro-magnetic interference: in accordance with CISPR 11 and 14.

Mechanical data

19" rack/table cabinet, 2 rack units high.
Height : 88 mm
Width : 440 mm (excl. brackets)
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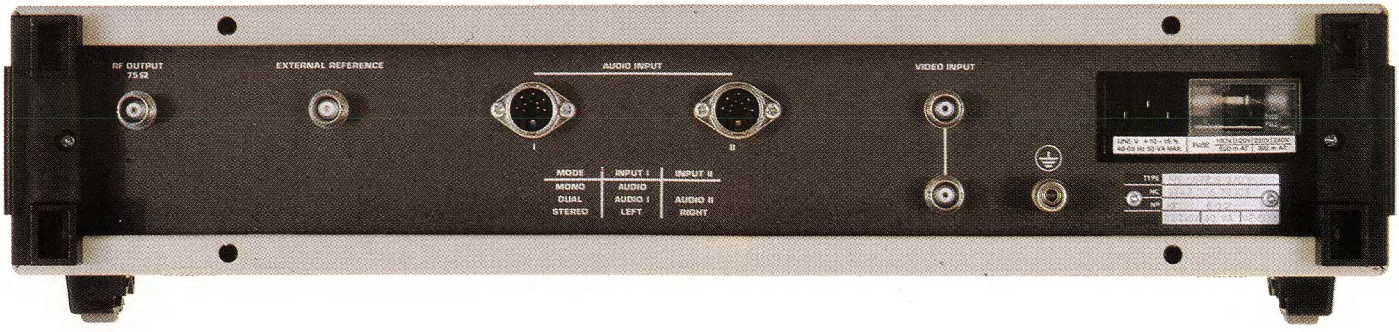
The cabinet has handles and rackmount brackets (integral part of cabinet) as well as rubber feet and a tilt bracket (removable). When rack mounted, improved air circulation through the instrument can be obtained by removal of the top and bottom plates.

Option

PM 8524 TCXO (temperature controlled crystal oscillator). Frequency: 10.000 MHz. Accuracy: 0.25 ppm (25°C - 40°C), 0.50 ppm (10°C - 50°C). Ageing: < 0.1 ppm/month.

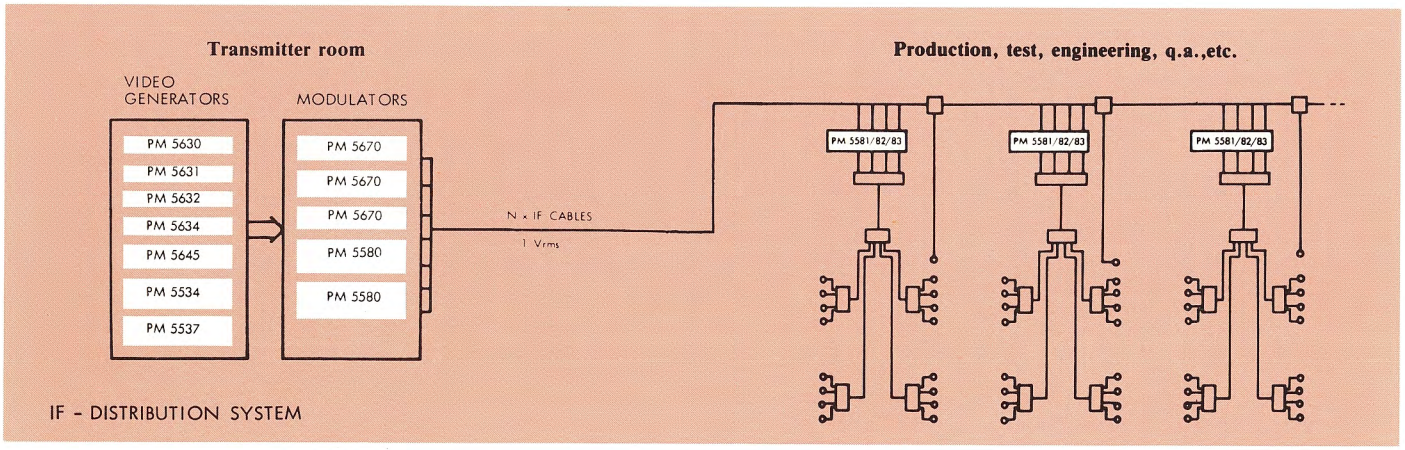


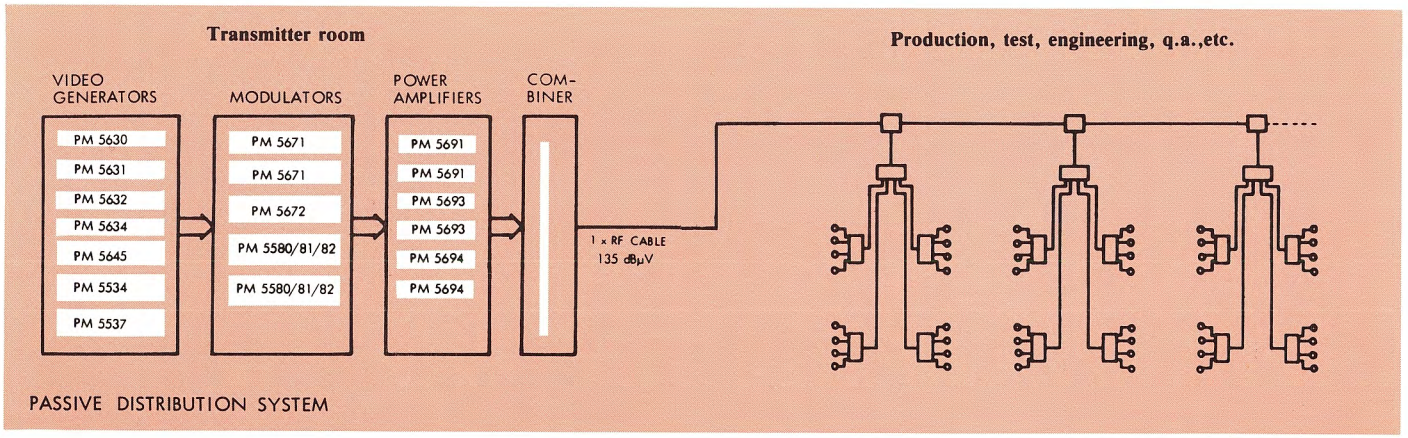
Distribution systems

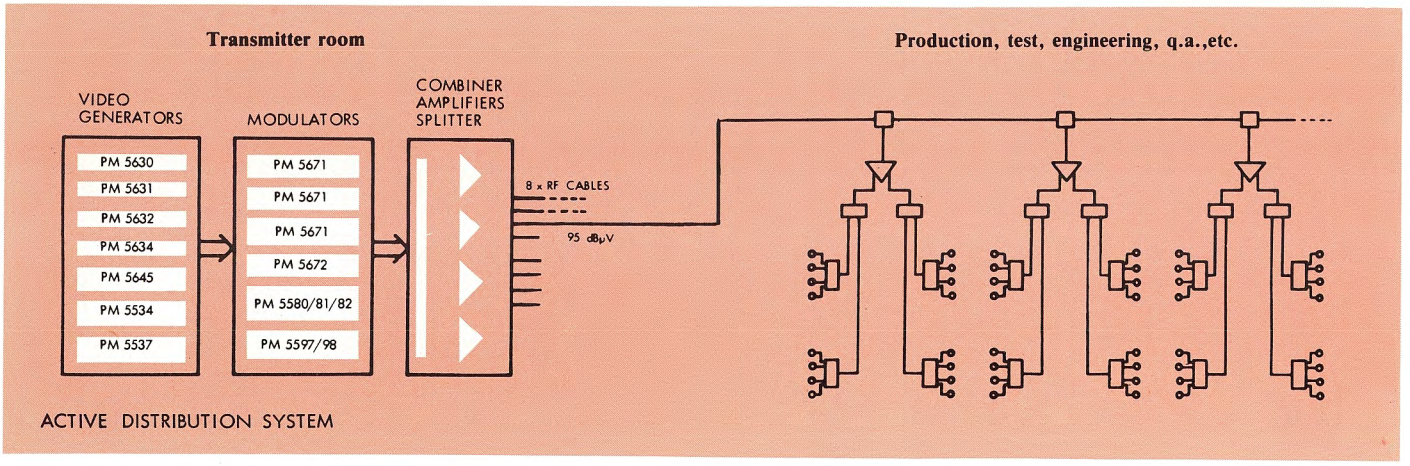
Factory distribution systems

Philips is the world's leading manufacturer of test systems for manufacturers of TV receivers, video cassette recorders and other types of consumer and professional television equipment. This is because only Philips can offer all the building blocks for a complete system, i.e. video pattern and test generators, modulators, power amplifiers and distribution systems. The factory distribution system much match to the type of equipment being produced, production methods and factory lay-out, and it must be of high quality and reliability.

Philips PTV can supply three different types of distribution systems, each one having its own characteristics:
1) IF distribution. This system has a central "transmitter" with video/audio sources and IF modulators. The IF signals are distributed in the factory, - one IF signal per video signal. A number of up-converters in the production area bring the signals on RF basis. This system is costly, however, the quality is superb and the flexibily unlimited.
2) Passive RF distribution. The central transmitter has in this case RF modulators and power amplifiers that bring all signals to high-level RF signals. These signals are combined and transmitted to the production areas via a single coax cable. This system is cost effective and concentrates all the electronic equipment in the transmitter room.
3) Active RF distribution. The central transmitter resembles the one of the passive system, however, the RF signals are combined at low signal level. The combined signal is distributed via one or more coax cables. To overcome cable losses and provide power for the outlets, a number of trunk amplifiers are placed in the production area. This system offers more flexibility than the passive system.





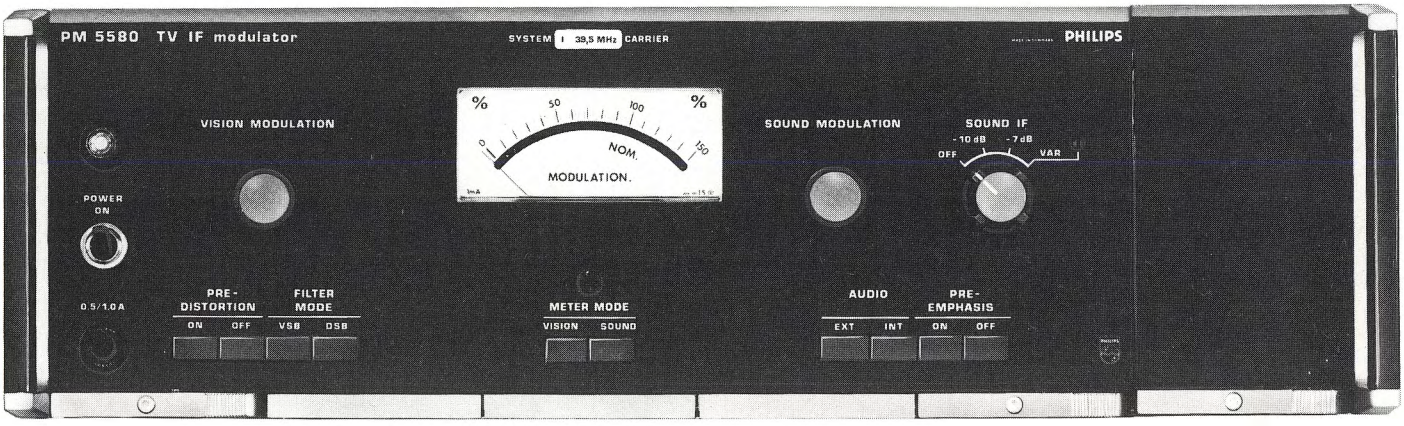


TV IF modulator

PM 5580

Code no. PM 5580:

9449 055 80002 (system D/K, 38.0 MHz IF)
9449 055 80302 (system D/K, 37,0 MHz IF)
9449 055 80502 (system D/K, 38.9 MHz IF)
9449 055 80003 (system B/G, 38.9 MHz IF)
9449 055 80005 (system I, 39.5 MHz IF)
9449 055 80505 (system I, 38.9 MHz IF)
9449 055 80007 (system L, 38.9 MHz IF)
9449 055 80008 (system M, 38.9 MHz IF)
9449 055 80508 (system M, 45.75 MHz IF)



The most professional vestigial side-band modulator on the market

Surpasses even the most stringent demands for television broadcasting

Used extensively by TV transmitter manufacturers

Part of the Philips IF distribution system, used in TV factories all over the world

Space in the cabinet for an RF converter of the PM 5581/82/83 type, which turns the unit into a low-power TV transmitter

Narrow limits for the amplitude and group delay profiles

Sturdy construction, with low RF radiation

Carriers derived from 10 MHz TCXO via synthesizer circuits

The PM 5580 IF Modulator is a TV vision and sound modulator that meets all the stringent requirements of various television standards such as the EBU Nomograph no. 3106 for TV transmitters. The output signals are either separate vision and sound carriers or the combined vision/sound signal. The output level is 1 V, which can drive a large number of the RF converter series PM 5581-83.

The high stability and the tight tolerance on amplitude and group delay characteristics of the PM 5580 make it well suited for use as the modulator in transmitters working after the IF modulation principle. Input requirements are 1 Vp-p ± 6 dB video and 0 dBm ± 6 dB sound (600 Ω balanced).

Its other main applications in television distribution systems, such as large CATV systems, TV factories, TV laboratories. One or more RF converters are then used to bring the signal onto any VHF or UHF channel.

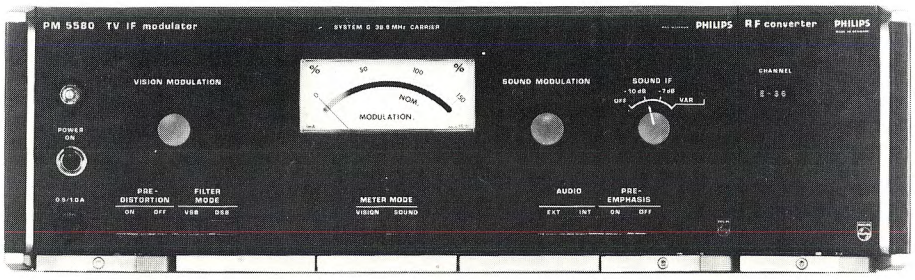
The RF converters PM 5581 and PM 5582 are available for up-conversion to VHF and UHF channels respectively. One converter can be housed in the "empty" space of the PM 5580; or up to four converters can be housed in the power supply PM 5583. The IF inputs of the converters are looped-through by means of directional couplers, so that a large number of converters can be driven by single IF modulator.



Technical description

The input video signal is first amplified, and then passes or by-passes the group delay pre-correction network. After the clamp circuit it is applied to the double balanced vision modulator. The IF vision carrier stems from a voltage tuned oscillator which is part of a phase-locked system with a built-in 10 MHz standard TCXO (Temperature Compensated Crystal controlled Oscillator). The modulated signal passes or by-passes the vestigial side-band filter unit to obtain either a vestigial side-band (VSB) or a double side-band (DSB) signal.

PM 5580



PM 5580 with a RF converter plugged-in. The PM 5580 drives the up-converter with power and a 100 kHz reference signal for the synthesized oscillators in the converter.

In the sound channel, the internally generated 1000 Hz (or externally applied audio signal) is amplified, passes the pre-emphasis circuit, and is frequency modulated on the sound IF carrier having the aforementioned 10 MHz standard signal as a reference. Both the vision and sound output signals can be made available on separate output terminals or combined on 2 terminals after being added by a passive hybrid circuit.

The vision rest carrier percentage and the sound sweep can be read from a meter instrument. A multi-pole plug at the rear of the instrument is provided to feed optional accessories which can be plugged into the free unit space. These accessories can be, for instance, a VHF/UHF converter for a complete professional VHF or UHF signal source mounted in a full 19" rack.

Synthesizer

The internal carriers are derived from a highly stable 10 MHz TCXO (Temperature controlled crystal oscillator) via a synthesizing circuit. This assures sufficient accuracy and stability for most applications. The TCXO needs no heat-up time. It operates immediately (after the instrument has been switched on) within the specified tolerances. Where an extremely accurate TV signal frequency is required, the PM 5580 can be controlled from an external 10 MHz frequency standard.

TECHNICAL DATA PM 5580 D

Carrier data

IF CARRIERS (system D/K) — Vision IF: 38.0 MHz. Sound IF: 31.5 MHz. Sound-vision spacing: 6.5 MHz. Special IF frequency: 38.9 MHz vision, 32.4 MHz sound.

INTERNAL REFERENCE — The carriers are derived from a 10 (or 5) MHz reference signal. Internal reference oscillator: 10 MHz TCXO (temperature compensated x-tal oscillator). Stability: 2×10^{-6} absolute, 1×10^{-6} per year ageing, 1×10^{-8} per °C temperature coefficient.

EXTERNAL REFERENCE — For high precision needs or for synchronization of several IF modulators, an external reference signal can be applied. Frequency: 10 MHz (or 5 MHz). Input level: ∿ 100 mVrms. Input impedance: 50 Ω.

Modulation characteristics

MODULATION — 1) Vision. Type: negative AM (A5C). Amplitude response: according to figure D1. Group delay without pre-correction: according to figure D2. Group delay with pre-correction: according to figure D3. Demodulated response (measured with a precision demodulator, for instance PM 5560): rapid transition profile measured with 15 kHz squarewave test signal according to figure D4. Tilt or sag measured with 50 Hz and 15 kHz squarewave test signal less than 1% relative to peak sync amplitude.
2) Sound. Type: FM (F3). Amplitude response: < 0.5 dB (30 - 15,000 Hz) relative to level at 400 Hz. Pre-emphasis: 50 µs. Simultaneous AM/FM modulation for testing purpose is obtainable.

NON-LINEAR DISTORTION — 1) Vision. Differential gain: < 2%. Differential phase: < 1° measured between 10 and 80% of carrier level with CCIR test signal no. 3.
2) Sound. Harmonic distortion ratio: < 0.5 % (30 - 15,000 Hz) for deviations up to ± 75 kHz. Intermodulation factor: < 0.5% (30 - 7,500 Hz) for deviations up to ± 50 kHz, < 1% for deviations up to ± 75 kHz.

UNWANTED RESIDUAL MODULATION — 1) Vision. Random noise: < - 60 dBrms unweighted. Periodic disturbances: < - 60 dBp-p. Cross modulation: better than 60 dB, all with reference to peak amplitude.
2) Sound. Signal-to-noise ratio: > 70 dB weighted for ± 50 kHz deviation at 1 kHz.

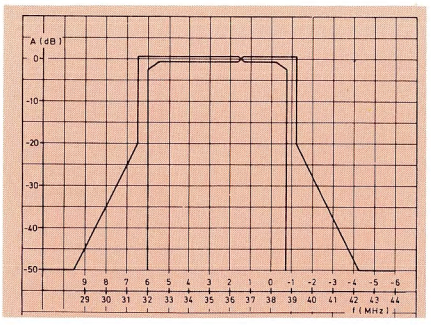


Fig. D1. Amplitude characteristic IF-VSB.

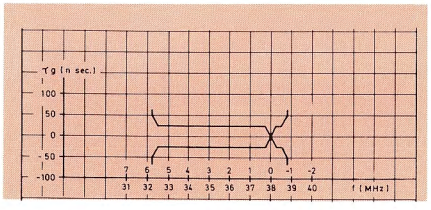


Fig. D2. Group delay tolerance Tg IF-VSB.

UNWANTED SIGNALS AT OUTPUT — Harmonic and spurious radiations, intermodulation products generated in the vision part. Vision: < - 60 dB below peak sync level. Sound: < - 60 dB below peak sync level.

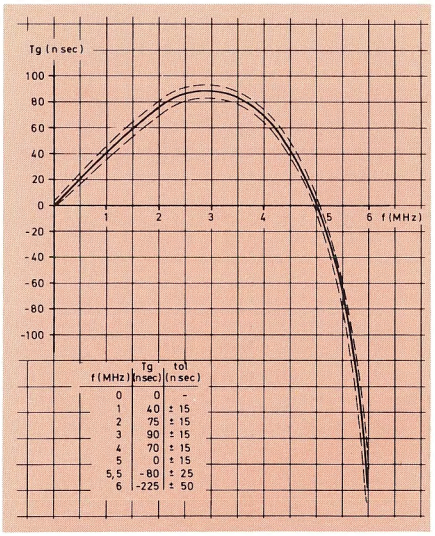


Fig. D3. Group delay tolerance Tg IF-DSB with pre-correction.

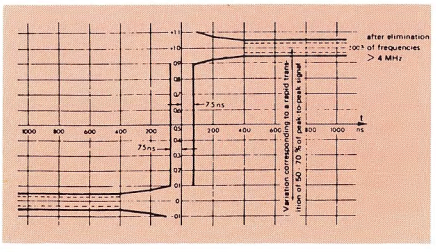


Fig. D4. Transient response.

Inputs

VISION — Composite video. Input level: 1 Vp-p ± 6 dB. Impedance: 75 Ω looped-through. Return loss: > 35 dB up to 8 MHz. Modulation meter accuracy: better than 2%. Black level restoration: clamping at blanking level.

SOUND — Input level: 0 dBm ± 6 dB. Impedance: 600 Ω balanced. Modulation meter accuracy: better than 2%. Internal sound oscillator. Frequency: 1000 Hz.

Outputs

MAIN OUTPUT — Vision and sound separately or composite vision/sound (2 x). Level: 1 Vrms (peak level). Impedance: 50 Ω. VSWR: < 1.1.
Sound, switchable three levels or off. 1) 316 mVrms (- 10 dB referred to vision), 2) 447 mVrms (- 7 dB referred to vision), 3) Variable 20 - 447 mVrms. Impedance: 50 Ω. VSWR: < 1.1.
Note: an automatic gain control circuit stabilizes the peak sync level to 1 Vrms.

MONITOR OUTPUTS — Low level vision and sound separately. Levels: 10% of the respective main outputs ± 1%.

VISION CARRIER OUTPUT — Level: 100 mVrms. Impedance: 50 Ω.

Power supply

Voltage: 90 - 110 - 200 - 220 - 240 V +10% to -15% (internally switchable). Frequency: 48 - 65 Hz. Consumption: 40 W at 220 V.

Temperature range

Operating: 0° - 45° C ambient.

Mechanical data

5/6 plug-in unit for the PHILIPS 19" rack/table cabinet.
Height : 132 mm
Width : 444 mm
Depth : 400 mm
Weight : 14.7 kg (incl. cabinet)

Cabinet

The PM 9716 A cabinet is supplied with the PM 5580.

TECHNICAL DATA PM 5580 G

Carrier data

IF CARRIERS (system B/G) — Vision IF: 38.9 MHz. Sound IF: 33.4 MHz. Sound-vision spacing: 5.5 MHz.

INTERNAL REFERENCE — The carriers are derived from a 10 (or 5) MHz reference signal. Internal reference oscillator: 10 MHz TCXO (temperature compensated x-tal oscillator). Stability: 2 x 10^{-6} absolute, 1 x 10^{-6} per year ageing, 1 x 10^{-8} per °C temperature coefficient.

EXTERNAL REFERENCE — For high precision needs or for synchronization of several IF modulators, an external reference signal can be applied. Frequency: 10 MHz (or 5 MHz). Input level: ∿ 100 mVrms. Input impedance: 50 Ω.

Modulation characteristics

MODULATION — 1) Vision. Type: negative AM (A5C). Amplitude response: according to figure G1. Group delay without pre-correction: according to figure G2. Group delay with pre-correction: according to figure G3. Demodulated response (measured with a precision demodulator,for instance PM 5560): rapid transition profile measured with 15 kHz squarewave test signal according to figure G4. Tilt or sag measured with 50 Hz and 15 kHz squarewave test signal less than 1% relative to peak sync amplitude.
2) Sound. Type: FM (F3). Amplitude response: ± 0.5 dB (30 - 15,000 Hz) relative to level at 400 Hz. Pre-emphasis: 50 µs. Simultaneous AM/FM modulation for testing purpose is obtainable.

NON-LINEAR DISTORTION — 1) Vision. Differential gain: < 2%. Differential phase: < 1° measured between 10 and 80% of carrier level with CCIR test signal no. 3.
2) Sound. Harmonic distortion ratio: < 0.5 % (30 - 15,000 Hz) for deviations up to ± 75 kHz. Intermodulation factor: < 0.5% (30 - 7,500 Hz) for deviations up to ± 50 kHz, < 1% for deviations up to ± 75 kHz.

UNWANTED RESIDUAL MODULATION — 1) Vision. Random noise: < - 60 dBrms unweighted. Periodic disturbances: < - 60 dBp-p. Cross modulation: better than 60 dB, all with reference to peak amplitude.
2) Sound. Signal-to-noise ratio: < 70 dB weighted for ± 50 kHz deviation at 1 kHz.

UNWANTED SIGNALS AT OUTPUT — Harmonic and spurious radiations, intermodulation products generated in the vision part. Vision: < - 60 dB below peak sync level. Sound: < - 60 dB below peak sync level.

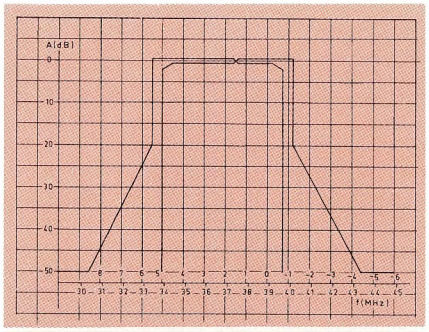


Fig.G1. Amplitude characteristic IF-VSB.

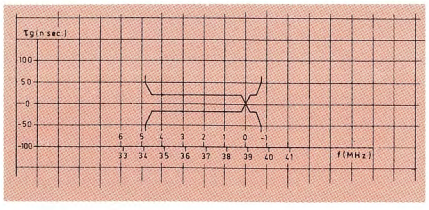


Fig.G2. Group delay tolerance Tg IF-VSB.

Inputs

VISION — Composite video. Input level: 1 Vp-p ± 6 dB. Impedance: 75 Ω looped-through. Return loss: > 35 dB up to 8 MHz. Modulation meter accuracy: better than 2%. Black level restoration: clamping at blanking level.

SOUND — Input level: 0 dBm ± 6 dB. Impedance: 600 Ω balanced. Modulation meter accuracy: better than 2%. Internal sound oscillator. Frequency: 1000 Hz.

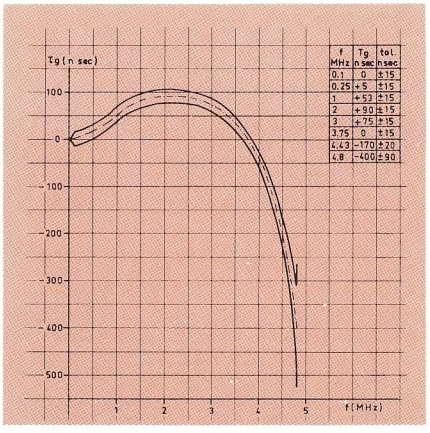


Fig.G3. Group delay tolerance Tg IF-DSB with pre-correction.

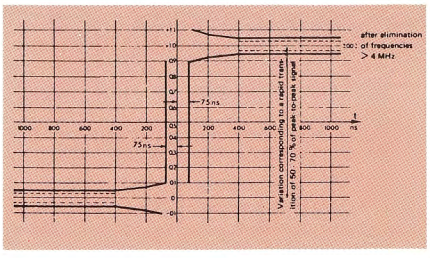


Fig.G4. Transient response.

PM 5580

Outputs

MAIN OUTPUT — Vision and sound separately or composite vision/sound (2 x). Level: 1 Vrms (peak level). Impedance: 50 Ω. VSWR: < 1.1.
Sound, switchable three levels or off. 1) 316 mVrms (- 10 dB referred to vision), 2) 447 mVrms (- 7 dB referred to vision), 3) Variable 20 - 447 mVrms. Impedance: 50 Ω. VSWR: < 1.1.
Note: an automatic gain control circuit stabilizes the peak sync level to 1 Vrms.

MONITOR OUTPUTS — Low level vision and sound separately. Levels: 10% of the respective main outputs ± 1%.

VISION CARRIER OUTPUT — Level: 100 mVrms. Impedance: 50 Ω.

Power supply

Voltage: 90 - 110 - 200 - 220 - 240 V +10% to -15% (internally switchable). Frequency: 48 - 65 Hz. Consumption: 40 W at 220 V.

Temperature range

Operating: 0° - 45° C ambient.

Mechanical data

5/6 plug-in unit for the PHILIPS 19" rack/table cabinet.
Height : 132 mm
Width : 444 mm
Depth : 400 mm
Weight : 14.7 kg (incl. cabinet)

Cabinet

The PM 9716 A cabinet is supplied with the PM 5580.

TECHNICAL DATA PM 5580 I

Carrier data

IF CARRIERS (system I) — Vision IF: 39.5 MHz. Sound IF: 33.5 MHz. Sound-vision spacing: 6.0 MHz. Special IF frequency: 38.9 MHz vision, 32.9 MHz sound.

INTERNAL REFERENCE — The carriers are derived from a 10 (or 5) MHz reference signal. Internal reference oscillator: 10 MHz TCXO (temperature compensated x-tal oscillator). Stability: 2 x 10^{-6} absolute, 1 x 10^{-6} per year ageing, 1 x 10^{-8} per °C temperature coefficient.

EXTERNAL REFERENCE — For high precision needs or for synchronization of several IF modulators, an external reference signal can be applied. Frequency: 10 MHz (or 5 MHz). Input level: ∿ 100 mVrms. Input impedance: 50 Ω.

Modulation characteristics

MODULATION — 1) Vision. Type negative AM (A5C). Amplitude response: according to figure 11. Group delay without pre-correction: according to figure 12. Demodulated response (measured with a precision demodulator, for instance PM 5560): rapid transition profile measured with 15 kHz squarewave test signal according to figure 14. Tilt or sag measured with 50 Hz and 15 kHz squarewave test signal less than 1% relative to peak sync amplitude.
2) Sound. Type: FM (F3). Amplitude response: ± 0.5 dB (30 - 15,000 Hz) relative to level at 400 Hz. Pre-emphasis: 50 µs. Simultaneous AM/FM modulation for testing purpose is obtainable.

NON-LINEAR DISTORTION — 1) Vision. Differential gain: < 2%. Differential phase: < 1° measured between 10 and 80% of carrier level with CCIR test signal no. 3.
2) Sound. Harmonic distortion ratio: < 0.5 % (30 - 15,000 Hz) for deviations up to ± 75 kHz. Intermodulation factor: < 0.5% (30 - 7,500 Hz) for deviations up to ± 50 kHz, < 1% for deviations up to ± 75 kHz.

UNWANTED RESIDUAL MODULATION — 1) Vision. Random noise: < - 60 dBrms unweighted. Periodic disturbances: < - 60 dBp-p. Cross modulation: better than 60 dB, all with reference to peak amplitude.
2) Sound. Signal-to-noise ratio: > 70 dB weighted for ± 50 kHz deviation at 1 kHz.

UNWANTED SIGNALS AT OUTPUT — Harmonic and spurious radiations, intermodulation products generated in the vision part. Vision: < - 60 dB below peak sync level. Sound: < - 60 dB below peak sync level.

Inputs

VISION — Composite video. Input level: 1 Vp-p ± 6 dB. Impedance: 75 Ω looped-through. Return loss: > 35 dB up to 8 MHz. Modulation meter accuracy: better than 2%. Black level restoration: clamping at blanking level.

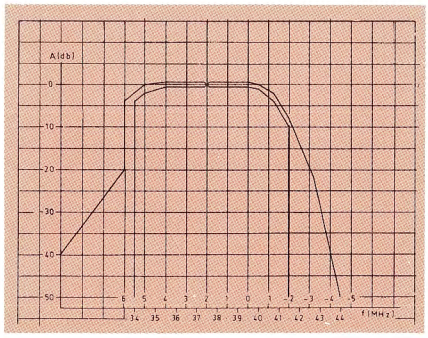


Fig.11. Amplitude characteristic IF-VSB.

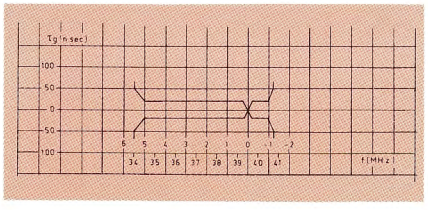


Fig.12. Group delay tolerance Tg IF-VSB.

SOUND — Input level: 0 dBm ± 6 dB. Impedance: 600 Ω balanced. Modulation meter accuracy: better than 2%. Internal sound oscillator. Frequency: 1000 Hz.

Outputs

MAIN OUTPUT — Vision and sound separately or composite vision/sound (2 x). Level: 1 Vrms (peak level). Impedance: 50 Ω. VSWR: < 1.1.
Sound, switchable three levels or off. 1) 316 mVrms (- 10 dB referred to vision), 2) 447 mVrms (- 7 dB referred to vision), 3) Variable 20 - 447 mVrms. Impedance: 50 Ω. VSWR: < 1.1.
Note: an automatic gain control circuit stabilizes the peak sync level to 1 Vrms.

MONITOR OUTPUTS — Low level vision and sound separately. Levels: 10% of the respective main outputs ± 1%.

VISION CARRIER OUTPUT — Level: 100 mVrms. Impedance: 50 Ω.

Power supply

Voltage: 90 - 110 - 200 - 220 - 240 V +10% to -15% (internally switchable). Frequency: 48 - 65 Hz. Consumption: 40 W at 220 V.

Temperature range

Operating: 0° - 45° C ambient.

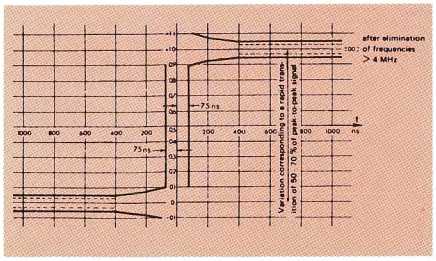


Fig.14. Transient response.

Mechanical data

5/6 plug-in unit for the PHILIPS 19" rack/table cabinet.
Height : 132 mm
Width : 444 mm
Depth : 400 mm
Weight : 14.7 kg (incl. cabinet)

Cabinet

The PM 9716 A cabinet is supplied with the PM 5580.

TECHNICAL DATA PM 5580 L

Carrier data

IF CARRIERS (system L) — Vision IF: 38.9 MHz. Sound IF: 32.4 MHz. Sound-vision spacing: 6.5 MHz.

INTERNAL REFERENCE — The carriers are derived from a 10 (or 5) MHz reference signal. Internal reference oscillator: 10 MHz TCXO (temperature compensated x-tal oscillator). Stability: 2 x 10^{-6} absolute, 1 x 10^{-6} per year ageing, 1 x 10^{-8} per °C temperature coefficient.

EXTERNAL REFERENCE — For high precision needs or for synchronization of several IF modulators, an external reference signal can be applied. Frequency: 10 MHz (or 5 MHz). Input level: ∿ 100 mVrms. Input impedance: 50 Ω.

Modulation characteristics

MODULATION — 1) Vision. Type: positive AM (A5C). Amplitude response: according to figure L1. Group delay without pre-correction: according to figure L2. Demodulated response: rapid transition profile measured with 15 kHz squarewave test signal according to figure L4. Tilt or sag measured with 50 Hz and 15 kHz squarewave test signal less than 1% relative to peak sync amplitude.
2) Sound. Type: AM (A3). Amplitude response: ± 0.5 dB (30 - 15,000 Hz) relative to level at 400 Hz. Simultaneous AM/FM modulation for testing purpose is obtainable.

NON-LINEAR DISTORTION — 1) Vision. Differential gain: < 2%. Differential phase: < 1° measured between 10 and 80% of carrier level with CCIR test signal no.3.
2) Sound. Harmonic distortion ratio: < 1% for M = 0 - 100%. Intermodulation factor: < 1% (30 - 7,500 Hz) up to m = 100%.

UNWANTED RESIDUAL MODULATION — 1) Vision. Random noise: < - 60 dB unweighted. Periodic disturbances: < - 60 dBp-p. Cross modulation: better than 60 dB, all with reference to peak amplitude.
2) Sound. Signal-to-noise ratio: > 70 dB weighted for m = 90% at 1 kHz.

UNWANTED SIGNALS AT OUTPUT — Harmonic and spurious radiations, intermodulation products generated in the vision part. Vision: < - 60 dB below peak sync level. Sound: < - 60 dB below peak sync level.

Inputs

VISION — Composite video. Input level: 1 Vp-p ± 6 dB. Impedance: 75 Ω looped-through. Return loss: > 35 dB up to 8 MHz. Modulation meter accuracy: better than 2%. Black level restoration: clamping at blanking level.

SOUND — Input level: 0 dBm ± 6 dB. Impedance: 600 Ω balanced. Modulation meter accuracy: better than 2%. Internal sound oscillator. Frequency: 1000 Hz.

Outputs

MAIN OUTPUT — Vision and sound separately or composite vision/sound (2 x). Level: 1 Vrms (peak level). Impedance: 50 Ω. VSWR: < 1.1
Sound, switchable three levels or off. 1) 316 mVrms (- 10 dB referred to vision), 2) 447 mVrms (- 7 dB referred to vision), 3) Variable 20 - 447 mVrms. Impedance: 50 Ω. VSWR: < 1.1.

MONITOR OUTPUTS — Low level vision and sound separately. Levels: 10% of the respective main outputs ± 1%.

VISION CARRIER OUTPUT — Level: 100 mVrms. Impedance: 50 Ω.

Power supply

Voltage: 90 - 110 - 200 - 220 - 240 V +10% to -15% (internally switchable). Frequency: 48 - 65 Hz. Consumption: 40 W at 220 V.

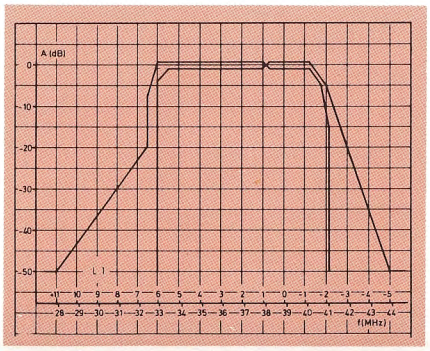


Fig.L1. Amplitude characteristic IF-VSB.

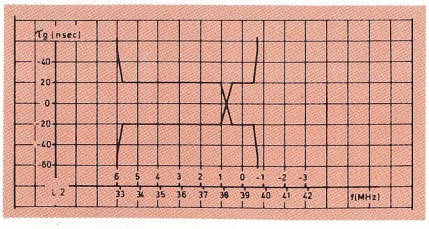


Fig.L2. Group delay tolerance Tg IF-VSB.

Temperature range

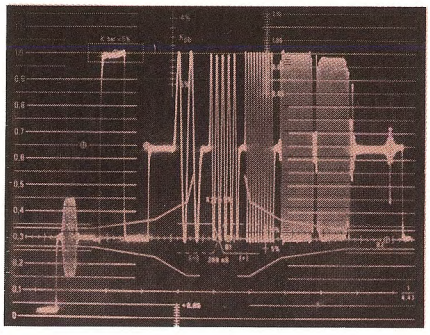
Operating: 0° - 45° C ambient.

Mechanical data

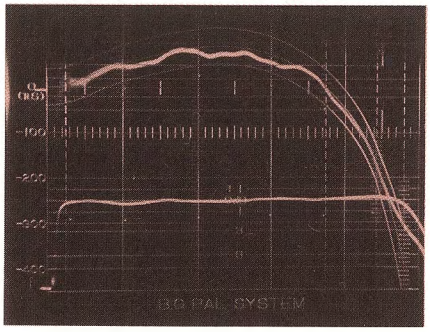
5/6 plug-in unit for the PHILIPS 19" rack/table cabinet.
Height : 132 mm
Width : 444 mm
Depth : 400 mm
Weight : 14.7 kg (incl. cabinet)

Cabinet

The PM 9716 A cabinet is supplied with the PM 5580.



EBU line 18 signal demodulated with precision demodulator. PM 5580 in VSB mode.



Group delay characteristics in flat mode and with Tg pre-correction.

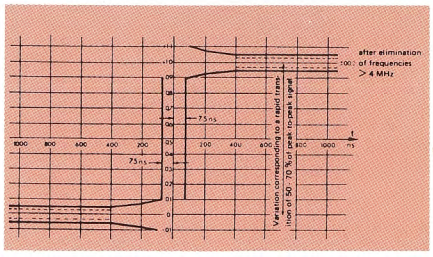


Fig.L4. Transient response.

PM 5580

TECHNICAL DATA PM 5580M

Carrier data

IF CARRIERS — Vision IF: 38.9 MHz. Sound IF: 34.4 MHz (4.5 MHz apart from vision). On requets: 45.75/41.25 MHz.

INTERNAL REFERENCE — The carriers are derived from a 10 (or 5) MHz reference signal. Internal reference oscillator: 10 MHz TCXO (temperature compensated x-tal oscillator). Stability: 2×10^{-6} absolute, 1×10^{-6} per year ageing, 1×10^{-8} per °C temperature coefficient.

EXTERNAL REFERENCE — For high precision needs or for synchronization of several IF modulators, an external reference signal can be applied. Frequency: 10 MHz (or 5 MHz). Input level: ∿ 100 mVrms. Input impedance: 50 Ω.

Modulation characteristics

MODULATION — 1) Vision. Type: negative AM (A5C). Amplitude response: according to figure M1. Group delay without pre-correction: according to figure M2. Group delay with pre-correction: according to figure M3. Tilt at field and line frequencies: < 0.5% relative to peak sync amplitude.
2) Sound. Type: FM (F3). Amplitude response: < 0.5 dB (30 - 15,000 Hz) relative to level at 400 Hz. Pre-emphasis: 75 µs. Simultaneous AM/FM modulation for testing purpose is obtainable.

NON-LINEAR DISTORTION — 1) Vision. Differential gain: < 2%. Differential phase: < 1° measured between 10 and 80% of carrier level with CCIR test signal no.3.
2) Sound. Harmonic distortion ratio: < 0.5 % (30 - 15,000 Hz) for deviations up to ± 75 kHz. Intermodulation factor: < 0.5% (30 - 7,500 Hz) for deviations up to ± 50 kHz, < 1% for deviations up to ± 75 kHz.

UNWANTED RESIDUAL MODULATION — 1) Vision. Random noise: < - 60 dBrms unweighted. Periodic disturbances: < - 60 dBp-p. Cross modulation: better than 60 dB, all with reference to peak amplitude.
2) Sound. Signal-to-noise ratio: > 70 dB weighted for ± 50 kHz deviation at 1 kHz.

UNWANTED SIGNALS AT OUTPUT — Harmonic and spurious radiations, intermodulation products generated in the vision part. Vision: < - 60 dB below peak sync level. Sound: < - 60 dB below peak sync level.

Inputs

VISION — Composite video. Input level: 1 Vp-p ± 6 dB. Impedance: 75 Ω looped-through. Return loss: > 35 dB up to 8 MHz. Modulation meter accuracy: better than 2%. Black level restoration: clamping at blanking level.

SOUND — Input level: 0 dBm ± 6 dB. Impedance: 600 Ω balanced. Modulation meter accuracy: better than 2%. Internal sound oscillator. Frequency: 100 Hz.

Outputs

MAIN OUTPUT — Vision and sound separately or composite vision/sound (2 x). Level: 1 Vrms (peak level). Impedance: 50 Ω. VSWR: < 1.1.

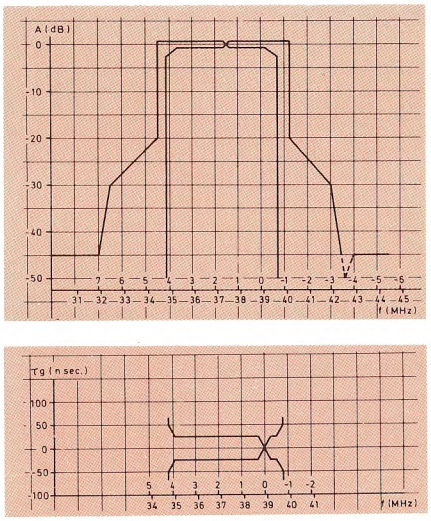


Fig.M1. Amplitude characteristic IF-VSB (top). Fig.M2. Group delay tolerance Tg IF-VSB.

Sound, switchable three levels or off. 1) 316 mVrms (- 10 dB referred to vision), 2) 447 mVrms (- 7 dB referred to vision), 3) Variable 20 - 447 mVrms. Impedance: 50 Ω. VSWR: < 1.1.
Note: an automatic gain control circuit stabilizes the peak sync level to 1 Vrms.

MONITOR OUTPUTS — Low level vision and sound separately. Levels: 10% of the respective main outputs ± 1%.

VISION CARRIER OUTPUT — Level: 100 mVrms. Impedance: 50 Ω.

Power supply

Voltage: 90 - 110 - 200 - 220 - 240 V +10% to -15% (internally switchable). Frequency: 48 - 65 Hz. Consumption: 40 W at 220 V.

Temperature range

Operating: 0° - 45° C ambient.

Mechanical data

5/6 plug-in unit for the PHILIPS 19" rack/table cabinet.
Height : 132 mm
Width : 444 mm
Depth : 400 mm
Weight : 14.7 kg (incl. cabinet)

Cabinet

The PM 9716 A cabinet is supplied with the PM 5580.

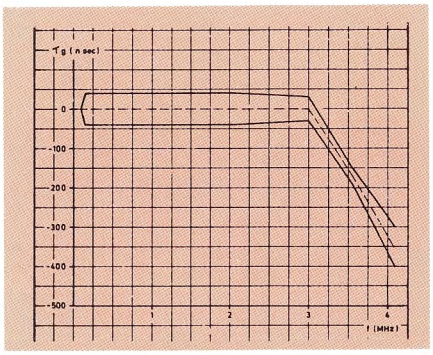
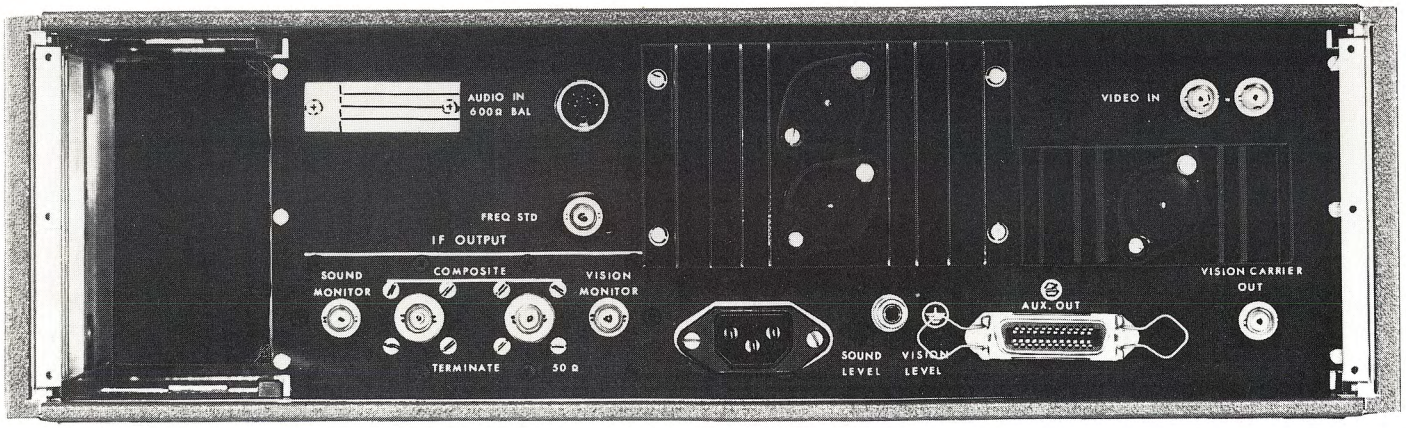


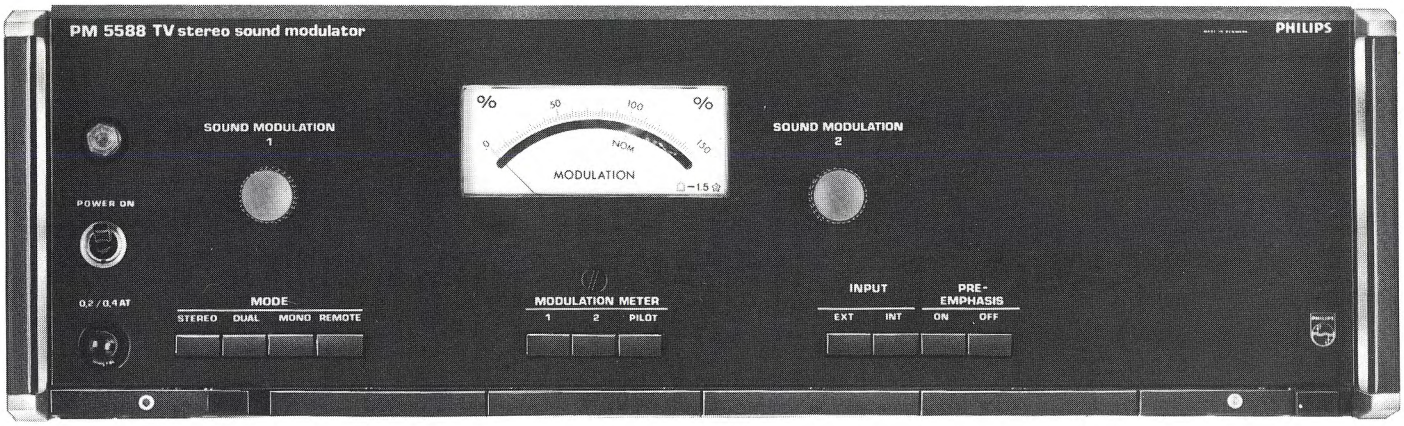
Fig.M3. Group delay tolerance Tg IF-DSB with pre-correction.



TV stereo modulator

PM 5588

Code no. PM 5588:
9449 055 88003 (system G, German dual/stereo sound system)



Self-contained sound modulator for 2-channel/stereo transmission

In full conformity with new German stereo broadcast requirements

Flexible construction allows adaptation to possible future modifications

Options for inter-carrier output and internal vision carrier

Ideal for final test of TV receivers with 2-channel/stereo reproduction facilities

The combination PM 5580/88 is the most sophisticated modulator for television with two-channel/stereo sound

Easy to use with existing vision modulators, in particular PM 5580

The PM 5588 TV stereo modulator contains all the circuitry for generating the FM modulated sound signals for normal television transmissions (mono), two-channel sound transmissions (dual), and stereophonic sound transmissions (stereo). For instance with the vision modulator, PM 5580, a composite vision/sound signal is generated (IF frequency), which can then be converted to any VHF or UHF channel with one or more RF-converters (PM 5581 for VHF, PM 5582 for UHF).

Carrier generation

The PM 5588 generates two sound carriers at 33.400 000 MHz and 33.157 812 5 MHz respectively. In relation to the vision carrier frequency of 38. 900 000 MHz, these frequencies correspond to 5.500 000 MHz and 5.742 187 5 MHz intercarrier frequencies. Both frequencies are produced by synthesizers using a 10 MHz crystal controlled oscillator as reference. The 10 MHz oscillator can be genlocked to the horizontal line frequency of the incoming video signal, or it may be free-running.

The two sound carriers are FM modulated by the incoming audio signals, in accordance with the selected mode of operation:

1) Mono mode. The audio signal at the L,A input passes a pre-emphasis circuit and modulates the 33.40 MHz sound carrier. The 33.16 MHz sound carrier is switched off. In this mode, the PM 5588 functions exactly as the normal sound part of the PM 5580 IF modulator.
2) Dual mode. The two audio signals at the L, A input and the R, B input pass the pre-emphasis circuits and modulate the 33.40 MHz and 33.16 MHz sound carriers.
3) Stereo mode. The two audio signals at the L, A input (left) and the R,B input (right) pass the pre-emphasis circuits and are fed to a matrix circuit. The sum signal (equivalent to a monophonic signal) modulates the 33.40 MHz carrier), while the R,B input signal (right) modulates the 33.16 MHz carrier.

Identification signal

To command the public's TV receivers to receive the programmes in the same mode as they are trans-



transmitted (mono, dual or stereo) an identification signal is added to the sound signal of one of the carriers:

1) Mono mode. No identification signal.
2) Dual mode. 274.1 Hz AM modulated on an auxiliary carrier of 54.687 5 kHz (3.5 x f_H).
3) Stereo mode. 117.5 Hz AM modulated on the same 54.687 5 kHz carrier.

Adder circuits

The two modulated carriers are added together in a 3 dB coupler. The combined sound signals can be added to a looped-through vision carrier signal by means of a 10 dB coupler.

Auxiliary circuits

Apart from the aforementioned circuitry the PM 5588 contains two audio oscillators of 400 Hz and 1000 Hz for testing purposes, and a meter circuit to allow for setting the maximum frequency deviation of the FM modulators as well as for checking the pilot signal (identification signal) level. Optional modules contain mixers which together with the 38.9 MHz vision carrier produce the 5.50 MHz and 5.74 MHz intercarrier signals. The 38.9 MHz signal can be supplied from the vision modulator or an optional carrier module.

Applications

The combination PM 5580 + PM 5588 is ideal for test of TV receivers with stereo sound and dual sound channel facilities. Furthermore this combination or the PM 5588 alone can be used as retrofit kit for conversion of "normal" TV transmitters into stereo/dual sound channel TV transmitters.

TECHNICAL DATA

Carrier data

IF CARRIERS — First (normal) sound carrier: 33.400 000 MHz. Second sound carrier: 33.157 812 5 MHz. Both are derived from a 10 MHz VCXO (voltage controlled crystal oscillator) via synthesizer circuits.

PILOT CARRIER — Frequency: 54.687 5 kHz (corresponding to 3.5 times the horizontal line frequency). The pilot carrier is synthesized from the above mentioned 10 MHz VCXO signal.

IDENTIFICATION TONES — Stereo sound mode: 117.5 Hz (corresponding to $f_H/133$). Dual sound mode: 274.1 Hz (corresponding to $f_H/57$).

INTERNAL REFERENCE — All carriers are generated from the internal 10 MHz VCXO. Accuracy and stability: better than ± 50 ppm from nominal frequency.

EXTERNAL REFERENCE — The internal 10 MHz VCXO can be genlocked to the sync pulses of an external video signal. In this case all carriers are consequently derived from the sync of the incoming video signal.

Modes of operation

STEREO MODE — Matrixing and modulation: carrier no.1 (33.4 MHz) is modulated with (L + R)/2 (half sum of left + right signal), carrier no.2 (33.158 MHz) is modulated with R (right signal). Identification: the pilot carrier of 54.687 5 kHz is AM modulated with the 117.5 Hz identification tone and added to the R signal.

DUAL MODE — Modulation: carrier no.1 (33.4 MHz) is modulated with the input A signal, carrier no.2 is modulated with the input B signal. Identification: the pilot carrier of 54.687 5 kHz is AM modulated with the 274.1 Hz identification tone and added to the B signal.

MONO MODE — Modulation: carrier no.1 (33.4 MHz) is modulated with the input A signal, carrier no.2 is switched off. Identification: there is no identification signal. In the MONO mode the output signal from PM 5580 + PM 5588 is identical with a conventional one sound channel TV signal (38.9 MHz vision, 33.4 MHz sound).

Modulation characteristics

MODULATION — Type of modulation: FM (frequency modulation). Amplitude response: within ± 0.5 dB (30 Hz - 15 kHz). Pre-emphasis: 50 µs ± 0.5 µs (switchable). Also 75 µs is possible. Frequency deviation of the sound carriers with audio signals: 0% - 150% of nominal, which is ± 50 kHz, adjustable with front panel knobs. Frequency deviation of carrier no.2 with the pilot signal: ± 2.5 kHz ± 0.5 kHz (internally adjustable).
AM modulation of pilot signal: 50% (internally adjustable 30% - 100%).

DISTORTIONS AND SPURIOUS SIGNALS — Harmonic distortions (demodulated LF signals): less than 0.2% (30 Hz - 15 kHz). Cross-talk between channels in STEREO mode: less than - 50 dB at 1 kHz, less than - 40 dB at 12.5 kHz. Cross-talk between channels in DUAL mode: less than - 70 dB at 1 kHz, less than - 60 dB at 12.5 kHz. Signal-to-noise ratio: better than 65 dB (measuring conditions: acc. to DIN standard, black video signal, 27 kHz deviation, and without pre-emphasis). Harmonic and spurious signals at the output: more than 60 dB below sync peak level.

Inputs

AUDIO INPUT — Connectors: 2 x 5 pole DIN, 180°. Level: 0 dBm (775 mV). Impedance: 600 Ω, balanced.

AUX INPUT — Connectors: 2 x 5 pole DIN, 180°. Level: 0 dBm (775 mV). Impedance: 600 Ω, balanced.
Note. By internal selection the MODE selector can take the audio signals from either the AUDIO input or the AUX input.

VIDEO INPUT — Connectors: 2 x BNC. Input level: 1 Vpp video or 4 Vpp composite sync. Impedance: high ohmic, looped through (75 Ω). Frequency of horizontal line frequency: 15.625 Hz ± 1 Hz.

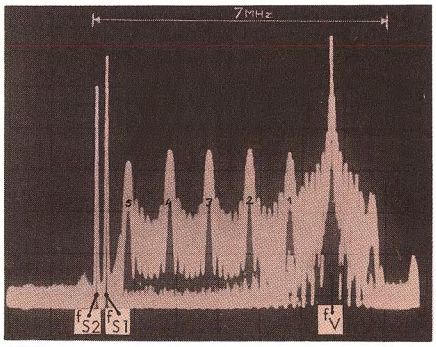


Fig.1. Spectrum of a TV signal with two sound carriers (IF base). The vision carrier is modulated with a multiburst signal and the two sound carriers with 1 kHz audio signals. The peaks on the photo are from right to left: vision carrier, multiburst frequencies no.1, no.2, no.3, no.4, no.5, sound carrier 1, and sound carrier 2.

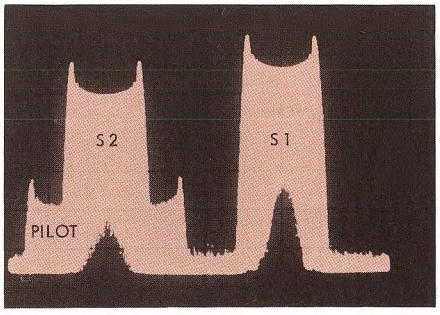


Fig.2. Same signal as fig.1, however the resolution is made larger in order to display the two sound carriers more clearly. The identification signal on carrier no.2 can is easily recognized.

EXT PILOT MODULATION — Connector: BNC. Input level: 0 dBm. Impedance: 600 Ω. Application: for external identification signals instead of the built-in 117.5 Hz and 274.1 Hz signals.

EXT PILOT CARRIER — Connector: BNC. Input level: TTL compatibel. Application: for external pilot signal instead of the internal 54.687 5 kHz signal.

INPUT VISION IF — Connector: N-type. Level: + 12 dBm (~1 Vrms). Impedance: 50 Ω.

AM 1 AND AM 2 — Connectors: BNC. Levels: 0 dBm corresponds to 50% AM modulation. Impedance: 600 Ω. Application: AM modulation of the optional PM 8513 intercarrier mixer signals for test of AM suppression of the FM discriminators in TV receivers.

VISION CARRIER — Connector: BNC. Level: 100 mVrms. Impedance: 50 Ω. Application: vision carrier 38.9 MHz for the optional PM 8513 intercarrier mixer.

Outputs

OUTPUT COMPOSITE IF — Connector: N-type. Levels: vision carrier + 10 dBm, sound carrier 1 - 3 dBm, sound carrier 2 - 10 dBm. Impedance: 50 Ω. Stability of carriers: within 0.5 dB.

IDENTIFICATION — Connector: BNC. Level 1 Vpp. Impedance: 50 Ω. Application: test of identification signal.

MONITOR 1 MONITOR 2 — Connectors: BNC. Levels: 0 dBm at 50 kHz deviation. Impedance: 600 Ω. Signals: samples of the two (matrixed) signals fed to the modulator stages.

5.74 MHz, 5.5 MHz + 5.74 MHz, AND 5.5 MHz — Connectors: BNC. Signals: intercarrier signals from the optional PM 8513 intercarrier mixer. Levels: 1 Vpp. FM modulated sound signals. Impedance: 50 Ω. See also under options.

Internal test oscillators

400 Hz OSCILLATOR — Frequency: approx. 400 Hz. Distortion: < 0.5%. Level stability: within 0.5 dB.

1000 Hz OSCILLATOR — Frequency: approx. 1000 Hz. Distortion: < 0.5%. Level stability: within 0.5 dB.

Note. The internal test signals are selected by a front panel input selector. Internal programming determines which signals are fed to the two sound carriers.

Remote control

Via a remote control plug on the rear all front panel functions and several internal functions can be remotely controlled. Connector type: 25 pole D-connector. Levels: TTL compatible, low level activates the desired function.

Modulation meter

The built-in modulation meter can be used to set modulation levels of the two sound carriers with audio and pilot signals. Signal selection: by front panel selector. Meter range: 0% - 150% (100% = ± 50 kHz deviation for audio signals, 100% = ± 5 kHz deviation for pilot carrier). Pilot signal measurement: via 54 kHz band pass filter.

Power supply

Voltage 220 V (110 V) + 10%, - 15%. Frequency: 48 - 65 Hz. Consumption: 20 W at 220 V. Safety: acc. to IEC 348 class 1.

Temperature range

Operating: 0° - 45° C ambient. Storage: - 30° - + 70° C.

Electromagnetic interference

In accordance with "VDE störgrad K".

Mechanical data

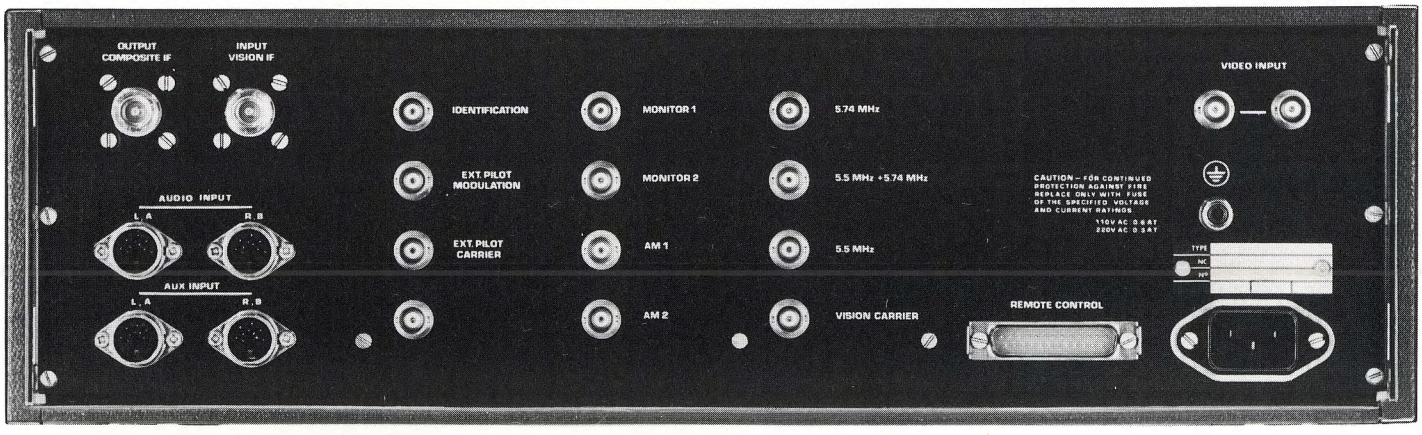
Full 19" rack/table cabinet.
Height : 132 mm
Width : 444 mm
Depth : 435 mm
Weight : 14 kg

Options

PM 8513 Intercarrier mixer
This printed circuit board provides the intercarrier signals 5.5 MHz, 5.74 MHz, and combined 5.5 MHz + 5.74 MHz. Input and output signals: please refer to inputs and outputs of main instrument.
Note. The PM 8513 can only function when an 38.9 MHz vision carrier is a available inside the PM 5588. This signal can be supplied from a vision modulator, as for instance the PM 5580 IF modulator, or it can be generated by the PM 8514 carrier oscillator.

PM 8514 Carrier oscillator
This option generates the unmodulated vision carrier 38.9 MHz needed for the PM 8513 Intercarrier mixer. The circuitry consists of a synthesized oscillator which is controlled from the internal 10 MHz reference oscillator of the PM 5588.

PM 8515 Test demodulator
The PM 8515 is a calibration tool for adjusting and testing the performance of the PM 5588. The parameters checked are: frequency deviation, distortion, and stereo cross-talk.

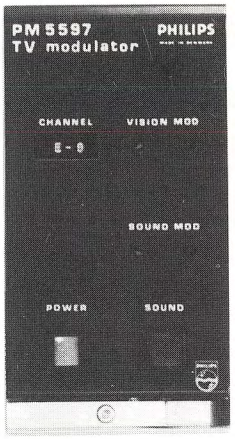


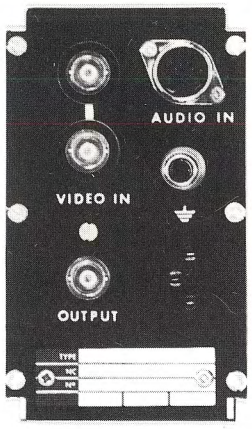
TV modulator

PM 5597

Code no. PM 5597:
9449 055 97002 (system D)
9449 055 97003 (system G)
9449 055 97005 (system I)
9449 055 97007 (system L')
9449 055 97008 (system M)

Ordering the PM 5597:
Please indicate television system and channel no. or state vision and sound carrier frequencies.
Note. IF versions are also available (sound carrier frequency below vision carrier).





Self-contained TV modulator for distribution and universal purposes

Double side-band modulation with special filter partly reducing the lower side-band, while suppressing spurious and harmonic signals

Built-in indicators for video and audio modulation

The output of several modulators may be combined onto a single coax cable with simple combiners

The PM 5597 TV modulator is a small one-channel combined vision/sound "transmitter" of professional quality well suited for colour and monochrome TV. The carrier frequency is crystal controlled and all channels from 35 to 300 MHz are available. The output signal is in principle a double side-band modulated RF signal, however, a band-pass filter in front of the output stage partly suppresses the lower side-band and the frequency content of the higher side-band above the sound carrier. Moreover, this filter suppresses any spurious and harmonics outside the band-pass range. Thanks to wide-band output stage (75Ω output impedance over the complete VHF range), the outputs of several modulators can be connected to a single cable for distribution by simple combiners without any mutual disturbance of the signals.

TECHNICAL DATA

Inputs

VIDEO — Amplitude: 1 Vpp nominal ± 3 dB. Input impedance: looped-through (75Ω system). Return loss: > 34 dB up to 7 MHz. DC restoration: clamping at sync level. Vision modulation indicator: starts flashing when the video level exceeds 1 Vpp (corresponds to 10% rest carrier (systems D and G), 20% (system I), 12.5% (system M) and nominal modulation (system L')).
SOUND — Amplitude: 0 dBm nominal, 0.3 - 1 Vrms can be compensated. Input impedance: 600 Ω ± 5% balanced. Sound modulation indicator: starts flashing when the audio level exceeds 0 dBm (corresponds to 50 kHz frequency deviation (systems D and G), 25 kHz (system M), or 50% AM modulation (system L')).

Output

RF OUTPUT — Level: 400 mVrms (L': 100 mVrms), peak sync. Output impedance: 75 Ω. Output VSWR: < 1.5 over the entire band. Sound/vision power ratio: - 10 dB nominal (adjustable - 10 to - 20 dB). The sound carrier can be switched off. Unwanted spurious: < - 50 dB outside band-pass range. Output connector: BNC.

Modulation characteristics

RF CARRIER — Frequency range: 35 - 300 MHz. Carrier stability: 100×10^{-6} . Sound carrier: vision carrier plus 6.5 MHz (D) 6.0 MHz (I), 5.5 MHz (G), 4.5 MHz (M) all ± 3 kHz. Temperature coefficient: < 200×10^{-6} per °C.

VISION — Type of modulation: AM negative, double side-band with lower side-band partly suppressed (positive modulation for system L'). Modulator type: balanced. Modulation depth: 10% rest carrier at peak white for video input 1 Vpp. Amplitude response: within ± 0.5 dB for 50 Hz to 5 MHz. Group delay: flat within 50 ns for 50 Hz to 5 MHz. Differential gain: < 4%. Differential phase: < 2°. Intermodulation: better than 60 dB (DIN 3-tone method). Note: group delay pre-correction is not possible.

SOUND — Type of modulation: FM (F3), for system L': AM. Deviation: 50 kHz nominal. Amplitude response within ± 3 dB incl. pre-emphasis. Pre-emphasis: 50 µs (75 µs in system M). Modulation distortion: < 2% at 50 kHz deviation.

Power supply

Voltage: 230 V (115 V) + 15/-20% (Internal selection). Frequency: 48 - 65 Hz. Consumption: 7 W at 220 V.

Temperature range

Operating: 0° - 45° C ambient.

Mechanical data

1/6 plug-in unit for the PHILIPS 19" rack/table cabinet.
Height : 132 mm
Width : 70 mm
Depth : 400 mm
Weight : 2.2 kg (without cabinet).

Cabinet

(To be ordered separately):
2/6 table cabinet: PM 9712.
3/6 table cabinet: PM 9713.
6/6 rack/table cabinet: PM 9716A.

RF-converters

PM 5581/82/83

Code no. PM 5581:

9449 055 81002 (D-version, 38.0 MHz)

9449 055 81003 (B-version, 38.9 MHz)

9449 055 81005 (I-version, 39.5 MHz)

9449 055 81008 (M-version, 45.75 MHz)

Code no. PM 5582:

9449 055 82002 (K-version, 38.0 MHz)

9449 055 82003 (G-version, 38.9 MHz)

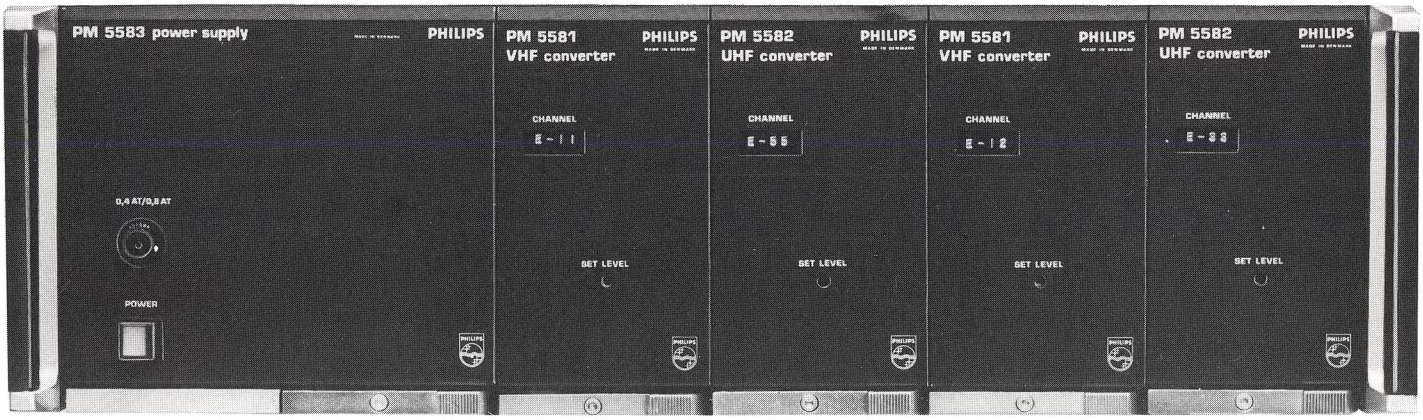
9449 055 82005 (I-version, 39.5 MHz)

9449 055 82008 (M-version, 45.75 MHz)

Code no. PM 5583:

9449 055 83001

Note: on request D, I, K and M-versions of PM 5581/82 can also be supplied for 38.9 MHz.



Modern synthesizer technique for demanding applications.

Change of channel frequency, simply by re-programming of the synthesizer

Output impedance of 75 Ohms matches distribution and cable TV demands.

With the PM 5580 IF modulator the PM 5581/82/83 forms a precision low-power transmitter

All TV channels are possible.

Very low distortion and very low content of spurious and harmonic signals.

Highly accurate channel frequency from built-in TCXO or external reference

Input via directional couplers with low insertion loss.

Steady and accurate RF levels through automatic gain control.

The RF converters PM 5581/82 are designed for high quality conversion of IF modulated television signals into RF channels, such as the signal from the PM 5580 IF modulator.

The converters use double-conversion and a high second IF. This principle allows conversion into any television channel, including S-channels, some of which are situated at frequencies harmonic to the IF frequency.

The PM 5581 VHF converter covers the whole VHF band from 40.25 to 299.25 MHz. The output frequency is programmable by internal selectors in steps of 1 MHz, so that changing frequency does not involve changing crystal.

The PM 5582 UHF converter covers the UHF band from 471.25 to 959.25 MHz. The output frequency is programmable by internal selectors in steps of 2 MHz. The easy frequency change for both the PM 5581 and PM 5582 is accomplished by using synthesized oscillators. This means great flexibility in systems, where frequencies have to be changed occasionally. Further advantages are that one frequency standard (10 MHz) may control a large number of converters, thus synchronizing the output signals; and highly accurate channel frequencies can be obtained by using just a single precision frequency source.

Mechanically, the PM 5581 and the PM 5582 consist of a 1/6 plug-in unit of the Philips 19" rack/table cabinet. One converter can be housed in the extra space of the PM 5580 IF modulator supplies power and 100 kHz reference frequency to the converter (derived from a 10 MHz TCXO). Up to four converters can be housed in the PM 5583 Power supply, which is a 2/6 plug-in unit with a full 19" rack cabinet. The unit contains a power supply capable of driving the four converters and a 10 MHz TCXO (Temperature Compensated Crystal Oscillator) controlling the synthesizers of the converters. Any combination of VHF and UHF converters can be inserted into the PM 5583.

Technical description

A simplified block diagram of the PM 5581 is shown in fig.1. The RF converters have looped-through 50Ω inputs via a directional coupler, a principle which allows up to 20 converters to be driven from the same IF source, such as the PM 5580. The loss from the IF input to the IF output socket of a converter is only ∼1 dB.

PM 5581/82/83

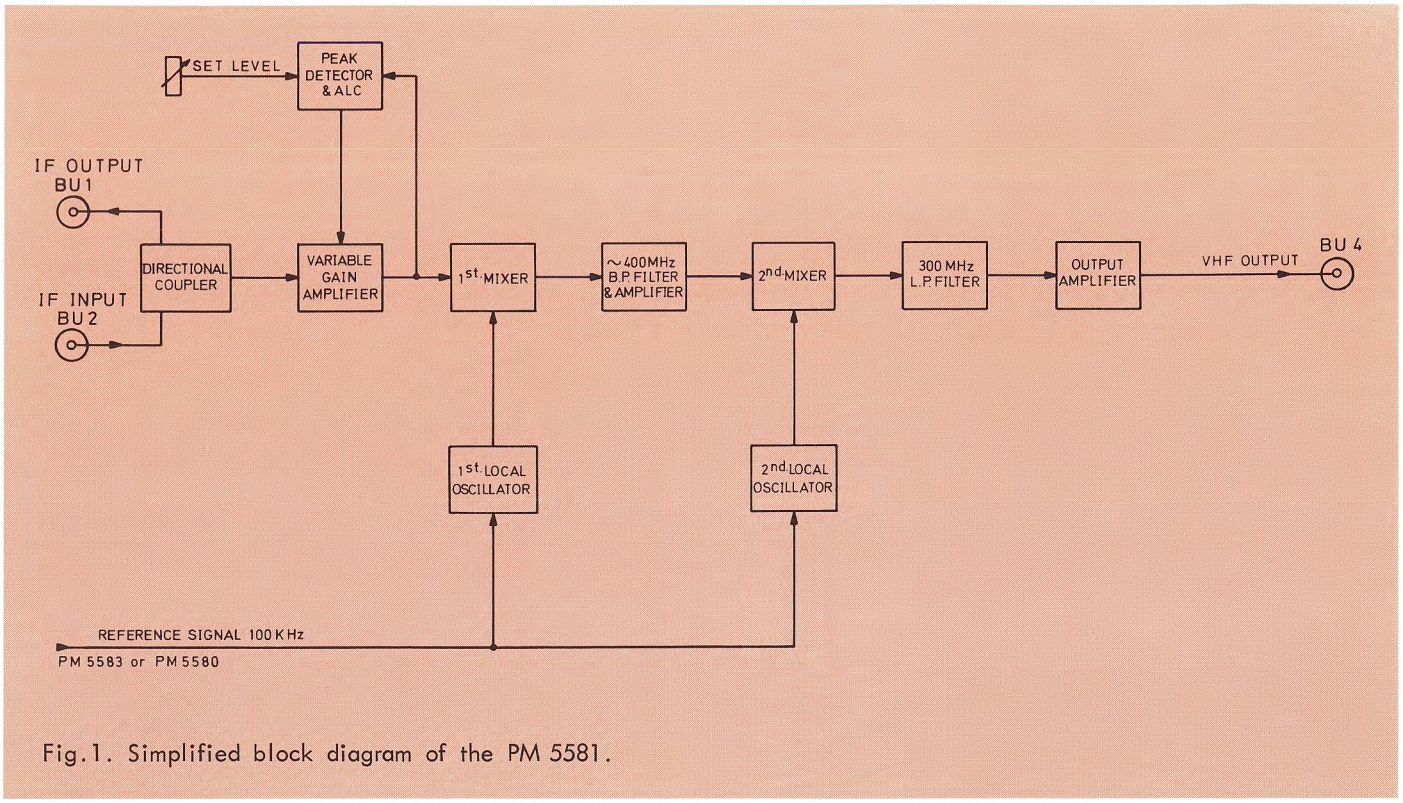


Fig.1. Simplified block diagram of the PM 5581.

After the directional coupler, the attenuated IF signal passes through the variable gain amplifier, which automatically controls the output level at 500 mVrms (or at any other level of the level control). In the first mixer, the IF frequency is converted into a fixed frequency of approximately 400 MHz. The mixer is supplied with a carrier from the first local oscillator, which is controlled (synthesized) by the 100 kHz reference. After the mixer the signal is amplified and filtered in the 400 MHz bandpass/amplifier, and it is now free from the unwanted side-band and carriers.

Via the second oscillator, which is programmable, and the second mixer, the 400 MHz signal is now brought to the final channel frequency. The unwanted side-band and the carriers are all above 400 MHz, so they are easily removed by the 300 MHz low-pass filter. The output amplifier delivers up to 500 mVrms into 75Ω. The output impedance is constant over the whole VHF and UHF range. The PM 5582 is similar to the PM 5581, except that its circuitry is a bit more complicated due to the very high frequencies in the UHF band.

Applications

An RF converter PM 5581 or PM 5582, together with the PM 5580 IF modulator forms a complete low-power TV transmitter of extremely high quality. This set-up can be used for testing TV receiver sets, demodulators, TV repeaters and other television equipment. The low content of harmonic and spurious signals of the PM 5580-PM 5581/82 combination makes it ideal for television distribution systems such as television factory test systems, cable TV systems and closed circuit television systems.

TECHNICAL DATA

PM 5581, systems B, D, I and M

PM 5582, systems K, G, I and M

Types

PM 5581 VHF converter is covering all channels in the frequency range of 40.25-299.25 MHz. PM 5582 UHF converter is covering all channels in the frequency range of 471.25-959.25 MHz. PM 5583 Power supply is a base unit that can house up to four VHF or UHF converters and supply them with power and 100.000 Hz reference signal.

Input

IF SIGNAL — Composite vision/sound signal from for instance the PM 5580 IF modulator. Vision frequency:

38.0 MHz, system D and K
38.9 MHz, system B and G
39.5 MHz, system I
45.75 MHz, system M

Note 1. In factories where TV sets of different systems are manufactured, it may often be advantageous to use the same IF frequency for all TV systems, e.g. 38.9 MHz. This makes the flexibility of the distribution system greater, exchange of units much easier, and mistakes in the programming of channel frequencies less probable. For that reason the converters and the IF modulator can also be delivered in a 38.9 MHz version for systems D, I and M.
Note 2. When ordering converters the wanted IF frequency must be indicated.

Input level: 100 mV to 1 Vrms. Automatic level control: maintains the output level, when the input level varies from 100 mV to 1 Vrms. Input impedance: 50Ω. Input type: looped-through via directional coup-

Output

RF SIGNAL — Nominal output level: 500 mVrms. Gain control: automatic. Reference level is set by screwdriver control at the front panel. For high input levels more than 500 mVrms output level can be obtained at reduced specification. Output impedance: 75Ω. Output VSWR: <1.5 for PM 5581, < 1.5 for PM 5582 in the range 470-860 MHz, <2 for PM 5582 in the range 860-960 MHz. Connector: 75Ω N-connector.

Characteristics

CHANNEL FREQUENCIES — Frequencies: derived from 100 kHz reference signal via synthesized oscillators. Frequency accuracy and drift: determined by reference signal. Programming: the channel frequency is programmed by switches on the "programmable divider" board. Programming of IF frequency: factory programmed.

LINEAR DISTORTIONS — Amplitude response: flat within ± 0.5 dB for 8 MHz band width. Group delay response: flat within ± 10 ns for 8 MHz band-width.

NON-LINEAR DISTORTIONS — Measuring method: three-tone method, f1 at vision frequency, -8 dB referred to peak sync level, f2 at colour subcarrier frequency, -16 dB referred to peak sync level and f3 at sound carrier frequency, -10 dB referred to peak sync level. Intermodulation: <-60 dB referred to peak sync level (f1+f3-f2).

SPURIOUS SIGNALS — Noise: < - 56 dBrms (typ. - 60 dBrms) referred to the black-to-white level of the video signal (10 kHz - 6 MHz). Spurious signals: < - 60 dB for factory aligned channels, typ.<-60 dB for field aligned channels (PM 5581). Spurious signals (PM 5582): < - 60 dB for factory aligned channels up to 720 MHz, < - 55 dB for factory aligned channels above 720 MHz. Field aligned channels are 5 dB worse. 2. harmonic spurious (PM 5582): < - 45 dB.

Power supply

Voltages: +15, +5 and - 15 V dc to be supplied from either PM 5580 IF modulator or PM 5583 Power supply.

Temperature range

Operating: 0° - 45°C ambient.

Mechanical data

1/6 plug-in unit for the PHILIPS 19" rack/table cabinet.
Height : 132 mm
Width : 70 mm
Depth : 400 mm
Weight : 3,5 kg (PM 5581)
3,7 kg (PM 5582)

TECHNICAL DATA PM 5583

POWER — +15, +5 and -15 V dc for driving up to four converters PM 5581 and/or PM 5582. Connector: Amphenol type.

REFERENCE SIGNAL — Frequency: 100 kHz. Waveform: squarewave signal. Frequency reference: temperature compensated crystal oscillator (TCXO) at 10.000 000 MHz. Accuracy: $\pm 2 \times 10^{-6}$ at 0-45°C ambient. Temperature drift: $< 10^{-8}$ /°C. Ageing: $< 10^{-6}$ /year.

Power supply

Voltage 230 V (115 V) ± 20% (Internal selection). Frequency: 48-65 Hz. Consumption (with four converters): 50 W at 220 V.

Temperature range

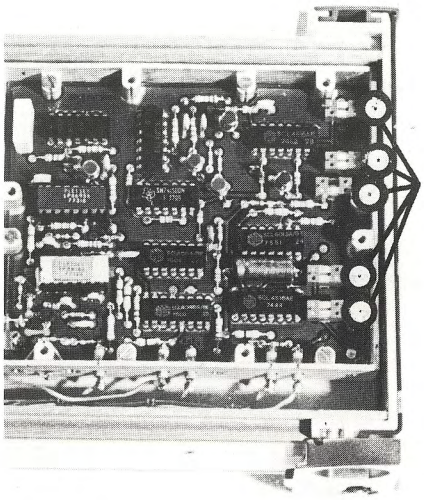
Operating: 0° - 45°C ambient.

Mechanical data

2/6 plug-in unit for the PHILIPS 19" rack/table cabinet.
Height : 132 mm
Width : 444 mm
Depth : 400 mm
Weight : 8.3 kg (including cabinet, without converters).

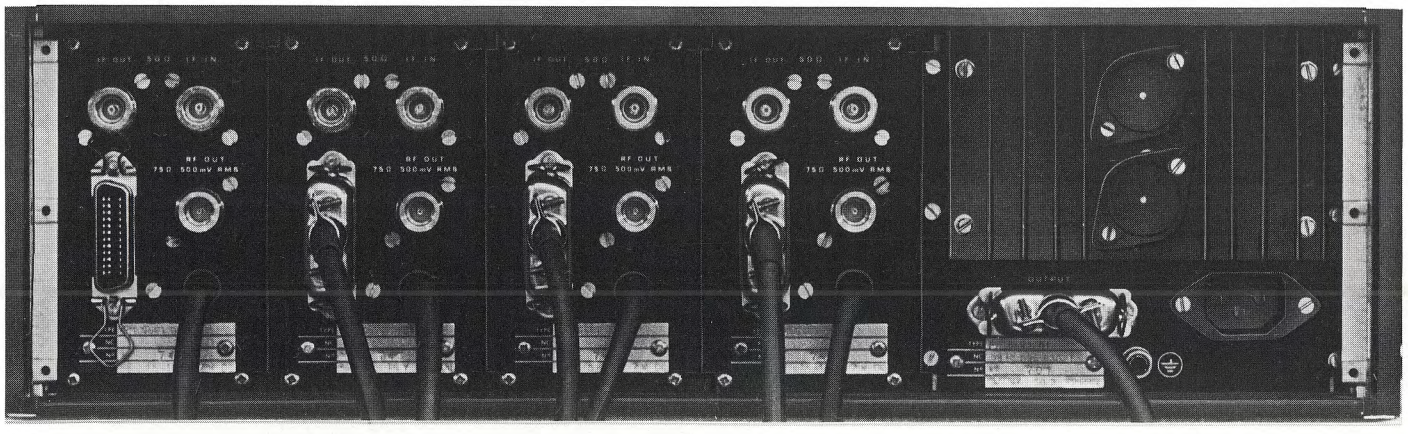
Cabinet

The PM 9716A rack/table cabinet is supplied with the PM 5583.



The circuitry of the RF converters is housed in small RF tight units in order to obtain a good screening between the various circuits. The photo shows the programmable divider of the synthesized 2nd. local oscillator.

The channel frequency is programmed by means of the small circuit board switches, marked with black dots. Besides setting the switches in the proper position, only a minor adjustment of the oscillator is required to complete the procedure of coding the converter to a specific channel.



TV test modulator

PM 5669

NEW

Code no. PM 5669:
9449 056 69002 (D-version)
9449 056 69003 (B-version)
9449 056 69005 (I-version)
9449 056 69008 (M-version)



Designed for testing and calibrating precision demodulators and off-air receivers

Digital precison modulation meter ensures accurate and repeatable measurements

Very low residual carrier and incidental phase modulation, because of unique modulator design

Double side-band modulator with extremely linear amplitude and group delay characteristics.

Two separate RF outputs, one for IF and one for VHF band I channel.

Switchable group delay pre-correction in accordance with CCIR TV systems.

The PM 5669 TV test modulator is a precision vision modulator designed for testing professional demodulators, such as Nyquist demodulators, off-air receivers and the receiving part of TV transposers. The PM 5669 has an extremely flat, double side-band response, without the usual sound notch, and an extremely accurate group delay pre-corrector. Linear and non-linear distortions are at an absolute minimum, to match the highest quality video equipment.

The test modulator has an IF output, i.e. an output with inverted vision spectrum. The frequency is in accordance with the various CCIR TV standards. In addition the PM 5669 has a standard RF output in band I. Further RF channels are possible with RF up-converters, for instance the PM 5581 or PM 5582 series of Philips up-converters. The inherent (but small) distortions of the up-converter however have, to be added to the distortions of the modulator, if such a system is chosen.

The front panel of the modulator is dominated by the digital modulation meter. For many measurements made on demodulators, the modulation depth (or rest carrier) is critical for the accuracy and repeatability of the measurements. The PM 5669 therefore has a precision digital modulation meter, a feature rarely seen in modulators.

The following precision features and specifications make the PM 5669 unique:
- Extremely flat amplitude response (typically 0.1 dB)
- Highly accurate group delay response (typically 5-10 ns over the band)
- Extremely low distortions (typically 0.5 % diff. gain and 0.3° diff. phase)
- Extremely low residual carrier and incidental phase modulation (typically 60 dB and 0.5°)
- Very low spurious signals and noise (less than 66-70 dB)
- Precision modulation meter (accuracy within 2% of reading)
- Both IF and RF output
- Selectable dc-restoration (back-porch clamping, peak level, and average level restoration).

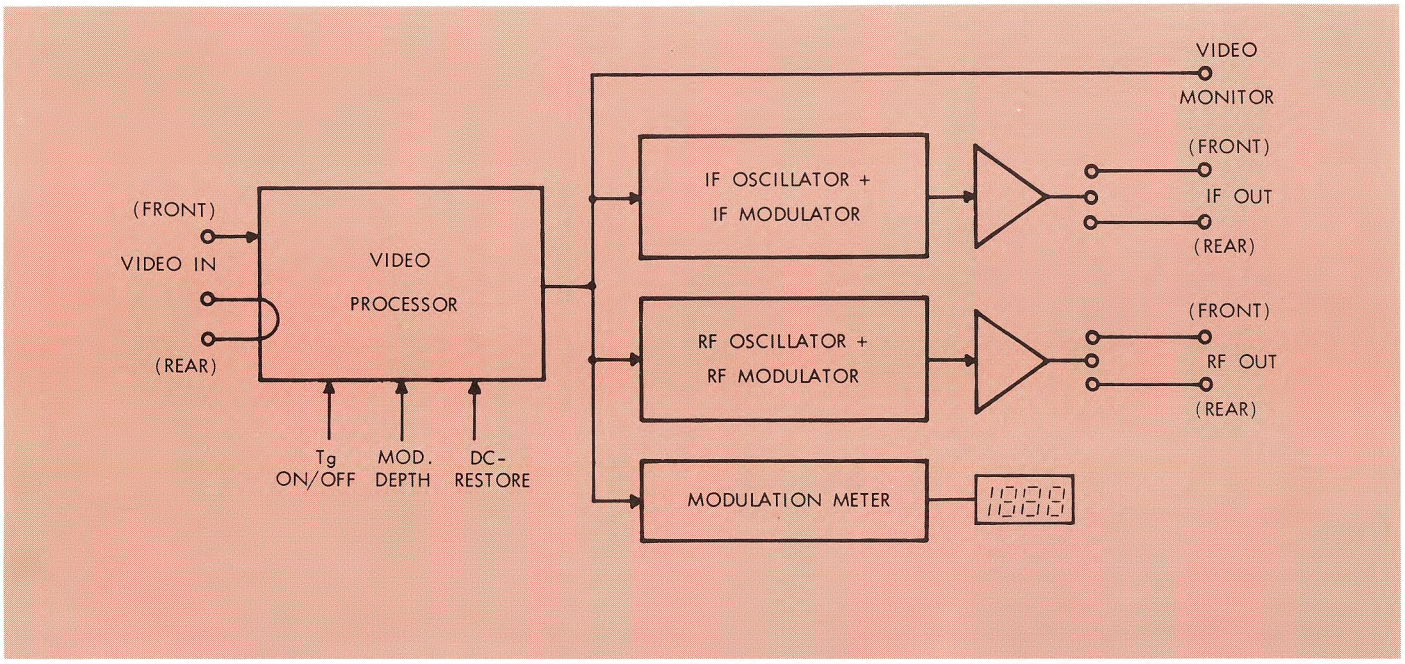
Technical description

The PM 5669 has two inputs, a 75Ω input at the front and a looped-through input at the rear. A front panel switch selects the input to be connected to the video processing part. The video processor includes flat group delay response or pre-corrected response (Tg on/off), dc restoration and video gain control (modulation). The output signal from the video processor is fed to the two modulators, to the monitor output and to the modulation meter. The modulation meter circuit has a low-pass characteristic, so that only the luminance content of a colour signal is measured.

The two modulators have their own crystal-controlled carrier oscillators. To ensure low incidental phase modulation and low content of residual carrier, and the modulator circuits are double balanced. The outputs are driven by buffer output amplifiers. By internal selection, the user can have the output signals available on the front panel BNC output connectors or at the rear panel connectors (BNC for IF, N for RF).

Applications

The PM 5669 is designed for testing precision demodulators and receivers in workshops and engineering groups, where such equipment is developed, calibrated or repaired. Because of its

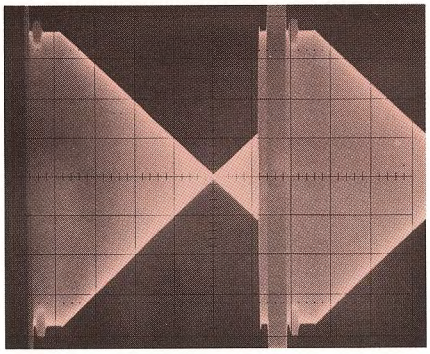


very high accuracy and low inherent distortion, the PM 5669 can be regarded as an "ideal modulator" for most applications.

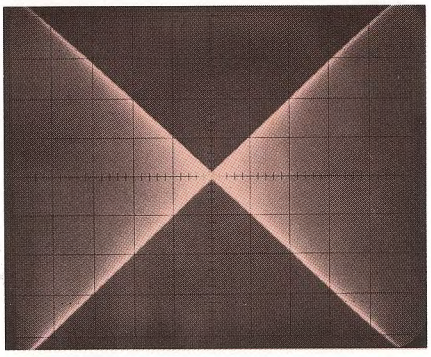
The front panel functions Tg on/off and various dc-restoration modes allow the user to trace the source of various distortions using for instance, non-TV test signals. With the Philips video test signal generator PM 5570, the PM 5669 forms a very strong RF measuring system.

The PM 5669 may be used in high quality transmission systems, if a suitable filter is inserted after the modulator (could be part of an up-converter). If the receivers sound notch is switched off, the RF transmission quality does not suffer from the usual broadcast system limitations. Thus the quality is comparable to video transmission quality, or in certain cases even better (lower relative bandwidth of the signal).

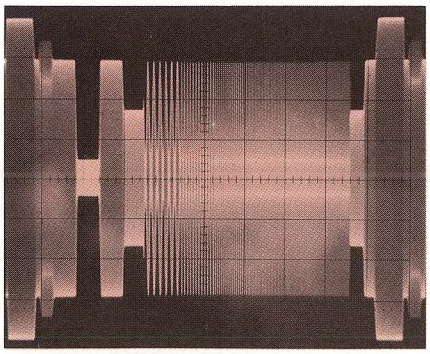
Recommended up-converters at fixed channels: Philips converter series PM 5581/82/83. These converters cover VHF (PM 5581) and UHF (PM 5582), and the channel number is selected by internal programming (synthezised carrier generation). The PM 5583 is the power supply driving up to 4 converters. For other applications, a tunable up-converter may be more convenient.



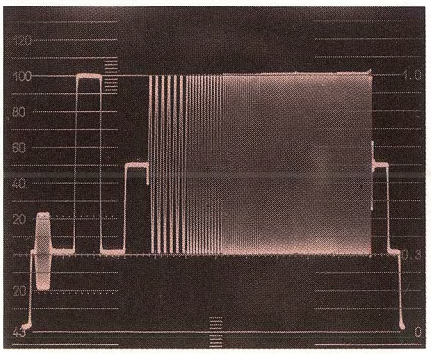
The balance of the modulator (residual carrier) may be checked with an overmodulated sawtooth signal as above. A good modulator balance is essential for a low differential phase distortion.



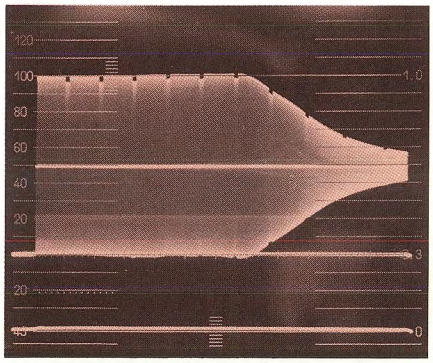
Overmodulated sawtooth magnified by 10 (peak-peak RF amplitude 1000 mm). The picture proves the superb balance of the PM 5669 (typ. 70 dB).



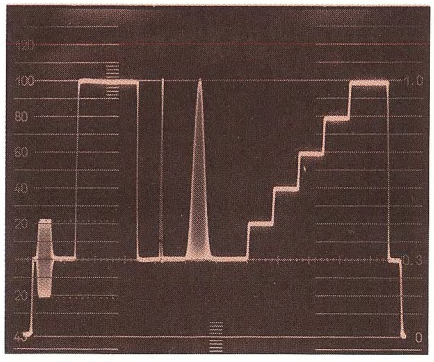
At IF and VHF band I frequencies the amplitude response of a modulator can be measured directly with a high-frequency oscilloscope. The photo shows the IF signal (30-40 MHz) modulated with a multiburst signal of 1-2-3-4-5-6 MHz bursts preceeded by white and black reference bars.



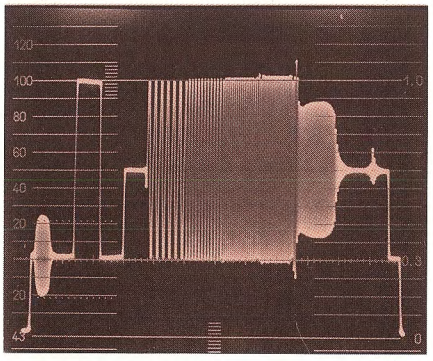
Same signal demodulated by the PM 5560 Nyquist demodulator in "broad" mode (i.e. without sound notch).



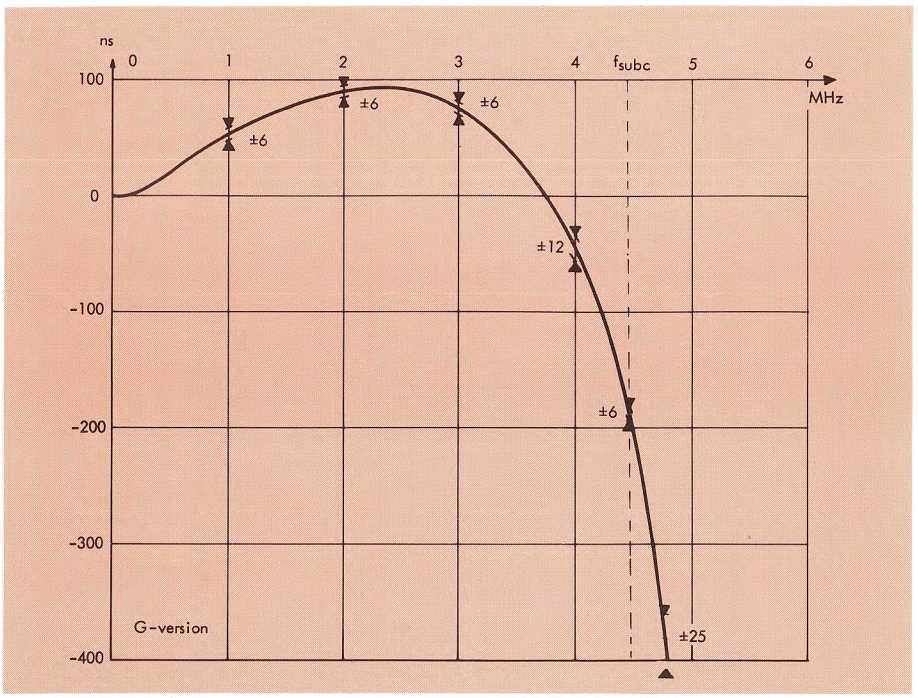
Demodulated video sweep 100 kHz to 10 MHz. The response is mainly decided by the demodulator and shows flat response to over 6 MHz.

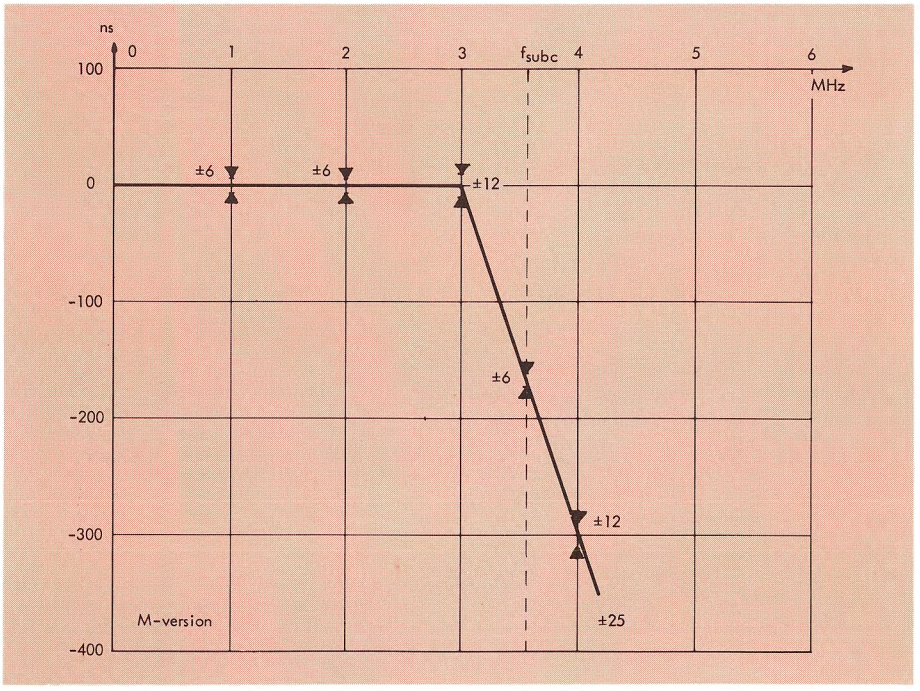


Demodulated pulse-and-bar signal. This photo and the multiburst photo on the previous page demonstrate that RF transmission may have very high quality.



Demodulated multiburst signal with the demodulator in "standard" mode (i.e. with sound notch at 5.5 MHz). The response is about the best possible in system B/G.





TECHNICAL DATA

Output signals

IF OUTPUT — Number of outputs: 1 BNC at the front or i BNC at the rear (by internal selection). Output impedance: 50Ω. Return loss: > 23 dB. Output level: 300 mVrms ± 1 dB. Type of signal: vision signal (modulated video) with inverted spectrum. Carrier frequency: 38.9 MHz (systems (B/G and I), 38.0 MHz (system D/K), 45.75 MHz (system M). Carrier accuracy: within 40 ppm.

RF OUTPUT — Number of outputs: 1 BNC at the front or 1 N-connector at the rear (by internal selection). Output impedance: 50 Ω. Return loss: > 23 dB. Output level: 300 mVrms ± 1 dB. Type of signal: vision signal. Carrier frequency: 55.25 MHz (system B channel 3, system M channel 2), or other frequencies in band I on request. Carrier accuracy: within 40 ppm.

VIDEO MONITOR OUTPUT — Number of outputs: 1 BNC at the front. Output impedance: 75 Ω. Return loss: > 26 dB up to 8 MHz. Output level: 1 Vpp at nominal modulation depth.

Input signal

VIDEO INPUT — Number of inputs: 1 BNC at the front (terminated), 2 BNCs at the rear (looped-through). Input impedance: 75Ω (front), high-ohmic (rear). Return loss: > 34 dB up to 7 MHz (when terminated). Input level: 1 Vpp ± 3 dB.

Modulation characteristics

MODULATION — Type of modulator: double balanced AM, negative modulation. Amplitude response: flat from -2 MHz to +6 MHz referred to the vision carrier. Accuracy: typically within ± 0.1 dB, guaranteed within ± 0.2 dB. Group delay response: flat or in accordance with TV sy-

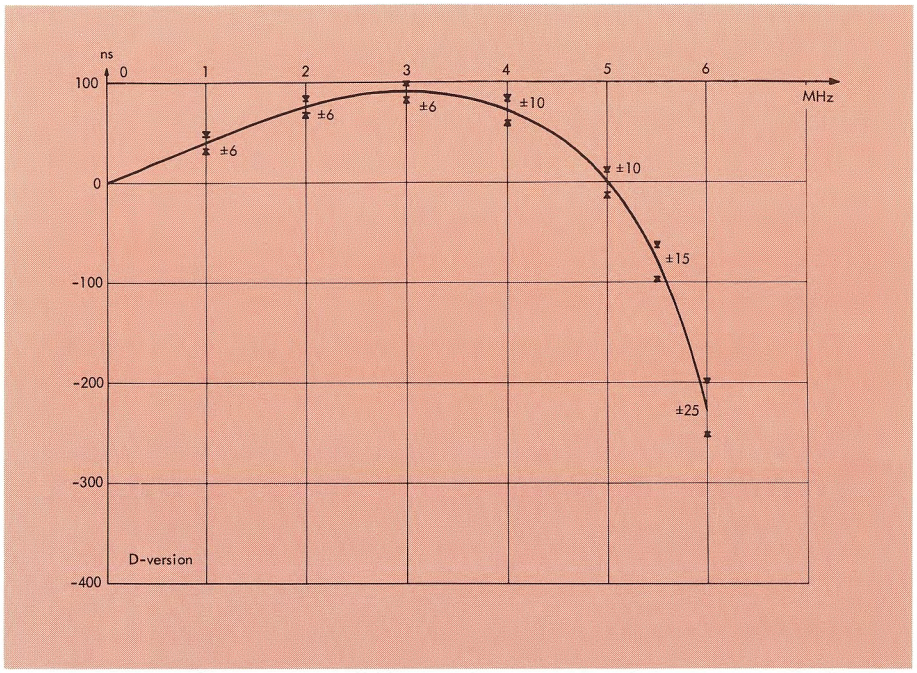
stem specifications. Accuracy in flat mode (tg off): within ± 6 ns (0-5 MHz), ± 12 ns (5-6 MHz). Accuracy with pre-correction: see relevant tolerance profiles. Residual carrier: < 60 dB. Incidental phase modulation: typically < 0.5° (up to 100 kHz).

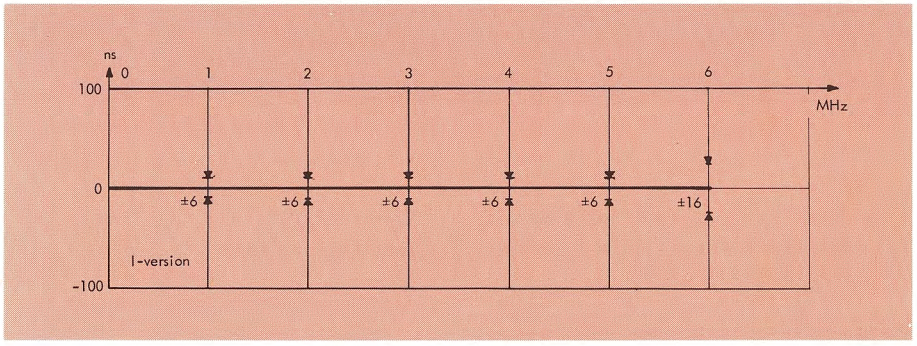
DC-RESTORATION — Types of dc-restoration: 1) back-porch clamp, 2) peak level restorer, and 3) average level restorer. Accuracy (referred to 700 mV or 100 IRE): within 1% (back-porch), within 2% (peak level), adjustable level 0-100% (average).

NON-LINEAR DISTORTIONS — Differential gain: < 1%, typically 0.5%. Differential phase: < 0.5°, typically 0.3°. Luminance non-linearity: < 1%, typically < 0.5%. Chrominance/luminance gain inequality: < 1% (without pre-correction, < 2% with pre-correction. Chrominance delay in-equality: < 3 ns without pre-correction, < 6 ns with pre-correction.

NOISE AND SPURIOUS SIGNALS — Noise in channel: < - 66 dBrms (10 kHz - 4.8 MHz). Low frequency noise: < - 60 dBpp (up to 1 kHz). Other spurious signals in channel: < - 70 dB. Harmonics of vision carrier: < - 40 dB.

MODULATION METER — Type of meter: 4-digit digital LED display. Range of measurement: 100% to - 15% restcarrier. Accuracy: within 2% of reading, 0.5% of full scale.





Front panel controls and indicators

- Power on/off
- Input selector front/rear
- Group delay pre-correction on/off
- Dc-restoration back-porch clamp/peak restorer/average
- Restorer level (average, screwdriver control)
- Modulation depth
- Power on indicator
- Rest carrier meter

Power requirements

Voltage: 100/120/220/240 V + 10 - 15%. Frequency: 48-65 Hz. Consumption: 25 W.

Environmental conditions

Operating temperature: 10-45° C ambient. Storage temperature: - 30 to + 70° C. Climatic conditions: Philips type C1. Mechanical conditions: Philips type M1. Supply conditions: Philips type S2.

Safety

Safety: in accordance with IEC 348 class I.

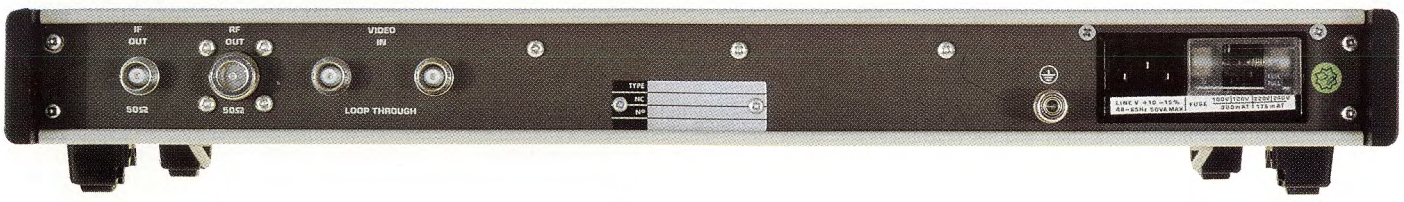
Mechanical data

19" rack/table cabinet 1 rack unit high.

Height	:	44 mm
Width	:	440 mm (excl. rackmount brackets)
Depth	:	460 mm
Weight	:	6.8 kg

The cabinet has handles and rackmount brackets as an integral part of the cabinet. Rubber feet and a tilt bracket may be removed (rackmount). When rackmounted the cabined should be supported at the rear.

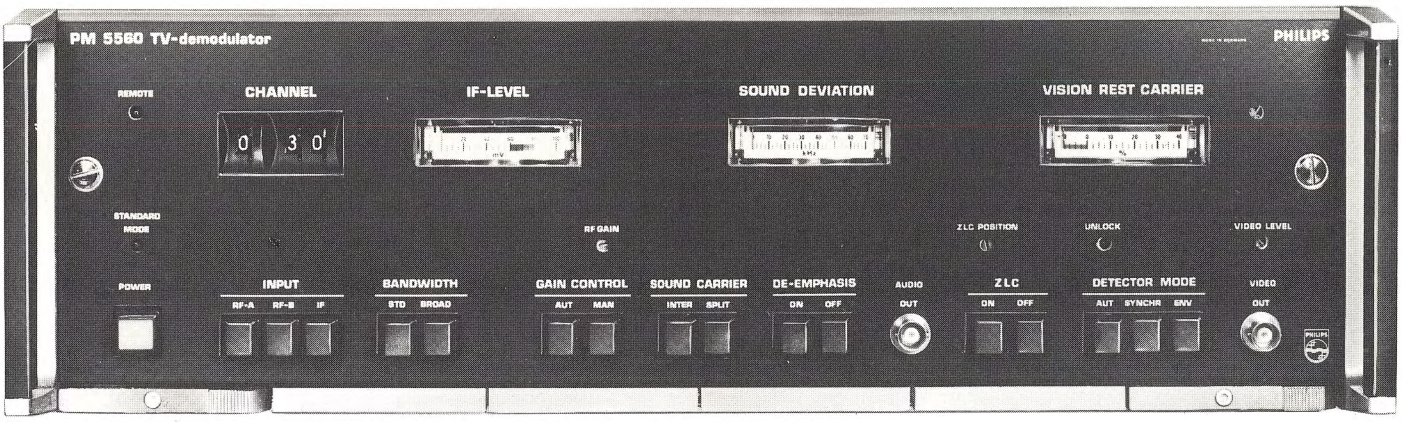
Accessories:
- Mains cord
- Operation and service manual
- 75Ω termination



TV demodulator

PM 5560

Code no. PM 5560:
9449 055 60002 (system D/K, 38.0 MHz IF)
9449 055 60003 (system B/G, 38.9 MHz IF)
9449 055 60005 (system I, 39.5 MHz IF)
9449 055 60008 (system M, 45.75 MHz IF)



PM 5560 is a major advance in measurement and convenience of operation

Both synchronous and envelope detaction modes allow for measuring more parameters than previously and with improved accuracy

Unique PROM and synthesizer circuits facilitate straightforward dialling of the desired channel

Narrow limits for the amplitude and group delay profiles

Automatic and manual level control ensures optimum usability for both automatic monitoring and maintenance work

Simultaneous reading of the IF level, sound deviation and vision rest carrier

High stability due to computer aided design of filters and equalizers

Automatic frequency control ensures optimum demodulation and corrects for possible frequency off-set

Separate inputs for UHF and VHF channels at low and high levels plus IF input

Channel and input selection can be remotely controlled

Ideal for use in automatic test and monitoring systems

The PHILIPS PM 5560 TV demodulator is a compact precision Nyquist demodulator incorporating a tunable RF part and an IF part with detectors.

The tuner is a combined VHF/UHF tuner using double conversion to obtain good selectivity. The tuning is done by means of thumb-wheel switches, indicating the selected channel number. All VHF and UHF channels can be selected as well as S channels and special VHF channels. An automatic frequency control circuit ensures correct tuning irregardless of a possible off-set of the transmitter.

The instrument has both a synchronous and an envelope detector. The synchronous detector has excellent demodulation characteristics, which allow measurement of most types of distortion at full modulation or even overmodulation. The sound part of the demodulator has both an intercarrier sound and a split carrier mode of operation.

Applications

The PM 5560 is primarily designed for high quality demodulation of vision and sound signals from television transmitters at any frequency. The very easy way of tuning the demodulator, by means of thumb-wheel selectors, makes the PM 5560 very convenient for use in stations where more than one transmitter is operating. The synchronous detector is a new and very sophisticated development included in the PM 5560 which overcomes completely the inherent quadrature distortion of detectors using the envelope detection principle. The effect of quadrature distortion can be minimized by using reduced signal levels at the cost of a reduced signal-to-noise level. It is a question whether the results obtained from reduced level measurements are objectively describing the performance of a high power TV transmitter. The synchronous detector, however, works perfectly with nominal level signals, such as VITS for example, or even with overmodulated signals. The measurements are thus more realistic, and furthermore they can be performed

during program hours using either the studio VITS or new VITS inserted at the transmitter input. This is particular important for automatic monitoring of television networks.

The PM 5560 has five inputs: UHF high and low level inputs, VHF high and low level inputs and IF input. In many cases all the transmitters in a station can be connected simultaneously to the PM 5560, for instance one VHF and two UHF transmitters. The switch-over from one transmitter to the other can then be done by only selecting the proper channel number and the proper input. As both functions can be remotely controlled, easy operation and possibilities for automatic monitoring are obvious. The system, PM 5560 and PM 5578 insertion signal analyser, make up the most elaborate monitoring system available on the market particularly when combined with the dataline remote control system, PM 5541/42, which allows certain remote functions to be carried out at the station on command from the network centre.

Technical description

The tuner makes use of double conversion, which ensures good RF selectivity. The channel selector at the front, controls a read-only-memory that "translates" the selected channel number into a frequency of the first local oscillator. Advanced technology is applied in the synthesizer that controls this oscillator operating at very high frequency (up to 1.4 GHz).

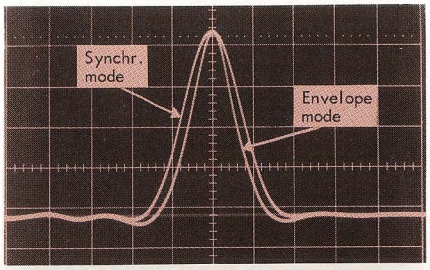
In principle the second oscillator is working at a fixed frequency, however, a minor frequency adjustment may be introduced by the automatic frequency control circuit. This guarantees the IF frequency to be very close to the nominal IF frequency (important for the performance of the synchronous detector) irregardless of any possible off-set or inaccuracy of the transmitter frequency.

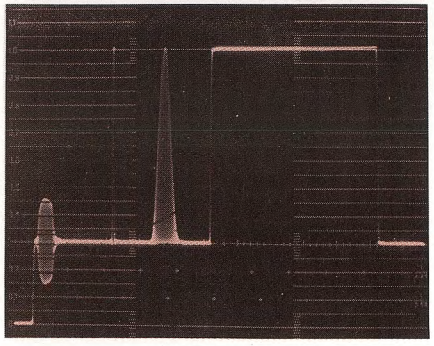
The IF filters and group delay equalizers are of conventional design. However, computer aided design has been applied to minimize the influence of a possible drift of the individual components - on the over-all characteristic. Buffer stages are included in the filters so that alignments are done easily and through a straight forward procedure. For special measuring purposes the broad-band mode has been included along with standard mode. The standard mode is extraordinary flat which results in distortionfree demodulation of chroma signals.

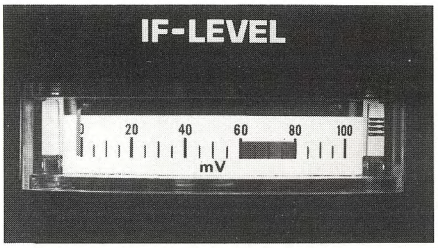
The synchronous detector is using sampling and phase locking techniques to regenerate the carrier of the IF signal. This system works even in case of overmodulation, so within the normal modulation range an extremely linear performance is obtained. An envelope detector is also available because incidental phase modulation in certain types of transmitters can disturb the differential phase measurement in the synchronous detection mode. The measurement of the differential phase in the two detection modes will give information about the incidental phase modulation, a parameter which will be increasingly important in the future.

The sound detector is of the phase locked loop type featuring very low distortion. Two modes for sound detection are possible: intercarrier and split carrier modes. In the first case the vision IF frequency is used for the conversion into the intercarrier frequency, while in the split carrier mode a crystal controlled oscillator is used. This makes it possible to perform measurements on the sound transmitter completely independent of vision characteristics (e.g. video content).

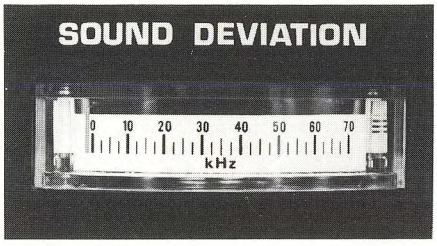
The built-in meters give a convenient indication of IF level, sound modulation and vision modulation. For most routine measurements the accuracy of these indicators is sufficient so that no extra modulation meters are needed. A zero carrier level can be keyed-in manually by a push-button control, - in the active picture -, and/or remotely (for instance from the PM 5578), - in the field blanking interval.



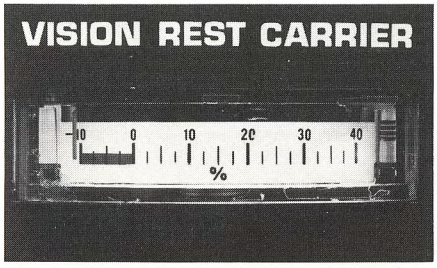




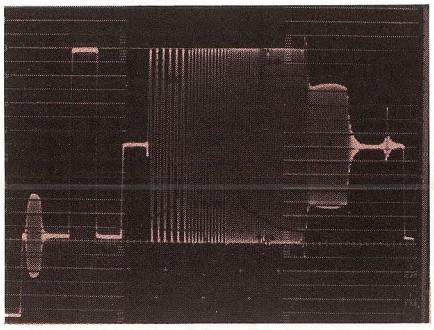
IF level meter. During normal operation the pointer should be within the 60 - 80 degrees range. Gain controls: ± 3 dB for the IF input, automatic or manual up to ± 10 dB for UHF and VHF inputs.



The sound deviation meter indicates the peak frequency deviation of the FM modulated sound carrier.



The vision rest carrier meter indicates the rest carrier at peak white level. Negative rest carrier means overmodulation.



Demodulated signals: above multiburst 1-2-3-4-5-6 MHz, left pulse-and-bar signal plus 2T pulse shown in envelope and synchronous detection modes. The signals are modulated in a precision DSB modulator with group delay pre-correction. The demodulator is in its standard mode.

TECHNICAL DATA

Input signals

RF-HIGH (VHF and UHF) — Input level: 1.5 Vrms nominal (peak sync level). Automatic gain control: ±10dB. Impedance: 50Ω. Return loss: > 30 dB (typ. 34 dB). Connector type: 50Ω N-connector.

RF-LOW (VHF and UHF) — Input level: 300 mVrms nominal (peak sync level). Automatic gain control: ± 10 dB. Impedance: 50 Ω. Return loss: > 20 dB (typ. 26 dB). Connector type: 50 Ω N-connector.

IF INPUT — Input level: 70 mVrms nominal. Manual gain control: ± 3 dB. Impedance: 50 Ω. Return loss: > 26 dB. Connector: BNC.

ZERO LEVEL CLAMP — The instrument has input for an external control signal for suppressing the carrier, in order to allow measurement of the modulation depth. Level: + 5 V TTL logic. Suppression: when the control signal is "low". Connector: BNC.

Output signals

MAIN OUTPUTS — Number: 2 video composite at the rear. Level: 1 Vp-p nominal, adjustable ±1.5dB. Impedance: 75 Ω. Return loss: > 34 dB up to 6 MHz.

VIDEO OUTPUT — Number: 1 video composite at the front. Level: 1 Vp-p. Impedance: 75 Ω. Return loss: > 34 dB up to 6 MHz.

SYNC OUT — Number: 2 composite sync at the rear. Amplitude: 2 Vp-p. Impedance: 75 Ω.

FIELD DRIVE — Number: 1 output at the rear. Amplitude: 2 Vp-p. Impedance: 75 Ω.

SOUND INTERCARRIER — Number: 1 output at the rear. Level: 110 mVrms. Impedance: 50 Ω. Frequency: 4.5 MHz.

MAIN AUDIO — Number: 1 DIN 5-pole 180° connector at the rear. Level: + 6 dBm (1.55 V) at ± 25 kHz deviation, adjustable to - 30 dBm. Impedance: 600 Ω balanced.

SOUND OUTPUT — Number: 1 BNC connector at the front. Level: + 6 dBm (1.55 V) at ± 25 kHz deviation. Impedance: 600 Ω.

Demodulation characteristics PM 5560 G

LINEAR DISTORTIONS — Video. Amplitude response in "Broad mode": see figure G1. Amplitude response in "Standard mode": see figure G2. Group delay characteristics in "Broad mode": see figure G3. Group delay characteristics in "Standard mode": see figure G4. RF-IF amplitude characteristics in "Broad mode": see figure G5. 2T pulse response: K-factor < 1% in synchronous detection mode for modulation 0 - 75%, K-factor < 1.5% in envelope detection mode for modulation 55 - 75%. Crosstalk between RF inputs:

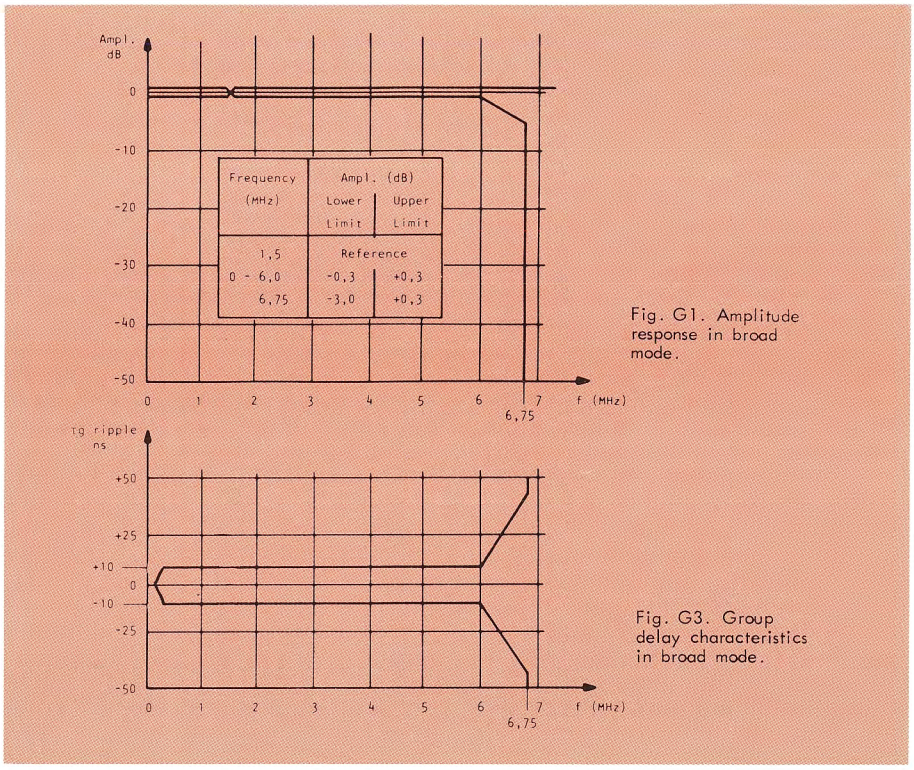


Fig. G1. Amplitude response in broad mode.

Fig. G3. Group delay characteristics in broad mode.

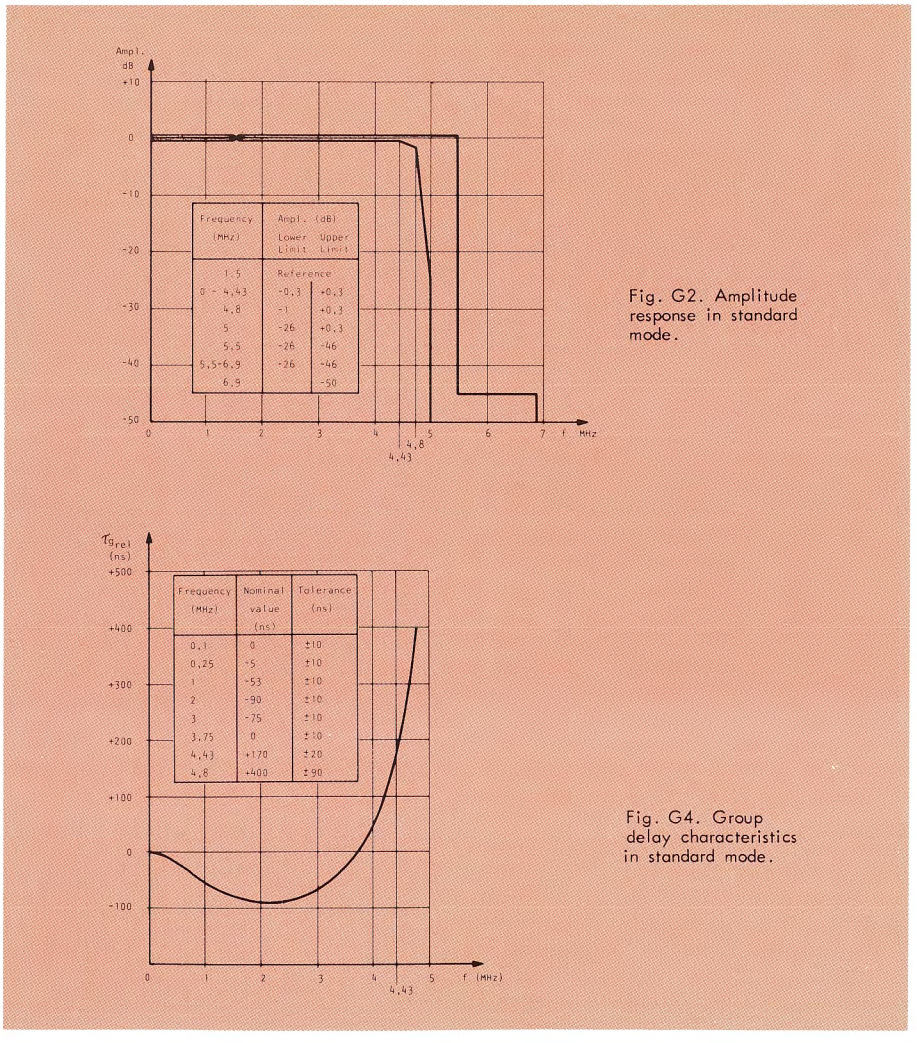


Fig. G2. Amplitude response in standard mode.

Fig. G4. Group delay characteristics in standard mode.

< - 54 dB. Crosstalk between RF inputs and IF input: < - 60 dB.
Sound. Amplitude response: flat within ± 0.5 dB for 40 Hz - 15 kHz with de-emphasis.

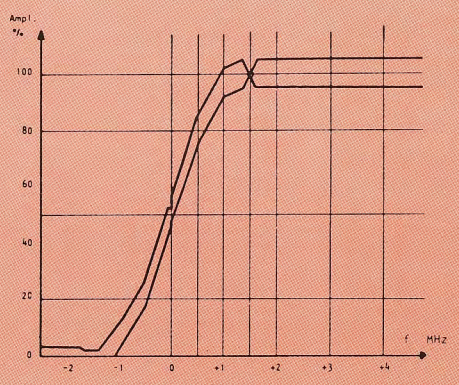
NON-LINEAR DISTORTIONS — Video. Differential gain: < 2% in synchronous mode up to 0% rest carrier, < 3% in envelope mode up to 12.5% rest carrier. Differential phase: < 2° in synchronous mode up to 0° rest carrier, < 3° in envelope mode up to 12.5% rest carrier. Intermodulation: < 60 dB below blanking level. Signal-to-noise ratio (standard bandwidth): low frequency noise up to 1 kHz: > 52 dBp-p, periodic disturbances 1 kHz - 6 MHz: > 60 dBp-p, random noise above 10 kHz: > 60 dBrms, all referred to 100 IRE video level.
Sound. Harmonic distortion: < 0.5% for ± 25 kHz deviation, < 1% for 50 kHz deviation, both in the frequency range of 40 Hz - 15 kHz. Signal-to-noise ratio: > 50 dB, in intercarrier mode for ± 50 kHz deviation at 1 kHz, > 60 dB (VHF), > 54 dB (UHF) in split carrier mode for ± 50 kHz deviation at 1 kHz.

TECHNICAL DATA PM 5560 D/K

Demodulation characteristics

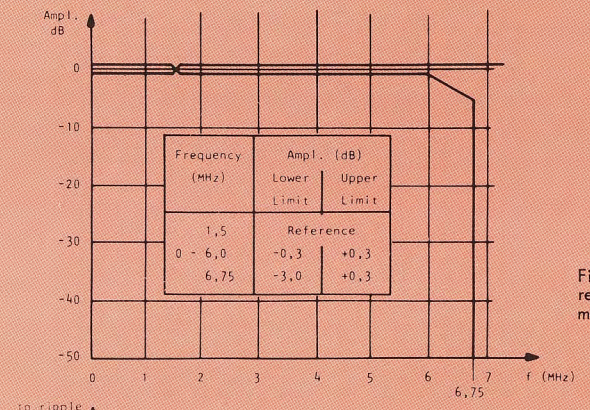
LINEAR DISTORTIONS — Video. Amplitude response in "Broad mode": see figure D1. Amplitude response in "Standard mode": see figure D2. Group delay characteristics in "Broad mode": see figure D3. Group delay characteristics in "Standard mode": see figure D4. RF-IF amplitude characteristics in "Broad mode": see figure D5. 2T pulse response: K-factor < 1% in synchronous detection mode for modulation 0 - 75%, K-factor < 1.5% in envelope detection mode for modulation 55 - 75%. Crosstalk between RF inputs: < - 54 dB. Crosstalk between RF inputs and IF input: < - 60 dB.
Sound. Amplitude response: flat within ± 0.5 dB for 40 Hz - 15 kHz with de-emphasis.

NON-LINEAR DISTORTIONS — Video. Differential gain: < 2% in synchronous mode up to 0% rest carrier, < 3% in envelope mode up to 12.5% rest carrier. Differential phase: < 1° in synchronous mode up to 0% rest carrier, < 2° in envelope mode up to 12.5% rest carrier. Intermodulation: < 60 dB below blanking level. Signal-to-noise ratio (standard bandwidth): low frequency noise up to 1 kHz: > 52 dBpp, periodic disturbances 1 kHz - 6 MHz: > 56 dBpp (typ. 60 dBpp on VHF, 56 dBpp on UHF), random noise over 10 kHz: > 59 dBrms (typ. 62 dBrms on VHF, 60 dBrms on UHF), all referred to 700 mVpp video level.
Sound. Harmonic distortion: < 0.5% for ± 50 kHz deviation, < 1% for 75 kHz viation, both in the frequency range of 40 Hz - 15 kHz. Signal-to-noise ratio: > 50 dB weighted, in intercarrier mode for ± 50 kHz deviation at 1 kHz, > 65 dB weighted (VHF), > 56 dB weighted (UHF) in split carrier mode for ± 50 kHz deviation at 1 kHz.



Frequency (MHz)	Ampl. % Upper Limit	Lower Limit
< - 1,65	0	2
- 1,65	0	0,8
- 1,35	0	0,8
- 1	0	8,5
- 0,5	15	25
0	48	52
+ 0,5	75	85
+ 1	91,5	101,5
+ 1,4	95	105
+ 1,5	Reference	
+ 1,6	95	105
+ 4,2	95	105
+ 7	71	105
>+ 7	-	105

Fig. G5. Nyquist slope in broad mode.



Frequency (MHz)	Ampl. (dB) Lower Limit	Upper Limit
1,5	Reference	
0 - 6,0	-0,3	+0,3
6,75	-3,0	+0,3

Fig. D1. Amplitude response in broad mode.

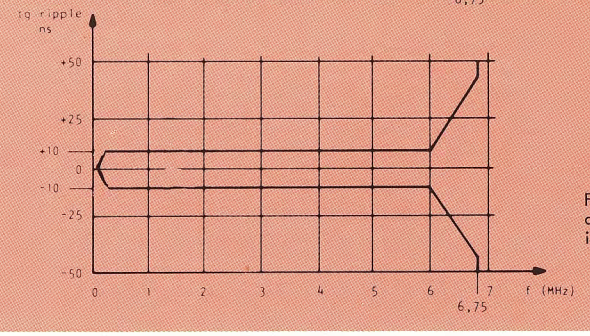
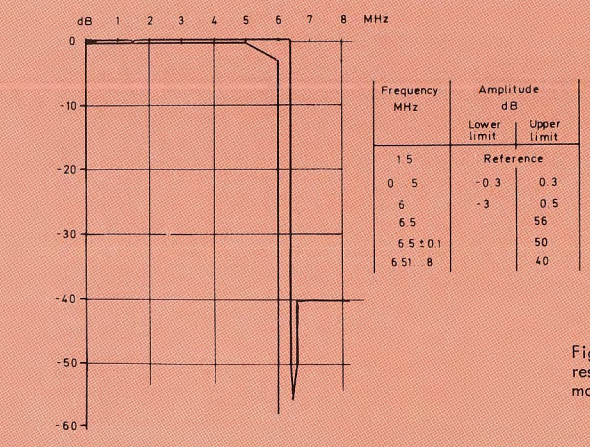
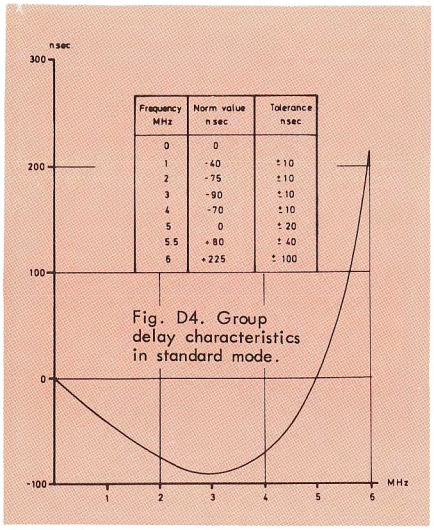


Fig. D3. Group delay characteristics in broad mode.



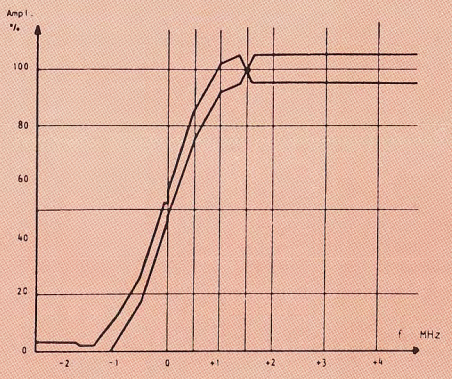
Frequency MHz	Amplitude dB Lower limit	Upper limit
1.5	Reference	
0.5	-0.3	0.3
6	-3	0.5
6.5		56
6.5 ± 0.1		50
6.51 8		40

Fig. D2. Amplitude response in standard mode.



Frequency MHz	Norm value n sec	Tolerance n sec
0	0	
1	-40	±10
2	-75	±10
3	-90	±10
4	-70	±10
5	0	±20
5.5	+80	±40
6	+225	±100

Fig. D4. Group delay characteristics in standard mode.



Frequency (MHz)	Ampl. % Upper Limit	Lower Limit
< - 1,65	0	2
- 1,65	0	0,8
- 1,35	0	0,8
- 1	0	8,5
- 0,5	15	25
0	48	52
+ 0,5	75	85
+ 1	91,5	101,5
+ 1,4	95	105
+ 1,5	Reference	
+ 1,6	95	105
+ 4,2	95	105
+ 7	71	105
>+ 7	-	105

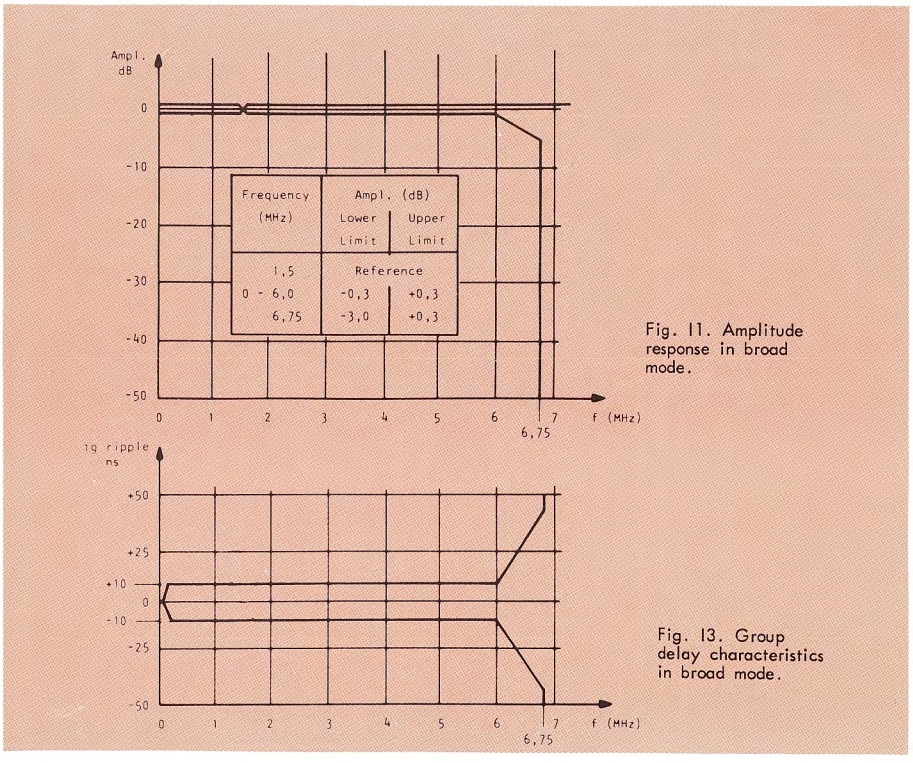
Fig. D5. Nyquist slope in broad mode.

TECHNICAL DATA PM 5560 I

Demodulation characteristics

LINEAR DISTORTIONS — Video. Amplitude response in "Broad mode": see figure 11. Amplitude response in "Standard mode": see figure 12. Group delay characteristics in "Broad mode": see figure 13. Group delay characteristics in "Standard mode": see figure 14. RF-IF amplitude characteristics in "Broad mode": see figure 15. 2T pulse response: K-factor < 1% in synchronous detection mode for modulation 0 - 75%, K-factor < 1.5% in envelope detection mode for modulation 55 - 75%. Crosstalk between RF inputs: < - 54 dB. Crosstalk between RF inputs and IF input: < - 60 dB.
Sound. Amplitude response: flat within ± 0.5 dB for 40 Hz - 15 kHz with de-emphasis.

NON-LINEAR DISTORTIONS — Video. Differential gain: < 2% in synchronous mode up to 0% rest carrier, < 3% in envelope mode up to 12.5% rest carrier. Differential phase: < 1° in synchronous mode up to 0% rest carrier, < 2° in envelope mode up to 12.5% rest carrier. Intermodulation: < 60 dB below blanking level. Signal-to-noise ratio (standard bandwith): low frequency noise up to 1 kHz: > 52 dBpp, periodic disturbances 1 kHz - 6 MHz: > 56 dBpp (typ. 60 dBpp on VHF, 56 dBpp on UHF), random noise over 10 kHz: > 59 dBrms (typ. 62 dBrms on VHF, 60 dBrms on UHF), all referred to 700 mVpp video level.
Sound. Harmonic distortion: < 0.5% for ± 50 kHz deviation, < 1% for 75 kHz deviation, both in the frequency range of 40 Hz - 15 kHz. Signal-to-noise ratio: > 50 dB weighted, in intercarrier mode for ± 50 kHz deviation at 1 kHz, > 65 dB weighted (VHF), > 56 dB weighted (UHF) in split carrier mode for ± 50 kHz deviation at 1 kHz.



Frequency (MHz)	Ampl. (dB) Lower Limit	Upper Limit
1,5	Reference	
0 - 6,0	-0,3	+0,3
6,75	-3,0	+0,3

Fig. 11. Amplitude response in broad mode.

Fig. 13. Group delay characteristics in broad mode.

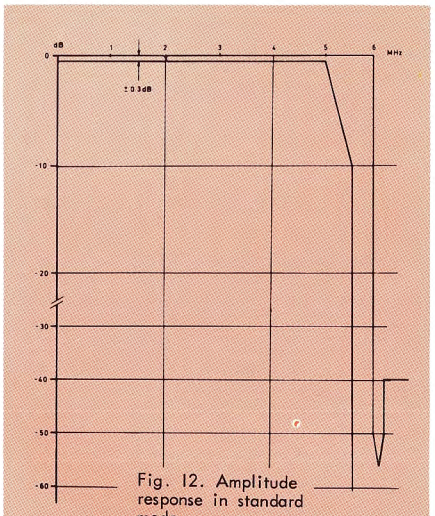


Fig. 12. Amplitude response in standard mode.

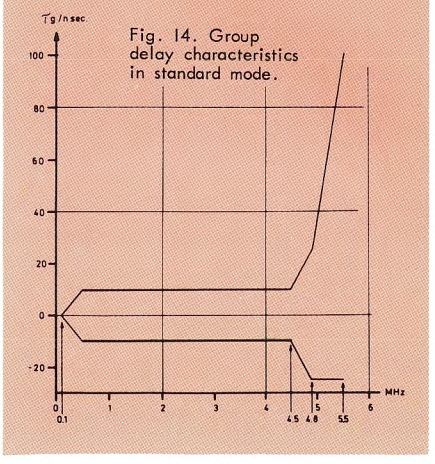


Fig. 14. Group delay characteristics in standard mode.

TECHNICAL DATA PM 5560 M

Demodulation characteristics

LINEAR DISTORTIONS — Video. Amplitude response in "Broad mode": see figure M1. Amplitude response in "Standard mode": see figure M2. Group delay characteristics in "Broad mode": see figure M3. Group delay characteristics in "Standard mode": see figure M4. RF-IF amplitude characteristics in "Broad mode": see figure M5. 2T pulse response: K-factor < 1% in synchronous detection mode for modulation 0 - 75%, K-factor <1.5% in envelope detection mode for modulation 55 — 75%. Crosstalk between RF inputs: < - 54 dB. Crosstalk between RF inputs and IF input: < - 60 dB.
Sound. Amplitude response: flat within ± 0.5 dB for 40 Hz - 15 kHz with de-emphasis.

NON-LINEAR DISTORTIONS — Video, as measured with a 10 riser 90 IRE staircase signal superimposed with 40 IRE chroma (Envelope broad: 20 IRE chroma only). Differential gain: < 2% in synchronous mode, < 3% in envelope mode. Differential phase: < 1° in synchronous mode, < 2° in envelope mode. Intermodulation: < - 60 dB referred to blanking level. Signal-to-noise ratio (standard bandwidth): low frequency noise up to 1 kHz: > 52 dBp-p, periodic disturbances 1 kHz - 6 MHz: > 56 dBp-p (typ. 60 dB on VHF, 58 dBp-p on UHF), random noise over 10 kHz: > 58 dB rms (typ. 60 dBrms on VHF, 59 dBrms on UHF), all referred to 100 IRE video level.
Sound. Harmonic distortion: < 0.5% for ± 25 kHz deviation, < 1% for 50 kHz deviation, both in the frequency range of 40 Hz - 15 kHz. Signal-to-noise ratio: > 50 dB weighted, in intercarrier mode for ± 25 kHz deviation at 400 Hz, > 60 dB weighted (VHF), > 54 dB weighted (UHF), in split carrier mode for ± 25 kHz deviation at 400 Hz.

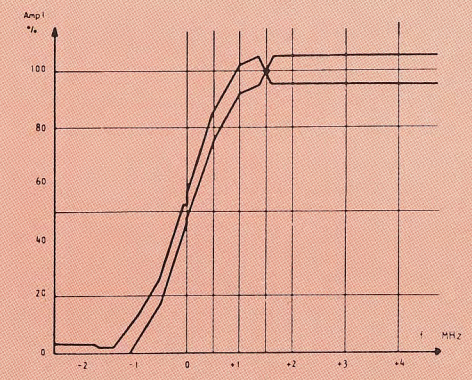
Indicators

PANEL METERS — Three panel meters at the front indicates directly the rest carrier, the IF level and the sound modulation deviation. Accuracy: better than 3% (of full scale deflection).

LED INDICATORS — A red LED diode indicates when the channel selector (thumbwheels) is remotely controlled. A green LED diode indicates when all push-button selectors are in the standard positions. A red LED diode indicates, when the synchronous detector is unlocked.

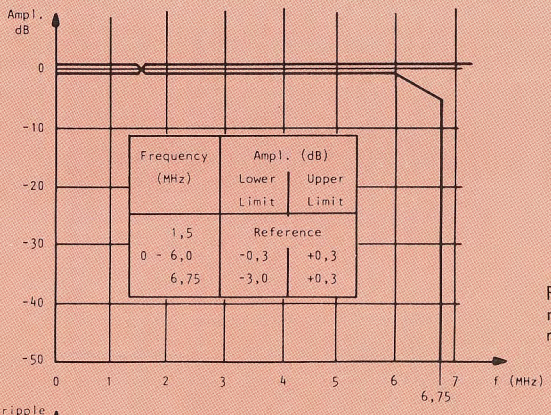
Remote control

Via multi plug type 24 pin Amphenol the channel selection can be carried out remotely while via the same plug indications of certain functions can be supplied to the remote monitoring place. Input for channel selection (BCD code): levels according to PHILIPS logical system (HNIL). Remote control is switched on by interconnecting pin 23 and pin 24.
Output for indications of functions. Synchronous detector: "15" V for locking, "0" V for unlocking. Standard mode (stan-



Frequency (MHz)	Ampl. % Upper Limit	Ampl. % Lower Limit
< - 1,65	0	2
- 1,65	0	0,8
- 1,35	0	0,8
- 1	0	8,5
- 0,5	15	25
0	48	52
+ 0,5	75	85
+ 1	91,5	101,5
+ 1,4	95	105
+ 1,5	Reference	
+ 1,6	95	105
+ 4,2	95	105
+ 7	71	105
>+ 7	-	105

Fig. 15. Nyquist slope in broad mode.



Frequency (MHz)	Ampl. (dB) Lower Limit	Ampl. (dB) Upper Limit
1,5	Reference	
0 - 6,0	-0,3	+0,3
6,75	-3,0	+0,3

Fig. M1. Amplitude response in broad mode.

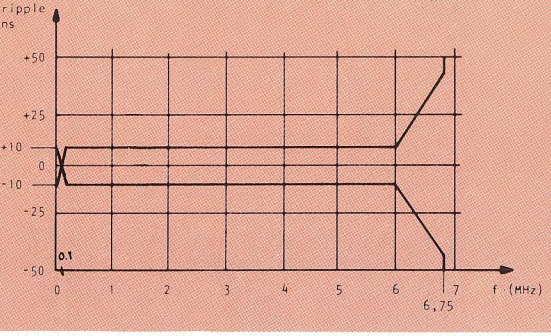
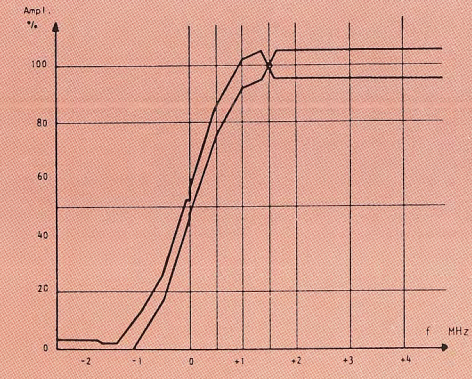


Fig. M3. Group delay characteristics in broad mode.



Frequency (MHz)	Ampl. % Upper Limit	Ampl. % Lower Limit
< - 1,65	0	2
- 1,65	0	0,8
- 1,35	0	0,8
- 1	0	8,5
- 0,5	15	25
0	48	52
+ 0,5	75	85
+ 1	91,5	101,5
+ 1,4	95	105
+ 1,5	Reference	
+ 1,6	95	105
+ 4,2	95	105
+ 7	71	105
>+ 7	-	105

Fig. M5. Nyquist slope in broad mode.

dard setting of push-buttons): pair of relay contacts. States: closed for standard mode, open for non-standard.
Output for indication of vision rest carrier, IF level and sound deviation: EMK = 10 V, I_K = 1 mA full scale.

Power supply

Voltage: 100, 110, 127, 220, 240 V ± 10% (Internal selection). Frequency: 48 - 65 Hz. Consumption: 70 W at 220 V.

Temperature range

Operating: 10° - 45° C ambient.

Mechanical data

Full 19" rack/table cabinet.
Height : 132 mm
Width : 444 mm
Depth : 435 mm
Weight : 18 kg (incl. cabinet).

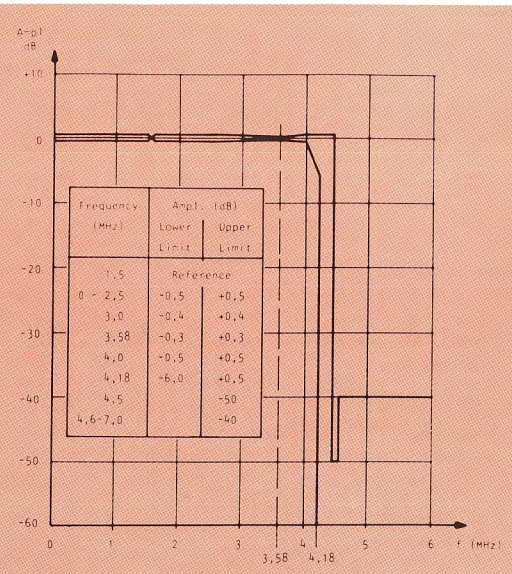
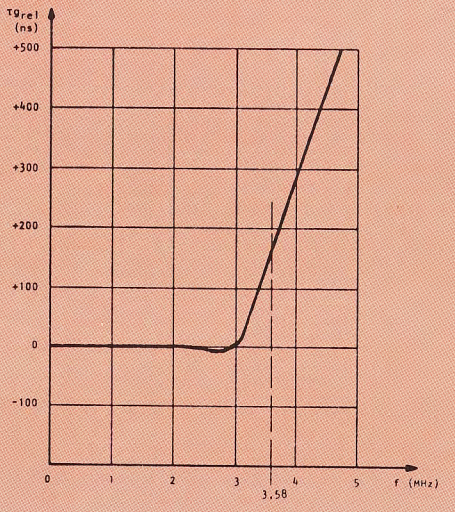
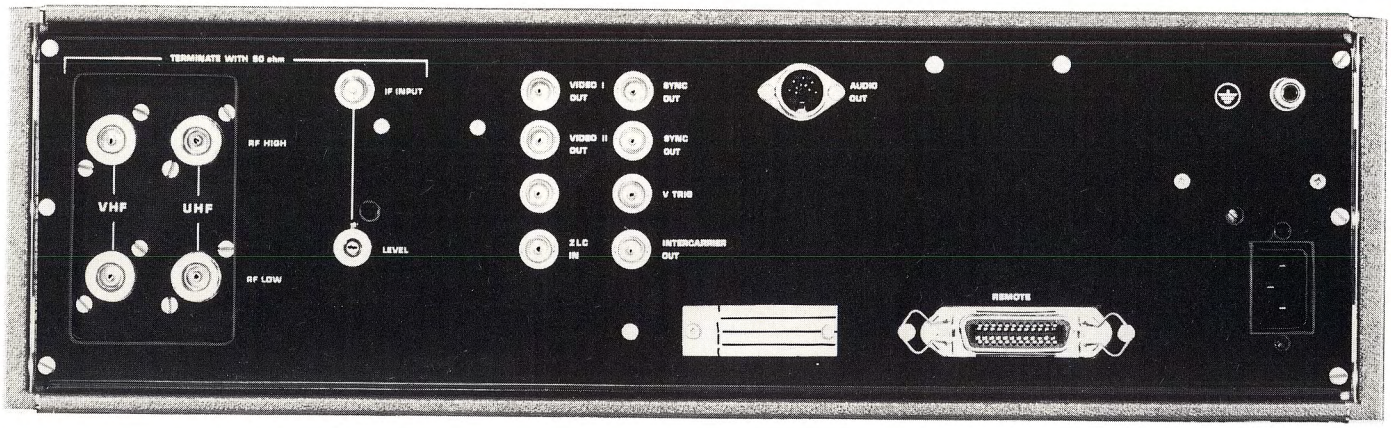


Fig. M2. Amplitude response in standard mode.



Frequency (MHz)	Nominal value (ns)	Tolerance (ns)
0,1	0	± 0
0,25	0	±25
1	0	±25
2	0	±25
3	0	±25
3,58	170	±10
4,0	290	±90

Fig. M4. Group delay characteristics in standard mode with de-emphasis.



Synchronous demodulation

Philips supplies a demodulator with synchronous detector (and synthesized front-end).

In order to save space in the frequency spectrum, the off-air television transmission standard used for applies the vestigial side-band principle (VSB). This combines a double side-band transmission system and a single side-band transmission system (see fig. 1). At high modulation frequencies the lower side-band is removed by a filter, so that only the upper side-band is transmitted (single side-band). At lower modulation frequencies, both side-bands are intact.

The difference between a double side-band signal (DSB) and a single side-band signal (SSB) is shown in fig.2. In both cases a sinusoidal waveform (100% modulation) modulates the carrier.

Note: the envelope of the carrier in the SSB case is not a sinewave. Consequently, the envelope detector (no matter how well designed) can never properly detect a high frequency modulation signal at a high modulation degree. This deficiency is called quadrature distortion.

In principle, the envelope detector is a rectifier that charges the condenser to the carrier's peak value. The synchronous detector is a sample-and-hold circuit that samples the carrier at specific times under the control of the restored (regenerated) carrier.

This sampling point does not coincide with the carrier peak in the case of high frequency-high modulation (see fig. 3). In case of overmodulation, the samples are even "on the other side" of the zero carrier level. By timing the sampling, perfectly with a perfect carrier regeneration circuit, the synchronous detection principle gives perfect demodulation.

The following photos show the difference between envelope detection and synchronous detection of some well-known test signals. The demodulator is in its "broad" mode, i.e. the sound notch has been switched off to eliminate imperfections caused by bandwidth limitation.

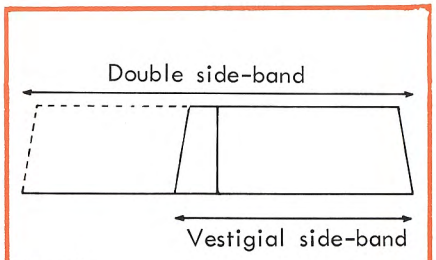


Fig. 1.

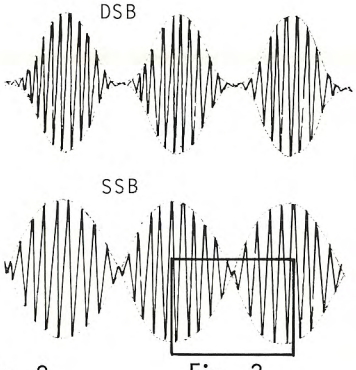


Fig. 2.

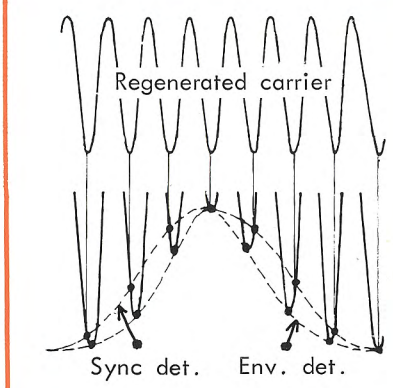
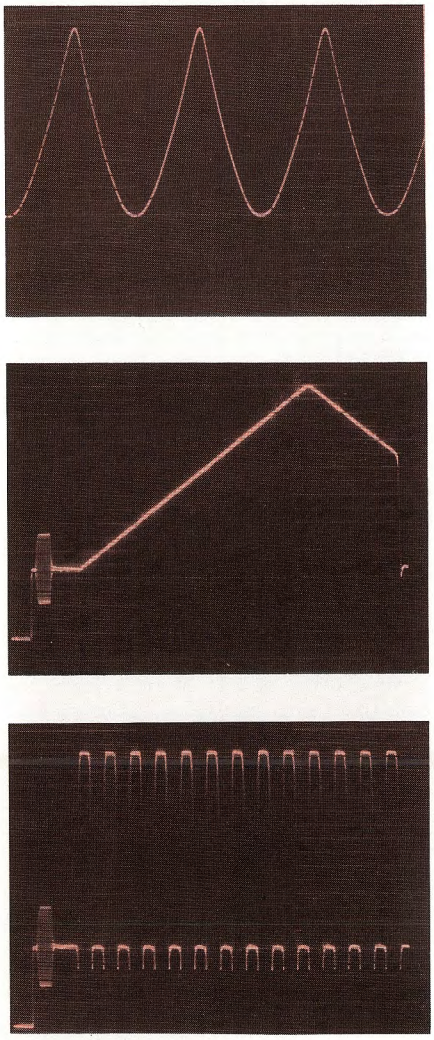
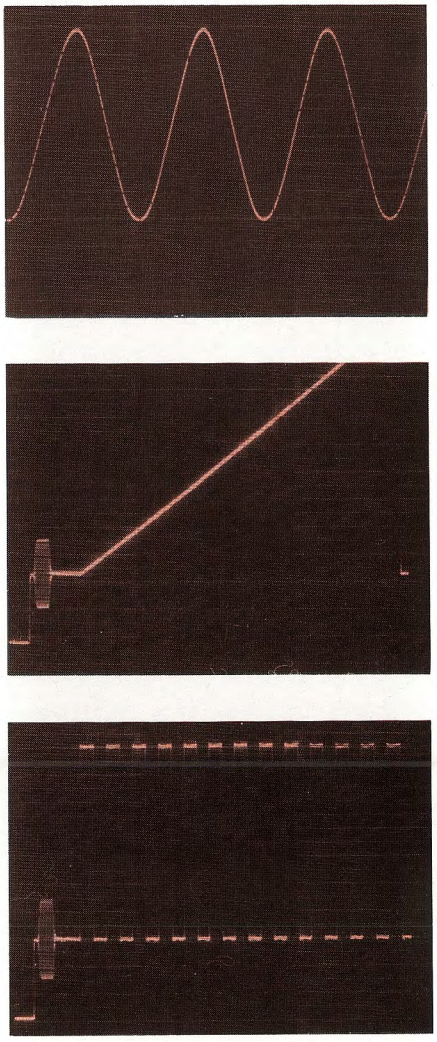


Fig. 3.


Envelope detection.


Synchronous demodulation.

Power amplifiers

PM 5691/93/94

NEW

Code no. PM 5691: 9449 056 91001
Code no. PM 5693: 9449 056 93001
Code no. PM 5694: 9449 056 94001

Ordering the PM 5691/93/94:
The power amplifiers are factory aligned for a specific TV channel or frequency, which has to be specified at the time of ordering.



May be used with forced-air cooling or rackmount cabinets, or with convection cooling.



Three types cover all TV channels VHF band I, VHF band III and UHF.

Signal level detector circuit for remote reading of the output power level.



Designed for medium and large TV factories with passive, high-power distribution systems.

The PM 5691/93/94 series power amplifiers are designed for high power TV distribution systems, but due to their low distortion and low content of spurious signals, the amplifiers may also be used as drivers in TV transmitters. The last cipher in the type number indicates the frequency range of the amplifiers: PM 5691 VHF band I (40-90 MHz), PM 5691 VHF band III (175-300 MHz), and PM 5694 UHF band IV/V (470-860 MHz). The amplifiers can operate within the specified band, however, in order to minimize spurious signals and noise the amplifiers have band-pass filters that are aligned optimally for a specific TV channel. The desired channel (or frequency) therefore has to be specified at the time of ordering.

An amplifier consists of a circuit board mounted in an aluminium housing with cooling fins. The housing has a format similar to a Euro-card. It can therefore be housed in a standard cabinet (with forced-air cooling), or it may be mounted vertically for cooling by convection. The amplifiers are powered from a single rail + 24 V dc source.

The input and the output are two BNC connectors at the rear, working at system impedance 75Ω (or 50Ω on request). The permissible input level is 150-600 mV (sync peak level RMS) for an output level of 10 V, corresponding to a gain of 67-17 times (37-25 dB). At 75Ω system impedance these levels correspond to input levels 103-115 dBμV and output level 140 dBμV.

Applications

The PM 5691/93/94 series power amplifiers are used in TV distribution systems in factories, laboratories and maintenance facilities where TV sets, video cassette recorders and similar television equipment are manufactured, developed or repaired. The input to the amplifiers come from a number of TV modulators that convert the base-band video test signals and audio signals into the specified RF television signals. The output signals from the amplifiers are usually multiplexed into a single signal in a so-called combiner or channel mixer, so that all the signals can be distributed via a single coaxial cable.

The 140 dBμV output level of the PM 5691/93/94 series is sufficient for driving medium/large factories with a great number of outlets. Because the cable losses are larger at high frequencies, it is necessary to drive the coax cable at high frequencies at maximum output level and low frequencies at lower power level. In this way equal power levels for all channels can be obtained in a reference point of the distribution network. The power amplifiers therefore have a front panel output level control, so that the system can be conveniently aligned to equal levels at the defined reference point.

Philips is a specialist in TV factory distribution systems. In addition to the above described passive, high level distribution system, Philips can also offer an active, low level distribution system (like a CATV system), or any combination of these systems. Philips PTV has its own systems group that is always prepared to advise about the various possibilities and optimal solution for a specific customer project.

TECHNICAL DATA

Input

RF INPUT — Type of signal: RF modulated TV signal. Input level: 150-600 mVrms for 140 dBuV output. Frequency range (PM 5691): 40-90 MHz. Frequency range (PM 5693): 175-300 MHz. Frequency range (PM 5694): 470-860 MHz. Input impedance: 75Ω (50Ω on request). Return loss (PM 5691/93): > 15 dB at the specified channel. Return loss (PM 5694): VSWR < 2 at the specified channel. Type of connector: BNC.

Output

RF OUTPUT — Type of signal: same as input signal. Output level: maximum 140 dBuV into 75Ω (1.3 W or 10 Vrms peak sync). Output impedance: 75Ω (50Ω on request). Return loss (PM 5691/93): > 15 dB at the specified channel. Return loss (PM 5694): VSWR < 2 at the specified channel. Type of connector: BNC.

Characteristics

RESPONSE — Amplitude response: flat within ± 0.5 dB. Group delay response: flat within ± 15 ns.

DISTORTIONS — Sync compression: < 2.5%. Intermodulation (3-tone test -8 dB, -10 dB, -16 dB): < -60 dB at 1 W output.

MEASURING CONDITIONS — Channel bandwidth: 8 MHz bandwidth centered around the specified channel no. Output level: 140 dBμV sync peak, if not otherwise specified.

Meter circuit

A meter circuit has been incorporated. The measuring-signal is available at the power plug. Calibration: 10 V/1 mA for 140 dBμV output level.

Front panel controls and indicators

- Output level (gain), screwdriver control
- Power on indicator (green LED)

Power supply

Details of a TV factory system. The amplifiers are mounted on panels so that efficient cooling by convection and easy access to the level controls are obtained.

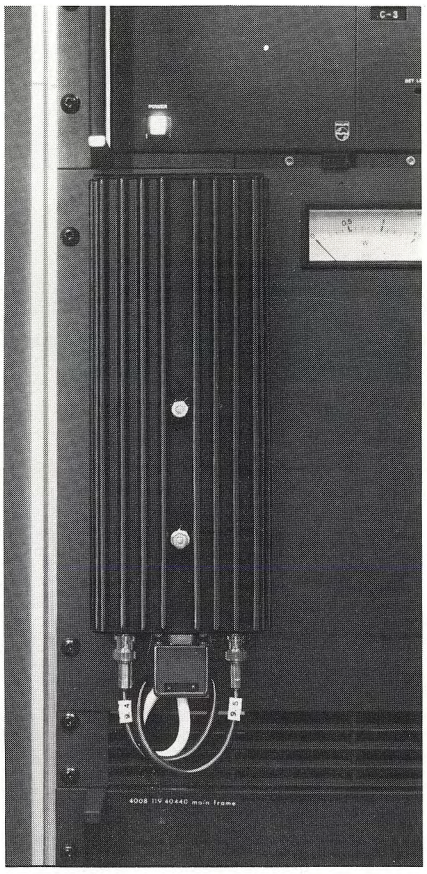
Environmental conditions

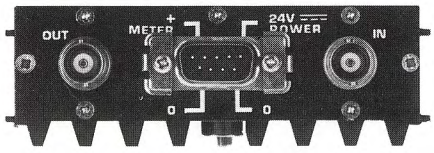
Operating temperature: 5° - 45° C. Storage temperature: - 30° to + 70° C.

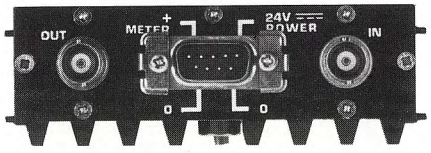
Mechanical data

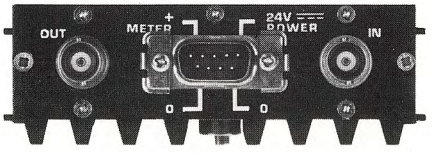
Height	:	37 mm
Width	:	100 mm
Length	:	250 mm
Weight	:	0.9 kg

Standard accessories:
- Combined operation and service manual
- 9-pole female plug

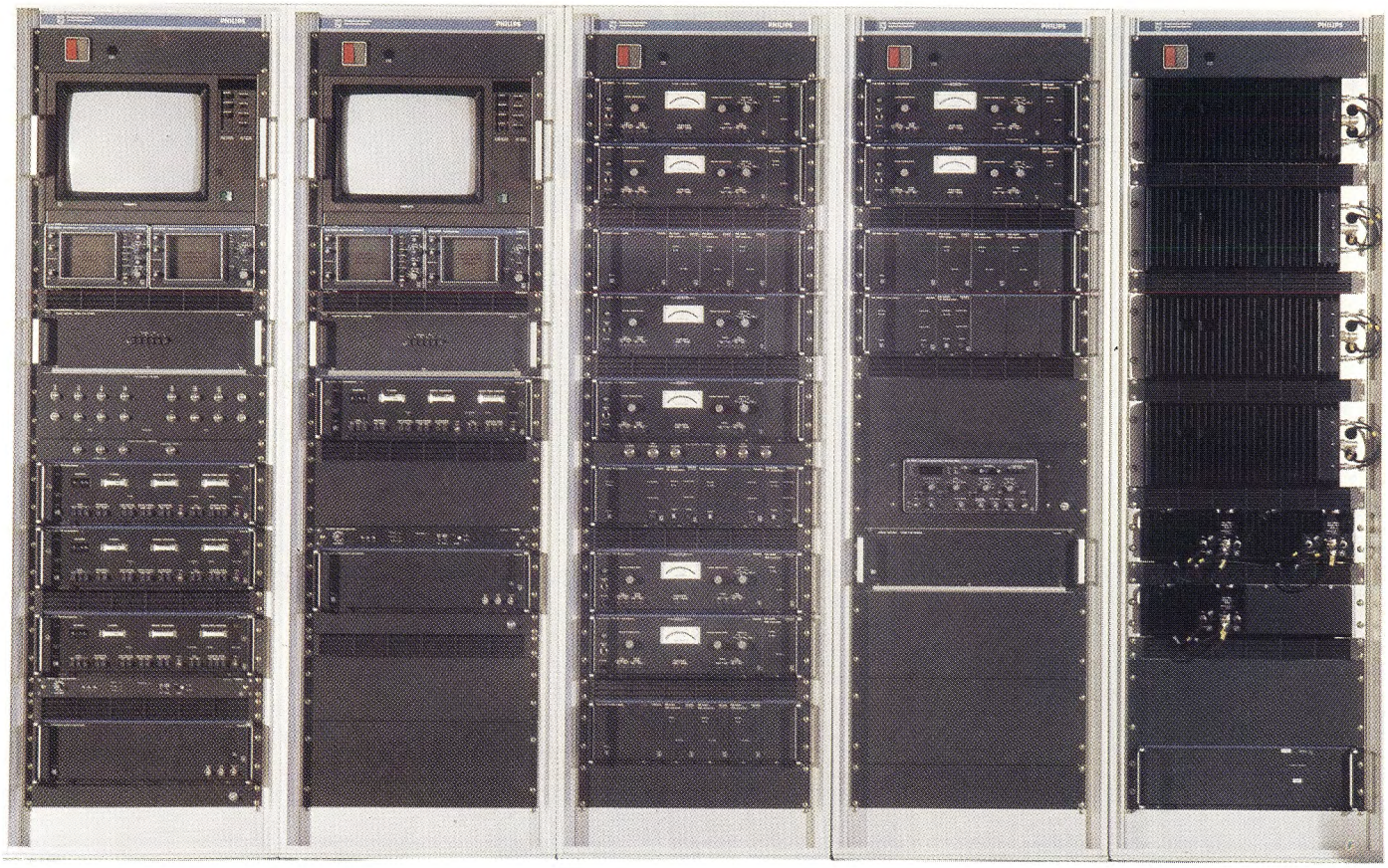








"TV transmitter"



Manufacturers of TV receivers and video cassette recorders need a reliable signals source with which to test their products -- a source that can accurately simulate the conditions under which these products are expected to function when in use. This signals source used by manufacturers for testing is called a "TV transmitter" and differs markedly from an actual broadcast transmitter.

Philips TV transmitters have long enjoyed a well-earned reputation among receiver and VCR manufacturers for reproducing all the signals needed for testing their products. As the world's foremost manufacturer of receivers and a leading producer of recorders, Philips itself is of course a major user of TV transmitters. And as such Philips has acquired the expertise to produce TV transmitters capable of meeting the most stringent demands made by manufacturers.

Regardless of whether a manufacturers products will be used for terrestial reception or be connected to a cable network, Philips TV transmitters are fully capable of producing all the signals conditions ever likely to be encountered.

Generators for service and repair

Type no.	Description	Page
PM 5515-18	Colour bar pattern generator	158
PM 5390	RF synthesizer	165
PM 5503	Colour TV pattern generator	168

Philips, of course.

Colour TV pattern generator

PM 5515/16/18

NEW

PM 5515 /-T /-X /-TX: PAL / NTSC-versions /with teletext / with stereo sound /with both.

PM 5516 /-T : SECAM-version /with teletext (Antiope).

PM 5518 /-TX : PAL/NTSC/SECAM-versions / with teletext and stereo sound.



Flick a switch to select CCIR or RTMA, PAL or NTSC

Operate up to 3 to 4 receivers on a 10 mV output

Use extended sound and video modulation, internal or external via DIN or BNC connectors

Use BNC or SCART connectors for video output, with separately adjustable video and chroma/burst amplitudes

Synthesized control of RF frequency precisely set, under software control and with clear LED display

Cover every RF band from IF to bands IV/V including S1-10 and S11-20 CATV bands

Touch a key to store or recall 10 complete programs, RF frequency, pattern and sound setting

RGB option

A pattern for the future - Yours, and the world of video trouble shooting. At every point in the video link from camera to receiver. Philips PM 5515 - unique forerunner of pattern generators to come. Pattern generators that serve you, powerful yet simple to use. Versatile, adapting as your needs change - now and in the future. Intelligent, microcomputer controlled and with powerful non-volatile memories. Covering all available TV standards - PM 5515 for PAL/NTSC; PM 5516 for SECAM; PM 5518 for SECAM/PAL/NTSC. Storing your most needed programs - recalling them at a touch of a key. And with a unique battery of over 70 patterns and combinations. Teletext, FM stereo and dual sound. Unbelievable performance yet simple to set up. Price concious, too. You've never seen a range of pattern generators to match this - giving an answer to your particular video/CTV requirements, in initial cost and in cost-for-life.

Stereo and second sound channel

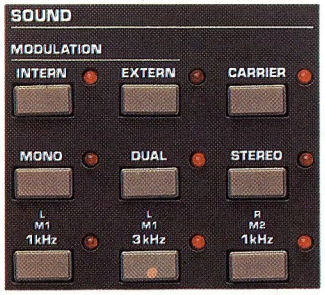
PM 5515-X and PM 5515-TX in PAL G-version have two sound carriers for use in one- or two-channel mode, or right and left channel of a stereo signal. CTV transmission with stereo sound or alternative second channel (e.g. for choice between synchronized or original voice tracks) is becoming more regular. The special CTV receivers with stereo decoders neede to reproduce these broadcasts can be expected to be increasingly popular. PM 5515-X and TV meet the need for a portable colour pattern generator for test and realignment for these receivers.

The instrument allows external modulation of a full stereo tuner/amplifier, tape or cassette recorder, with PM 5515 as RF modulator. Features:

- Sound carriers according to standard at 5.5 MHz and $5.7421875 \pm 3 \cdot 10^{-5}$
- Sound/vision separation at 13 and 20 dB, respectively
- Internal FM of 1 kHz and 3 kHz



with 30 kHz deviation
- Full external stereo modulation facility for tape and cassette recorders
- Pilot tone according to standard at 54.6875 kHz ± 3 · 10^{-5}, with recognition frequency at fH/133 = 117.5 Hz (stereo) and fH/57 = 274.1 Hz (second sound channel).



Teletext

The growth of electronic communications has seen a rapid increase in the instruduction of text transmission. To meet the highly specialized requirements in the checking and alignment of teletext receivers and decoders the PM 5515-T and -TX have been developed. Both instruments offer the facility of a selection of five teletext pages with special contents for decoder testing as well as a wallpaper test pattern.



Features of the PM 5515/-TX

- Availability of RF, IF and video outputs to CCIR or RTMA standards allow the generator to be used with full confidence for the critical examination of video circuits, CTV alignment and setting up monitors.

- Select the sound modulation you need. You've full internal and external stereo and dual channel sound in certain models i.e. PM 5515-X and -TX.
- Sound carrier can be switched on and off and is modulated internally at 1 kHz or externally using a tape recorder.

- Store up to 10 multi-program sequences with any mix of RF vision frequency, or TV channels, with individual or combined test patterns and with sound mode.

- Chroma/burst amplifier control with either a standard burst level or continuously variable chroma from 0 to 150%. Video 1 Vpp standard variable between 0-1.5 V.



- Multi function keyboard - for frequency selection, for memory store/recall or for pattern selection. Single-function keys for selecting eighteen on-screen alignment patterns, up to 70 combinations possible. All with individual LED display.

- Separate video input/output to modulate a video signal of a camera or check the signals on an oscilloscope or monitor.

- Switch selectable external video modulation with front panel BNC socket.

- Teletext selection of pages or test patterns PM 5515-T and PM 5515-TX.

- Key-in RF frequency, in MHz, visualized by the last three digits of the LED display. Fine tune in steps of 250 kHz, just by touching a button. For IF, key in MHz step in 100 kHz steps.

- IF one of the step buttons is continuously pressed it is possible to tune through the frequency range, either up or down.

- Use the step function with recall to run through stored programs and locate the program you need.

- RF carrier out can be attenuated 60 dB down from a max. of 10 mV.

PM 5515/16/18

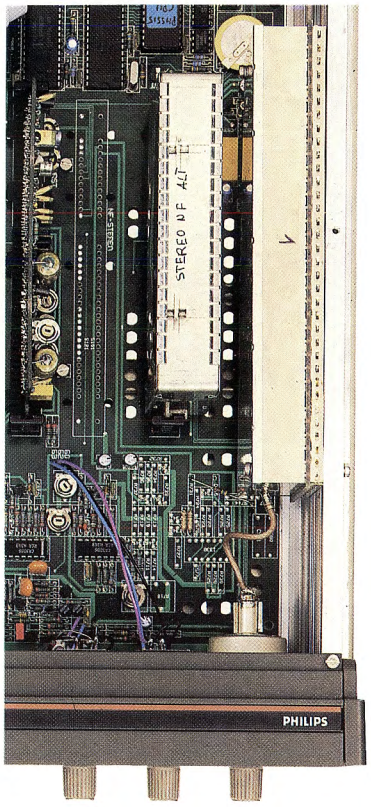
RF selection

The PM 5515 covers all TV transmission in the frequency bands I, III, IV and V. Full coverage of the S-channels 1-20 is provided in the frequency bands 104-175 MHz (S1-S10), and 230-300 MHz (S11-S20). Selecting the synthesized RF frequency within these bands is done electronically via the keyboard.
Up to ten memory places can be used either to store the selected RF frequency or TV channel number. Having stored, e.g. your local TV stations, any one of them can be recalled at the touch of a button - no time-consuming dial tuning.
The first digit show the memory place. The other three digits indicate the selected frequency or TV channel. The RF carrier output of > 10 mV into 75Ω is ample for 3 or 4 receivers in parallel during work-shop repairs, and the carrier can be continuously attenuated by more than 60 dB, with output indications at 1 mV, 100 μV levels. The ability to smoothly vary the RF levels is of particular value when checking the overall RF sensitivity or AGC circuits.



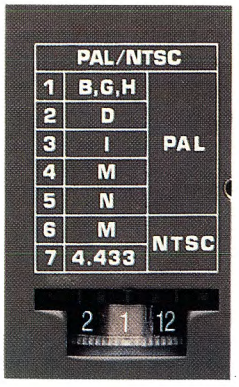
RF carrier and frequency spectrum

Although double side band, the RF envelope of the PM 5515 is very similar to that transmitted by professional TV broadcast companies - such as eg 13 dB for TV standard G between the sound and vision channels (most other generators have 25 dB or more separation, leading to false impressions when aligning tuners and RF amplifiers).



The system switch

The rear of the instrument offers additional facilities which add to the uniqueness of the PM 5515 range. A selection switch is used to choose the TV system required. Line frequency is automatically selected utilising internal crystals, either 15625 Hz for CCIR or 15734 Hz for RTMA with less than 0.4 Hz frequency tolerance.



RGB option

RGB signals and a SYNC and subcarrier facility are available to meet the rapid advance in computer graphics techniques and servicing of colour video monitors. There are many monitors which only accept RGB signals and for testing these the RGB option is essential. Standard is the Euro/SCART connector for audio/video out as well as the DIN connector for external audio modulation.



TABLE of TV SYSTEMS COVERED BY PM 5515

Series	B&G	D	I	M	N	M
TV and chroma standard	CCIR, PAL	CCIR, PAL	CCIR, PAL	RTMA, NTSC	CCIR, PAL	RTMA, PAL
No of lines per picture frame	625	625	625	525	625	525
Field frequency (Hz)	50	50	50	60	50	60
Line frequency (lines/S)	15625	15625	15625	15734	15625	15734
Chrominance subcarrier(MHz)	4.433619	4.433619	4.433619	3.579545	3.582056	3.575611
Sound carrier to vision carrier (MHz)	5.5	6.5	6	4.5	4.5	4.5
Sound modulation	FM	FM	FM	FM	FM	FM
Pre-emphasis (μs)	50	50	50	75	75	75

PM 5515/-T/-X/-TX PAL/NTSC



The versatility of the Philips colour pattern generator family not only ensures that todays requirements are expertly met but the developments of tomorrow are anticipated.

The standard PM 5515 generator with its advanced features unrivalled in the marketplace is complemented by the three enhanced models 5515-T, 5515-X and 5515-TX.

PM 5515-T with 5 Teletext pages plus wall-paper test pattern for aligning and testing teletext receivers and decoders.
PM 5515-X with full additional f.m. stereo and dual sound channel facilities according to system G.
PM 5515-TX with, in addition to all the facilities of the basic model, all those of the other two models.

Type Number	Stereo	Teletext	PAL					NTSC	RGB option
			D	G	I	M*	N*	M	
PM 5515			X	X	X	X	X	X	□
PM 5515-X	0		X	0 X	X			X	□
PM 5515-T		Δ	X	Δ X	Δ X			X	□
PM 5515-TX	0	Δ	X	0 Δ X	Δ X			X	□

X = Mono sound 0 = Stereo sound Δ = Teletext □ = RGB option

PM 5516/-T SECAM



The PM 5516 SECAM generator operates according to the French SECAM TV system L with positive video modulation and AM sound. It also operates to the TV standards D, K1, B, G and H corresponding to OIRT TV system with negative video modulation and FM sound. The desired TV standard is simply selected at the rear of the instrument.
PM 5516 is the standard SECAM COLOUR generator.
PM 5516-T as PM 5516 but extended with ANTIOPE.

PM 5518/-TX SECAM/PAL/NTSC



PM 5518 SECAM/PAL version offers the choice of operating according to the PAL or SECAM COLOUR system. A push button on the front panel selects PAL or SECAM. And the rear panel switch selects NTSC.
PM 5518-TX SECAM/PAL pattern generator operates according to TV standard G, STEREO FM, DUAL SOUND and five pages of teletext and - according to system SECAM L - more than four pages of ANTIOPE.

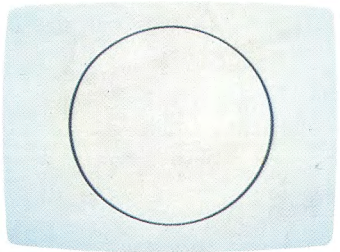
Needless to say that these SECAM and SECAM/PAL versions offer the same wide choice of test patterns, advanced RF selection, STORE/RECALL facilities and, last but not least, RGB option as the PM 5515 PAL/NTSC generators.

Type Number	Antiope-Teletext	PAL					NTSC	SECAM						RGB option
		D	G	I	M*	N*	M	L	B	D	G	H	K_1	
PM 5516								X	X	X	X	X	X	□
PM 5516-T	◆							◆ X	X	X	X	X	X	□
PM 5518		X	X	X			X	X	X	X	X	X	X	□
PM 5518-TX	Δ ◆	X	0 Δ X	Δ X			X	◆ X	X	X	X	X	X	□

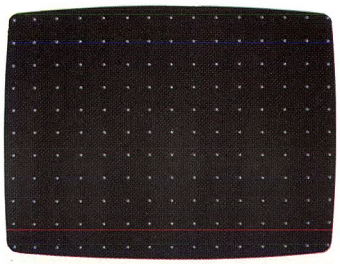
X = Mono sound 0 = Stereo sound Δ = Teletext ◆ = Antiope □ = RGB option

* For Brazil M and Argentine N TV-standards – Crystals are not included but can be ordered separately.

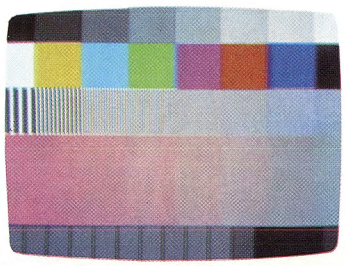
PM 5515/16/18



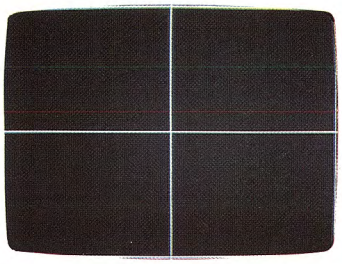
White 100% with swinging burst is designed for setting "white D" and for an overall check of purity. Also for beam current adjustment. White D is the correct white necessary for a natural colour reproduction.



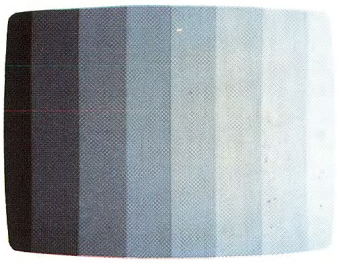
Dot pattern mainly for static convergence. The screen should contain pure white dots.



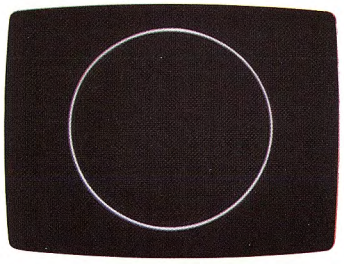
VCR is a specially-designed test pattern to check the bandwidth, linearity, sensitivity and AGC of the chroma amplifiers in colour video recorders.
This combined test pattern is devided in 4 horizontal segments:
- 24 lines of 100% white to clip and to level.
- Eight bars of resolution of which 2.8, 3.0, 3.2 and 3.4 MHz are used to align the high pass filter for a maximum resolution in VCR bandwidth.
- Eight steps of decreasing linear levels of saturation from 100 to 0% to check the chroma amplifier linearity and colour AGC circuitry.
- A black horizontal bar with a moving white field to check video recorders on moving pictures.



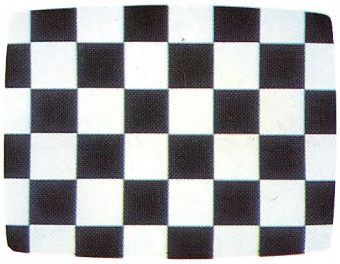
Centre Cross/Border lines is ideal to centre TV monitors and TV screens. Also to check the deflection linearity and for pin cushion correction.



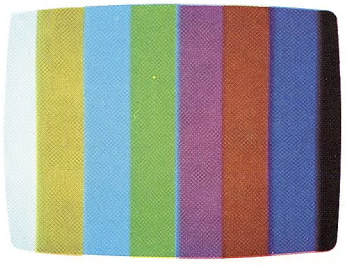
Grey scale. Full screen linear staircase signal with 8 equal steps from black to white is used to locate faulty linearity of the video amplifier or grey-scale setting.



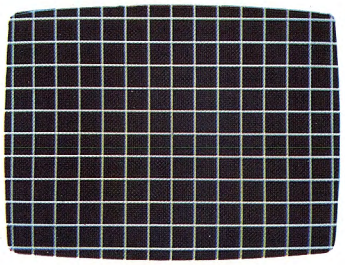
Circle on a grey background for checking the overall linearity and geometry. The white circle change automatically to black when used with the white pattern and so is usefull for checking reflections.



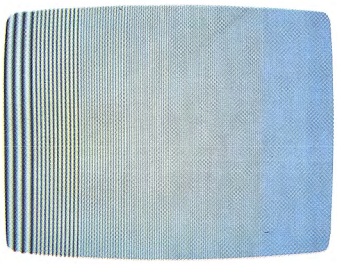
Chequerboard pattern of six times eight rows of squared provides a visual standard for basic picture tube alignments, for example: centering, focus, horizontal and vertical deflection and linearity.



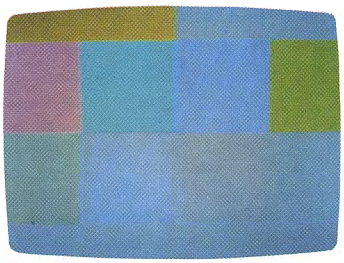
Colour bar standard bar pattern. The vertical bars are white D, yellow, cyan, green, magenta, red, blue and black. Important, the luminance content is dependent on the TV system selected and is automatically correct after making the choice.
The colour bar pattern in fact provides sufficient information for a good overall check on colour performance, including checks on burst keying, subcarrier regeneration, RGB amplifiers, the delay colour versus B/W signal and saturation.



Cross hatch/Centre Indication with 17 vertical and 12 horizontal lines is used for checking and realigning dynamic and corner convergence. The advantage of this pattern is that there is no interlacing which normally would tire the eyes during alignment.
If interlacing is required this can be achieved by superimposing another pattern such as centre cross or circle. Centre indication is provided to make an accurate centering possible.



Multiburst contains eight full screen vertical bars of definition lines in the frequency ranges 0.8, 1.8, 2.8, 3.0, 3.2, 3.4, 3.8 and 4.8 MHz. This checks the bandwidth of the video or luminance amplifier in black and white or colour TV also the resolution of monitors and video recorders.

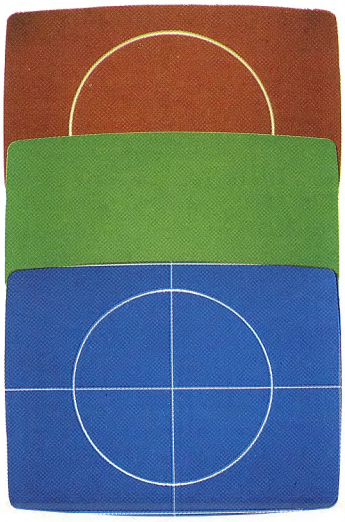


DEM pattern. Demodulator is a combined test pattern which, divided in 4 sections, contains information to make on-the-screen checks and alignments possible of the colour demodulators and subcarrier frequency. For PAL it is used to check the chroma delay line for amplitude and phase (venetian blinds).

G−Y = 0		Y = 50%	
Δ +(R−Y)	Δ −(R−Y)	□ +(B−Y)	□ −(B−Y)
Δ +(R−Y)	Δ −(R−Y)	□ ±(B−Y)	□ ∓(B−Y)
Reference Y = 50%			

Δ (B−Y) = 0 □ (R−Y) = 0

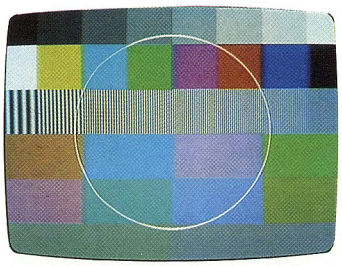
Example of PAL coded DEM pattern. For NTSC this DEM pattern contains different colour coding.

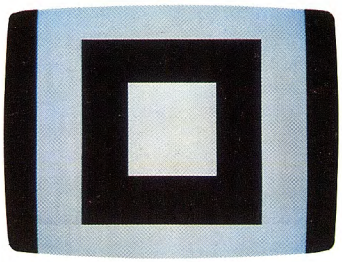


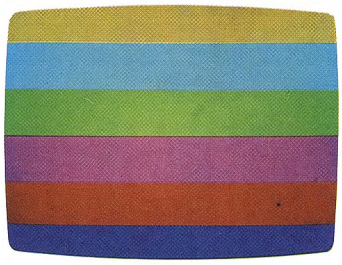
Purity with a choice of the three primary colours clearly indicated by LED's. The red pattern is used for checking colour purity.

The green pattern provides a purity check for three-in-line tubes. Blue is also available to check colour performance. The three complementary colours, magenta, yellow and cyan can also be displayed by selection, as can white and black.

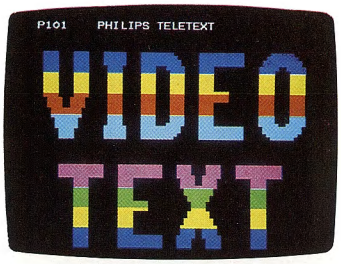
Combinations with circle and/or centre cross are easy to select.

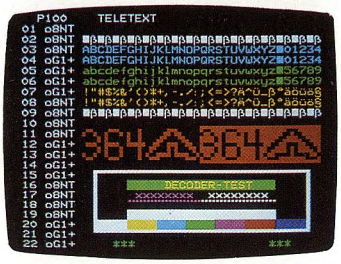


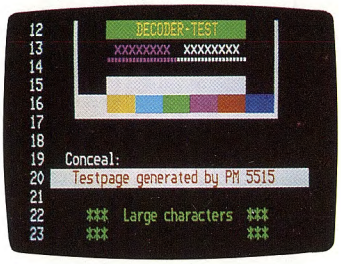


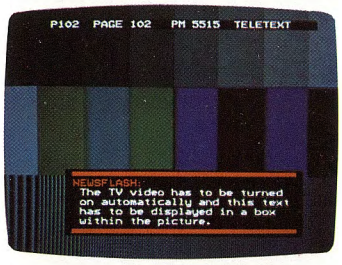


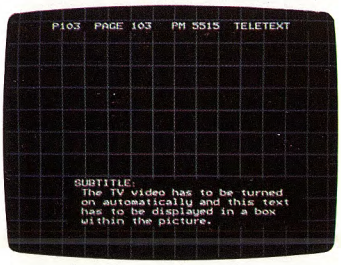
Test pattern combinations. Only a few examples to illustrate the versatility of the colour pattern generator.











Teletext test pages.

TECHNICAL DATA

Modulation

VISION CARRIER — Frequency range A: 32-300 MHz (IF + band I, S-channels, band III). Frequency range B: 470-900 MHz (band IV/V). Frequency selection: keyboard controlled. Fine tuning: 250 kHz steps (100 kHz for IF). Tuning: either positive or negative direction; tuning speed increase by holding the step button. Storage: possibility of 10 different frequencies, indicated by frequency or channel no. Indication: 4-digit, 7-segment LED display (digit 1 is memory, store and recall, digit 2, 3, 4 is frequency in MHz, LED's show 250, 500 and 750 kHz).

VIDEO MODULATION — Modulation: AM negative, internal or external video. External video: 1 Vpp nominal input level (max. ± 5 V), 75Ω input impedance, front panel BNC connector.

SOUND CARRIER — Principle: intercarrier modulation. Frequencies: 4.5 MHz (systems M and N), 5.5 MHz (systems B, G and H), 6.0 MHz (system I), 6.5 MHz (system D). Accuracy: 3.10^{-5} (+ 5 to + 45°C). Vision/sound carrier ratio: 13 dB (systems B, G and H), 11 dB (system D), 10 dB (systems M and N) 7 dB (system I).

SOUND MODULATION — Type of modulation: FM. Pre-emphasis: 50 µs (systems B, D, G, H and I), 75 µs (systems M and N). Audio signal: internal or external (0.4 V corresponds to internal audio). Frequency deviations: ± 30 kHz (systems B, G and H), ± 15 kHz (systems M, N), ± 27 kHz (system I), ± 24 kHz (system D). Input connector: DIN (rear panel). Input impedance: 0.5 MΩ. Bandwidth: 40 Hz - 15 kHz. Max. input level: ± 40 V.

Outputs

VIDEO OUT — Type of connectors: BNC (front), SCART (rear). Impedance: 75Ω. Output level: 1 Vpp (variable 0-1.5 Vpp). Polarity: negative. Coupling: dc.

AUDIO OUT — Type of connector: SCART (rear). Impedance: 1 kΩ. Output level: 0.4 V.

SUBCARRIER OUT — Type of connector: BNC (rear). Output level: 1 Vpp. Impedance: 75Ω.

SYNC OUT — Type of connector: BNC (rear). Output level: 1 Vpp. Impedance: 75Ω.

SYNCHRONIZATION OUT — Type of connector: BNC (front). Output level: 5 Vpp (field pulse, 2.5 Vpp line pulses). Impedance: 6 kΩ. Polarity: negative.

RF OUT — Type of connector: BNC (front). Output level: > 10 mV (adjustable 0 to < - 60 dB). Impedance: 75Ω.

Synchronization characteristics

COLOUR CHARACTERISTICS — Subcarrier frequencies:
- 4.433 619 MHz (systems B, D, G, H and I)
- 3.575 611 MHz (system M-PAL)
- 3.582 056 MHz (system N-PAL)
- 3.579 545 MHz (system M-NTSC).

Accuracies: $3 \cdot 10^{-5}$ (+ 5 to + 45°C). Colour burst: according to standard. Chroma amplitudes: 100% or variable 0-150%. Chroma accuracy: better than 3° phase and 5% amplitude.

MONOCHROME CHARACTERISTICS — Horizontal frequencies: 15.625 (CCIR) or 15.734 kHz (RTMA). Accuracy: better than 0.4 Hz (+ 5 to + 45°C). Number of lines: 625/525. Field frequencies: 50 Hz (CCIR), 60 Hz (RTMA). Line + frame synchronization signal: Acc. to TV standard, interlacing.

Teletext (T, IT and TX-versions)

TELETEXT SIGNAL — Clock frequency: 6.9375 MHz (= 444 x f_H). Data coding: acc. to standard. Signal levels: logic 0 = black level, logic 1 = 66% of white level. Shaping filter: Cos^2. Teletext patterns: 5 pages with special contents for decoder testing.

TELETEXT OUTPUT — Type: data lines in the normal video and RF output signals. Line numbers: 22 and 335. Decoder alignment mode: teletext and normal video patterns cannot be combined.

Stereo sound (X and TX-versions)

STEREO SOUND CHARACTERISTICS — Sound carrier 1: 5.500 000 MHz. Sound carrier 2: 5.742 187 5 MHz. Vision/sound ratios: 13/20 dB resp. Accuracies: 3.10^{-5} (+ 5 to + 45°C. Modulation: FM, internal/external on/off, 50 µs pre-emphasis. Internal audio: 1 kHz and 3 kHz (channel 1) and 1 kHz (channel 2). Frequency deviations channel 1: ± 30 kHz (mono and dual), ± 15 kHz (stereo, without right channel), or ± 30 kHz (stereo both channels with internal 1 kHz). Deviation channel 2: ± 30 kHz (stereo with internal 1 kHz). External modulation: 0.4 V gives the same deviation as the internal signal. Pilot frequency 54.6875 kHz (83.5 x f_H). Accuracy: $3 \cdot 10^{-5}$. Modulation: AM, 50% modulation depth. Identification tones: 117.5 Hz (f_H/133) and 274.1 Hz (f_H/57) for stereo resp. dual sound. Pilot deviation: ± 2.5 kHz of the second carrier.

INPUTS AND OUTPUTS — Type of connectors: DIN for input, SCART for output, both at the rear. Levels: 0.4 V. Input impedance: 0.5 MΩ. Frequency range: 40 Hz to 15 kHz. Output impedance: 1 kΩ.

NOTE — for standards D, I, M and N the stereo versions X and TX offer all mono facilities.

Power supply

Voltage: 110/127/220/240 V +10/ -12%. Frequency: 50/60 Hz ± 5%. Consumption: Depends on version.

Mechanical data

Portable/bench top cabinet
Height : 140 mm
Width : 300 mm
Depth : 395 mm
Weight : approx. 10 kg

Standard accessories: PM 9538 RF cable 75Ω with BNC connector, operation manual, mains cord.

Options

- PM 9539 RF cable 75Ω with 300Ω transformer
- PM 9075 cable 75Ω BNC-BNC
- Service manual
- RGB output (3 x BNC with 0.7 V video).

RF synthesizer

PM 5390

Code no. PM 5390:
9452 053 90001 (100mV output level)
9452 053 90701 (S-version, 1V output level)

IEEE 488 IEC 625



Just touch a button and enter your chosen frequency, Δfrequency, sweep time, level and Δlevel

Step function settings for frequency /level increment/decrement sweep facilities

Keyboard lets you enter digital parameters swiftly and accurately

Input for external wide-band AM and FM modulation

Video and sound carrier modulation. Simple push-buttons with LED display to select external video modulation, with separate sound carrier that can be INT/EXT modulated for FM or AM

Store/recall up to 8 complete front panel set-ups

Input for external video source. Covers more than the TV RF frequency range, with or without FM or AM sound

Built-in IEEE interface, LED indicates when instrument is remotely controlled

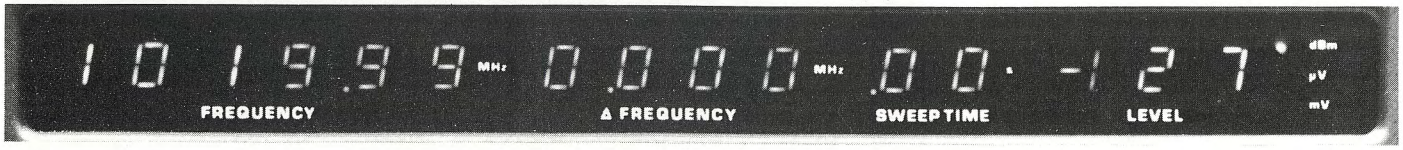
LED display of output level unit, dBm, mV and V for PM 5390S

The PM 5390, operating beyond 1 GHz, will find wide application in the generation of carrier and subcarrier frequencies for TV, radio and communications, in sensitivity tests and radiation measurements.
Sweep measurements on broadband amplifiers and IF filters, plus signal simulation such as gain/bandwidth and conversion loss or antenna gain, can easily be accommodated.
It will be of especial interest for applications associated with cable TV bands, currently increasing UHF ranges and (ultimately) satellite TV. Moreover, the trend towards using programmable generators in automated testing systems, further extends its application potential.

PM 5390 is a fully-programmable 1 GHz RF generator and provides AM, FM and video modulation, plus a wide range of sweep measurements and both automatic and manual frequency-stepping facilities. The output (100 kHz to 1020 MHz) is highly stable and accurate, and frequency, signal amplitude, frequency increment and sweep time can be digitally selected and displayed.

The heart of the PM 5390 is the main RF oscillator which is used for mixing frequencies generated by voltage controlled oscillators (VCOs) under phase-locked loop control. A 5 MHz crystal oscillator provides a highly stable reference source.

The main oscillator comprises four separate voltage-controlled oscillators (VCOs) from which six discrete frequency bands are produced. Two of these are developed within the main



oscillator by a frequency-mixing process. The generated bands cover the ranges 340 to 510 MHz, 510 to 680 MHz, 680 to 850 MHz and 850 to 1020 MHz. Fig.1 shows a block schematic of this circuitry.

Frequency control is achieved by comparing the output signal from VCO1 mixed with the relevant frequency generated by oscillator VCO2 to a signal from the reference oscillator.

Signals divided down

Both signals are divided down to 1 kHz (the reference signal) by a fixed reference divider and the output signal by a programmable divider controlled by the microprocessor. A phase detector ensured that the signals agree in both phase and frequency.

The output from the main oscillator is then fed out to an automatic level control. Amplitude modulation can be added after this stage. Video modulation is also applied here. The final section provides fine and coarse attenuation.

The lower two frequency bands are obtained by mixing the output of the main oscillator with the 510 MHz output of oscillator VCO3. Frequency modulation is applied to this oscillator to ensure constant deviation at different output frequencies.

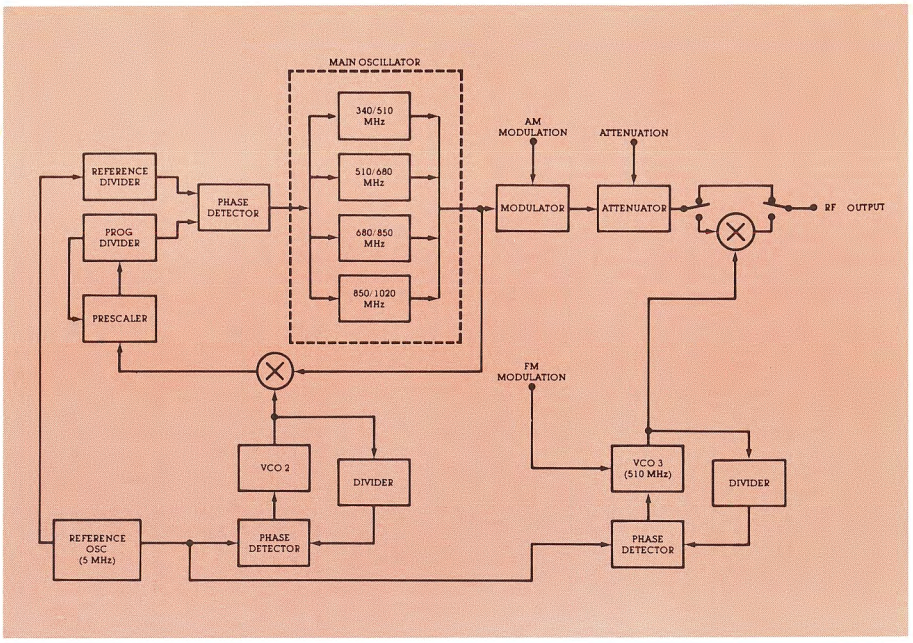
Standard integrated circuits are used in the phase-locked loop control system. These were developed initially for similar applications in television and broadcoast work. These LSIs are designed for use in microprocessor circuits and need few peripheral components.

Careful attention to shielding

Particular care has been taken to ensure negligible RF interference. The RF circuitry is split into two separately shielded sections - oscillators in one part and the digital control circuitry in the other - to reduce any possible crosstalk.
As the accuracy of the output frequency is directly related to that of the crystal-controlled reference oscillator, this is contained in a specially shielded compartment in the control box. The circuitry is designed to ensure stability of better than 10^{-6}.

Built-in microprocessor

The built-in microprocessor enables simple and rapid selection of parameters and values via front-panel-mounted push-buttons, and permits the the storage of up to 8 sets of parameters for subsequent use. All values are clearly displayed on four separate LED displays. Full remote control is assured via the integral IEEE/IEC interface.
Internal and external AM and FM modulation are important features.



Unique video modulation

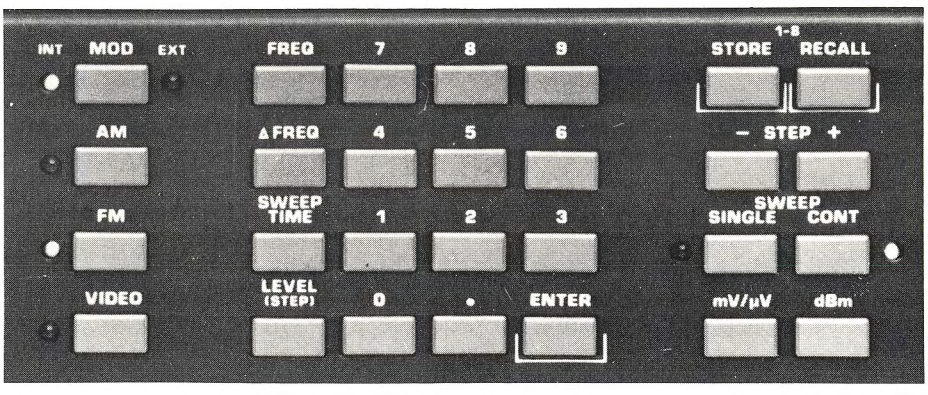
AM modulation is effective over the full 1 GHz range, FM modulation is up to 340 MHz.
Video modulation facilities are possible over the full video band with the choice of internal or external AM or FM sound. This makes the instrument an invaluable tool in, for example, video equipment production testing.

Internal or external sweep

Single and continuous sweep modes can both be internally or externally controlled; sweep time can be varied from 0.05 to 20 seconds. Manual or automatic incremental frequency-changing is also provided in the range 1 kHz to 50 MHz, positive or negative. This latter facility is ideal for random sequence testing of TV and/or radio channels.

Extremely wide application potential

The PM 5390 is thus designed to cater for almost every possible application in industrial electronics including audio, video and communications. As such, it meets todays need for a versatile, easy-to-use RF signal source having the most comprehensive modulation facilities; with reserve performance for tomorrow.



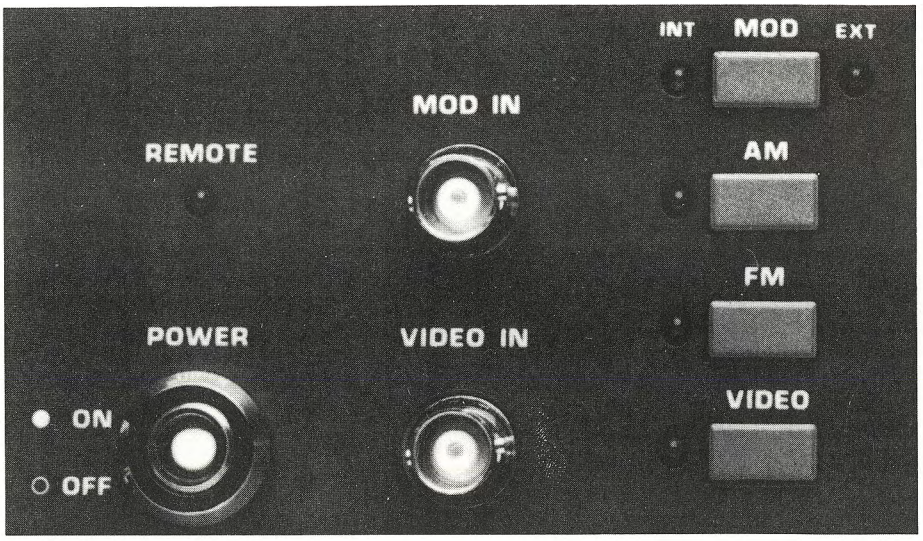
TECHNICAL DATA

Frequency characteristics

OUTPUT SIGNAL — Frequency range: 100 kHz to 1019.99 MHz. Setting: keyboard and IEEE/IEC bus. Display: 6-digit LED display. Resolution: 1 kHz (10 kHz over 1 GHz). Accuracy: $< 3 \cdot 10^{-6}$ (after 30 min.), $< 1 \cdot 10^{-6}$ (after 80 min.). Reference oscillator accuracy: < 1 ppm/C/ < 1 pmm/month).

SPECTRAL PURITY — Harmonics: typ. - 35 dB (< 30 dB) for output level <-7 dBm, - 20 dB at + 13 dBm (PM 5390S only). Non-harmonics: < - 45 dB (PM 5390S), < - 30 dB. Residual FM: 75 Hz (40 Hz in sub-ranges. SSB phase noise: - 100 dBc/Hz. Residual AM: typ. < 0.5%.

RESOLUTION — Increment range I: 1 kHz. Increment range II: 10 kHz. Setting: by keyboard or by IEEE/IEC bus. Settling time per increment: 80-240 ms. Indication: 4 digits, LED.



Output characteristics

RF OUTPUT PM 5390 — Output level (rms): 0.1 µV - 100 mV (- 127 dBm - - 7 dBm). Output impedance: 50Ω. Type of connector: BNC. Setting: by keyboard or IEEE/IEC bus. Indication: 2 1/2 digit LED display, units in µV, mV, V and dBm.

RF OUTPUT PM 5390S — Output level (rms): 0.1 µV - 1 V (- 127 dBm ± 13 dBm). Output impedance: 50Ω. Setting by keyboard or IEEE/IEC bus. Indication: 2 1/2 digit LED display, units in µV, mV, V and dBm. Amplitude flatness: ± 2 dB (typ. 1.5 dB), ± 1 dB in sub-ranges. Attenuation error per 1 dB step: max. ± 0.5 dB.

Modulation

MODULATION MODES — Types:
- Unmodulated: full freq. range.
- Amplitude modulation, AM: full freq. range.
- Frequency modulation, FM: freq. below 340 MHz.
- Video without sound carrier: freq. over 30 MHz.
- Video with AM sound (int/ext): freq. over 30 MHz.
- Video with FM sound (int/ext): freq. over 30 MHz.

AMPLITUDE MODULATION (internal — RF level: reduced by 6 dB. Modulation frequency: 1 kHz sine wave. Modulation depth: 30%. Accuracy: ≦ 5%.

AMPLITUDE MODULATION (external) — RF level: reduced by 6 dB. Modulation frequency: 20 Hz - 20 kHz. Modulation depth: 0 - ≦ 80%. Modulation coefficient: 10 mVpp/%. Max. input voltage: ± 5 V. Input impedance: 10Ω. Input connector: BNC.

FREQUENCY MODULATION (internal) — Applicable for frequencies 340 MHz. Modulation frequency: 1 kHz sine wave. Deviation: ± 25 kHz.

FREQUENCY MODULATION (external) — Bandwidth: 20 Hz - 100 kHz. Max. deviation: ± 80 kHz (5 - 340 MHz), ± 10 kHz (0.1 - 5 MHz). Modulation coefficient: 100 mV/7.5 kHz. Max. input voltage: ± 5 V. Input impedance: 10Ω. Input connector: BNC.

VIDEO MODULATION — Frequency range: 30 - 1019.99 MHz. Bandwidth: 8 MHz. Input amplitude: 1 Vpp video. Input impedance: 75Ω. Polarity: negative. Modulation: negative (or positive). Rest carrier: 15%.

INTERNAL SOUND (video modulation) — Intercarrier frequency: 5.5 MHz (4.5, 6 and 6.5 MHz possible). Accuracy: > 0.2%. Vision/sound carrier ratio: 13 dB. Modulation: FM or AM. Modulation frequency: 1 kHz sine wave. Deviation: ± 40 kHz (FM). Modulation depth: 30% (AM).

EXTERNAL SOUND (video modulation) — Bandwidth: 50 Hz - 20 kHz. Pre-emphasis: 50 µs. Modulation coefficient FM: 100 mVpp/8 kHz. Max. deviation: ± 75 kHz. Modulation coefficient AM: 100 mVpp/6%. Max. modulation depth: 50%. Max. input voltage: ± 5 V. Input impedance: 0.5 MΩ. Input connector: BNC.

FREQUENCY SWEEP — Within a selectable sweep time the frequency passes a selectable range Δ FREQUENCY in 50 steps from the start frequency (FREQUENCY) to the stop frequency (FREQUENCY + Δ FREQUENCY). During the fly-back time the amplitude is reduced. Frequency ranges:
- Sub-range I : 0.1 - 169.999 MHz.
- Sub-range II : 170 - 339.999 MHz.
- Sub-range III : 340 - 509.999 MHz.
- Sub-range IV : 510 - 679.999 MHz.
- Sub-range V : 680 - 849.999 MHz.
- Sub-range VI : 850 - 1019.999 MHz.

Sweep width: 50 kHz - 50 MHz. Step width: 1 kHz - 1 MHz.
Sweep modes: single sweep and continuous sweep. Repetition rate: 50 ms - 20 s. Fly-back time: 200 ms. Sweep time out: 50 steps of 10 mV each. Impedance: 10 kΩ.

REMOTE CONTROL — Conformity: IEEE 488/IEC 625. Connector: 24-pole IEEE bus connector. Device address: is set at the rear panel. Remote indication: LED on the front. Interface functions: AH 1 acceptor handshake, L1 listener, RL 2 remote/local, DC 1 device clear. Delimiters: comma, LF (NL=new line), ETX, ETB. Control functions: fully remote controllable. Interface reaction time: 2 - 20 ms. Frequency settling time: 15-120 ms. Level settling time: 5 ms.

Power supply

Voltage: 110/128/220/238 V ± 10%. Frequency: 50/60 Hz ± 5%. Consumption: 44/53 W.

Environmental data

Operating temperature: 5-45°C. Reference temperature: 23°C ± 1°C. Storage temperature: - 40 to + 70°C.

Safety and EMI

Safety: IEC 348 class I. Screening: RF unit is double screened to avoid radiation.

Mechanical data

Portable/bench top cabinet
Height : 140 mm
Width : 310 mm
Depth : 660 mm
Weight : 9.9 kg

Colour bar pattern generator

PM 5503

NEW

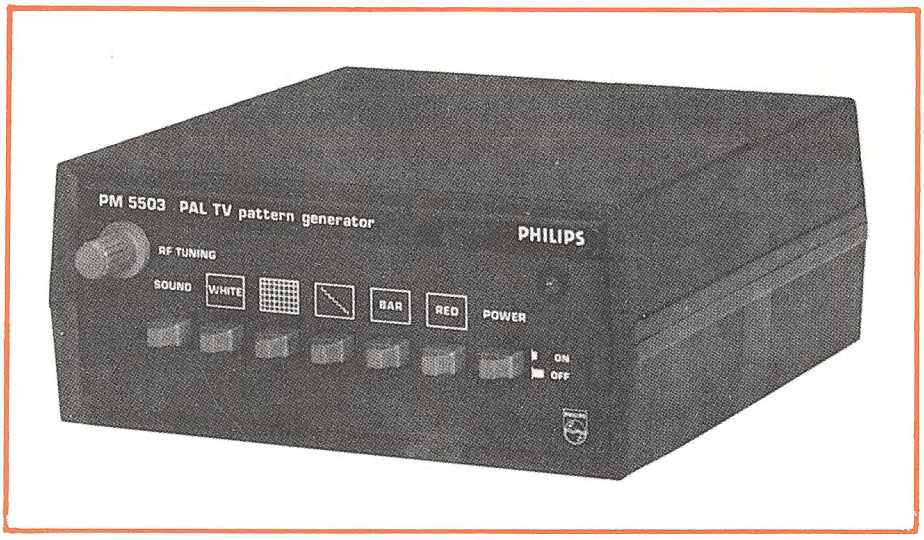
Code no. PM 5503:
9452 055 03003 (G-version)
9452 055 03005 (I-version)

Extremely light and compact instrument for mobile maintenance

Five different test patterns for colour and black/white TV installation and service

RF output signal in VHF range and UHF range

Built-in 1 kHz oscillator (sine wave) for sound performance checks



The PM 5503 colour pattern generator has been specially designed for black/white and colour TV alignment and service at the customer's house. The generator operates according to the PAL TV standard, system G, internally changeable to system I. Although the PM 5503 is a low priced instrument, it produces RF carrier signals tunable within two frequency ranges: VHF = 189....205 MHz and UHF = 567....615 MHz. RF output is adjustable in VHF range (189 to 205 MHz) and UHF range (567 to 615 MHz).
Especially for checking, e.g., CCTV and monitors the instrument offers a video output facility.

For accurate tuning and checking the sound performance of a CTV receiver, the generator has 1 kHz tone available. This tone also makes checks on interference between luminance and sound, as well as chroma/sound, possible.

TECHNICAL DATA

Video signals

GREY SCALE — Type of signal: staircase signal with 8 equal steps from white to black level.

CROSS-HATCH — Type of signal: 15 vertical white lines (200 ns HAD), 13 horizontal lines (one active line each).

RED SIGNAL — Type of signal: identical with red bar of the EBU colour bar (G-version). Change possible by internal adjustment.

WHITE — Type of signal: 100% luminance signal with colour burst.

COLOUR BAR — Type of signal: EBU colour bar (75% contrast, 100% white). Change to BBC colour bar is possible by internal adjustment.

VIDEO OUTPUT — Voltage: 1 Vpp. Output impedance: 75Ω. Polarity: sync negative. Type of connector: 1 BNC at the rear.

SYNCHRONIZATION CHARACTERISTICS — Horizontal frequency: 15.625 kHz. Vertical frequency: 50 Hz. Interlacing: none (624 lines). Pulse widths: 4.8 µs (line), 180 µs (field).

COLOUR CHARACTERISTICS — Subcarrier frequency: 4.433619 MHz ± 10 Hz. Burst width: 10 cycles ± 1 cycle. Burst position: 5.6 µs after line sync. Type: line alternating (PAL). Amplitude: same as sync (0.3 Vpp nominal).

RF signal

VIDEO MODULATION — Frequency range: 189-205 MHz (VHF) and 567-615 MHz (UHF). Tuning: front panel control.

SOUND MODULATION — Intercarrier frequency: 5.5 MHz (G-version), 6.0 MHz (I-version). Tolerance: ± 20 kHz (typical). Sound/vision carrier ratio: - 12 dB. Type of modulation: FM. Internal modulation: 1 kHz sine wave. Frequency deviation: ± 25 kHz (internally adjustable).

RF OUTPUT — Output level: 1 mVrms. Output impedance: 75Ω. Output connection: coaxial flying lead from rear of unit. Cable length: 1.5 m.

Power supply

Voltage: 220/240 V +6/-10%. Mains frequency: 50 Hz. Consumption: 4 W. Mains cable: fixed, 1.75 m long.

Environmental conditions

Reference temperature: 20° C. Operating range: 0 - 50° C.

Mechanical data

Portable cabinet:
Height : 65 mm
Width : 155 mm
Depth : 180 mm
Weight : 1.1 kg
Standard accessory: instruction manual.

Option

PM 9075 Coaxial cable 75Ω with BNC connectors.

Type no.	Description	Page
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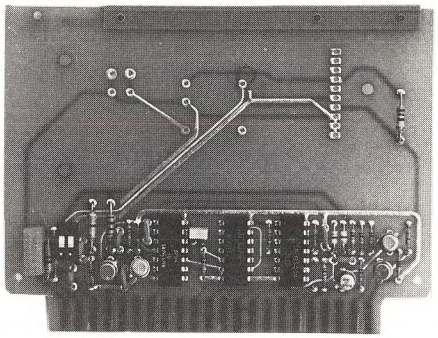
PM 9713	Table cabinet	175
PM 9716A	19" rack/table cabinet	175
PM 9799	Air flow unit	175

Philips, of course.

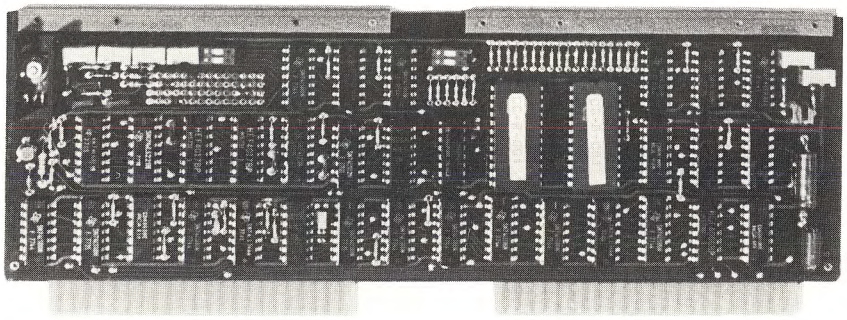
Options

Interface card PM 8501



PM 8501 Interface card is a print card that allows the PM 5534/37 to be controlled via a 10 MHz reference signal from for instance an atomic frequency standard. This may be required for such applications of the test pattern as using the colour subcarrier as a frequency standard and/or for displaying the local time in the test pattern (see clock option).
Technical data — Input level: 100 mVrms-2 Vrms. Input impedance: 75 Ω.

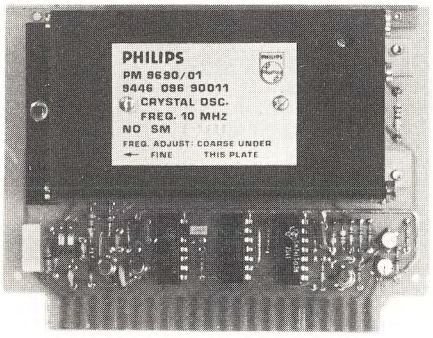
Text generator PM 8503



PM 8503 Text generator provides two lines of text (caption) in the test pattern. The maximum number of characters per line is 14, however, the text areas in the PM 55 34 and 35 patterns only have space for 8 characters in the upper part and 13 characters in the lower text area.
The text facilities are used for displaying authority and source identifications, and may include name and channel of the transmitting station.
The actual wording of the caption is programmed in an integrated circuit, which is socket-mounted (Programmable Read-Only Memory). This PROM is factory programmed according to user specification, however a new PROM can be programmed and inserted in the text generator at any later time.
Together with the PM 8504 clock generator the text generator can also display the time in the test pattern.
Technical data — Number of lines: 2. Number of characters per line: max. 14. Characters: 14 x 32 dot matrix. Programming: PROM (code no. 4008 108 90180 for PM 5534, 4008 108 90190 for PM 5537.

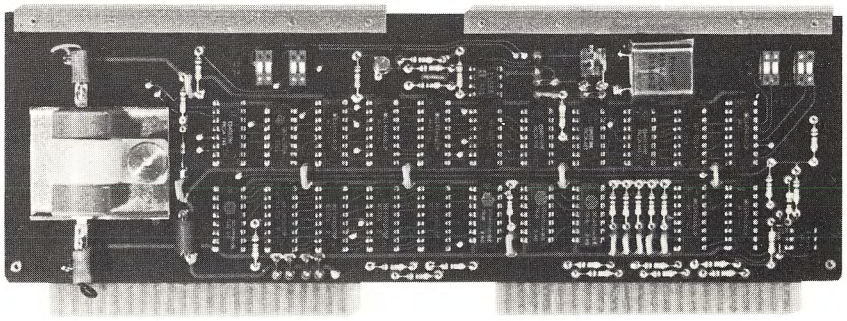


Oven-controlled crystal oscillator PM 8502



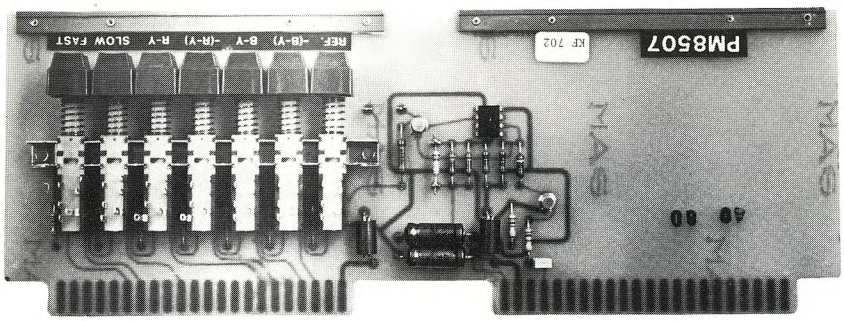
PM 8502 Oven-controlled crystal oscillator consists of a print card with a 10 MHz crystal oscillator identical to the ones used in the PHILIPS range of precision counters. Due to very tight temperature control of the crystal and the oscillator combined with selection and ageing of the crystals, the accuracy and stability is extremely good, in fact only surpassed by atomic frequency standards.
The PM 8502 is used where the standard stability of the PM 5534/37 (± 5 Hz on the colour subcarrier) is considered insufficient.
Technical data — Frequency: 10.000 000 MHz. Accuracy: better than ± 1 Hz. Stability: better than 3×10^{-8}. Ageing: < 1×10^{-7} /month. The PM 8502 can only be used in G, I and N-versions of the PM 5534 and PM 5537.

Clock generator PM 8504



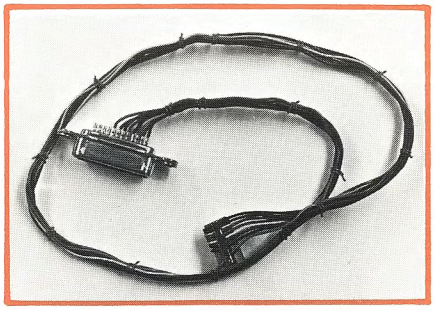
PM 8504 Clock generator produces the necessary control signals for the text generator to display the time in hours-minutes-seconds. In the normal mode the clock is controlled by the field frequency, which is derived from the 10 MHz crystal oscillator or the external 10 MHz frequency standard (in case of genlocking by the incoming colour subcarrier).
In case of mains failure the standby battery and crystal oscillator of the clock generator print card keep the clock going, so at return of the mains, the time is still correct. By means of controls that are accessible when the PM 5534/37 is pulled slightly out of the cabinet, the clock generator can be set for the correct time.
Technical data — Time: displayed in hours, minutes and seconds (0-24 or 0-12 hours). Capacity of standby battery: > 24 hours at fully charged battery. Accuracy of standby oscillator: keeps the time within 2 sec. for 24 hours.

Calibration board PM 8507



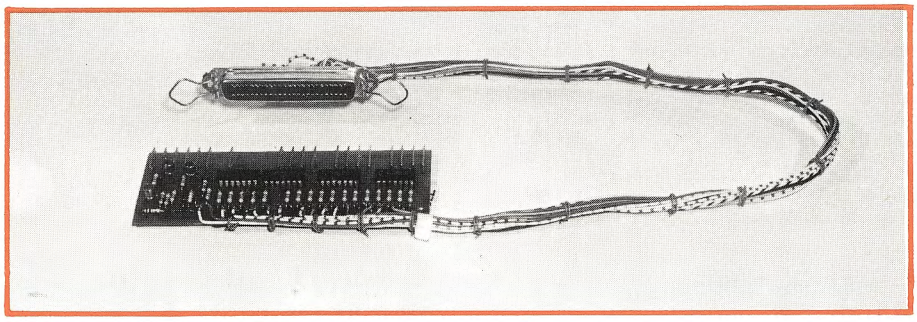
The PM 8507 is used for adjustment and calibration of the PM 5534 and PM 5537 pattern/test signal generators. The PM 8507 board is inserted instead of the chrominance modulator board of the two instruments. The exact levels of the Y, B-Y and R-Y signals can then be measured at the composite output connector by means of the PM 5548 video level meter. The measuring procedure is described in the service manuals of the instruments.

Remote control assembly PM 8508



The PM 8508 is a cable assembly which allows the PM 5570 to be remotely controlled. More specificly all the push-buttons in the lower row of the PM 5570 can be remotely activated. These buttons control the main type of signal that is generated. The PM 8508 can easily be installed by the user.

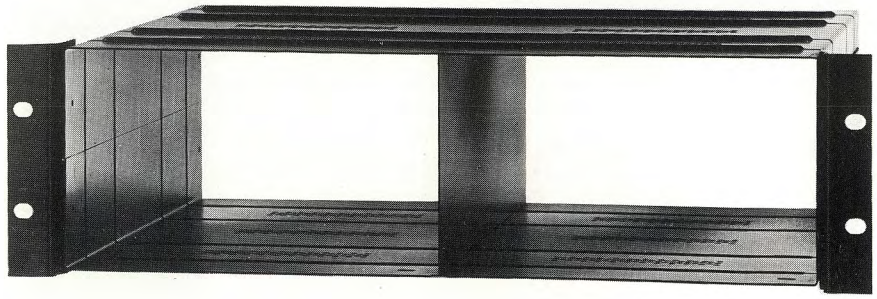
BCD option PM 8509



With the BCD option for the PM 5548 it is possible to get the reading of the display out in digital form for applications such as printing, data processing or logic control. The data contains besides the actual reading of the display also polarity, transfer and stop signals.
The output level is selectable + 5 V or + 12 V logic.

TECHNICAL DATA. Low level: 0 - 0.4 V. High level: +5 V to +12 V selectable with zener diode. Code: BCD (1 - 2 - 4 - 8), 13 bits for max. 1999. Polarity: 2-bit code.

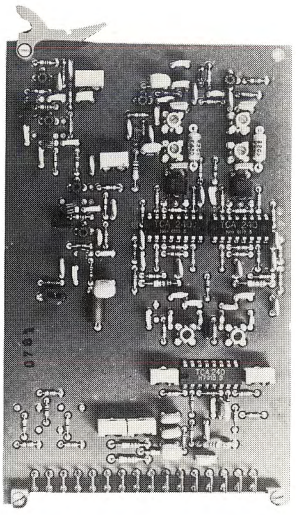
19'' rack cabinet PM 8510



The PM 8510 rack mount cabinet can house two waveform monitors PM 5565, or two vectorscopes PM 5567, or one of each. The cabinet is made of steel plates, which are reinforced by several impressions. The cabinet normally does not require support on the rear. Width: 19" (490 mm). Height: 3 U ~ 132 mm. Weight: 4.2 kg.

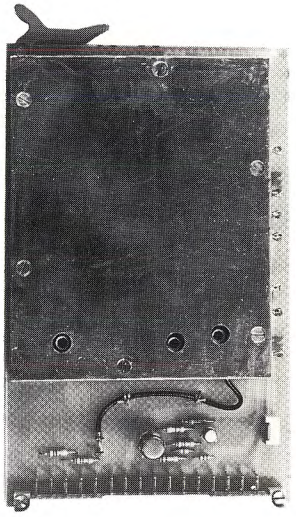
Options

Intercarrier mixer PM 8513



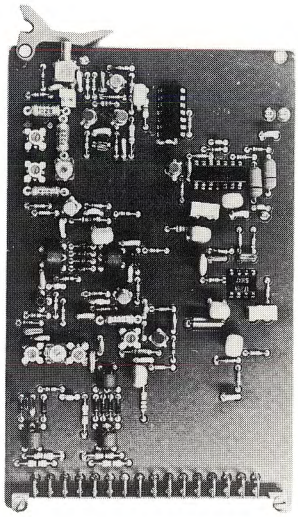
The intercarrier mixer board provides the two sound carriers for dual/stereo sound on intercarrier base, i.e. 5.5 MHz and 5.74 MHz. This can be advantageous for unit testing in television factories. The PM 5588 is wired for this option, so that the PM 8513 board only has to be plugged into the PM 5588, however, a vision carrier signal is needed, which can either be supplied from the vision modulator (PM 5580), or from the optional PM 8514 carrier oscillator. Outputs: 5.5 MHz, 1 Vpp in 50 Ω, 5.742 187 5 MHz, 1 Vpp in 50 Ω, and 5.5 MHz + 5.74 MHz combined, 1 Vpp in 50 Ω, level of 5.74 MHz signal is 7 dB lower than the 5.5 MHz signal.

Carrier oscillator PM 8514



The PM 5588 stereo sound modulator generates the two sound carriers on IF base, i.e. 33.400 and 33.158 MHz. For certain applications intercarrier signals are required, i.e. 5.50 and 5.74 MHz. For that application the PM 8513 intercarrier mixer has been made available. This unit requires, however, a vision carrier signal of 38.9 MHz. The PM 8514 generates the needed vision carrier, so that the PM 5588 can operate completely independently of a vision modulator. Output: 38.9 MHz, 100 mVrms in 50 Ω. Accuracy: derived from the 10 MHz VCXO of the PM 5588.

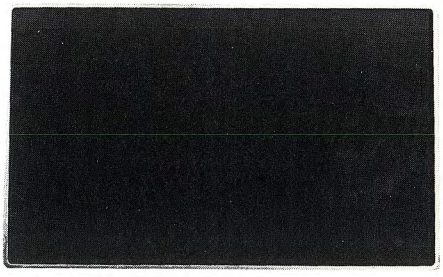
Test demodulator PM 8515



The PM 8515 Test demodulator is a calibration tool for adjusting and testing the PM 5588 stereo sound modulator.

The following parameters can be checked: modulation (frequency deviation), distortion and stereo cross-talk.
Technical data. Accuracy of modulation: better than 500 Hz on peak deviation, tracking of the two sound carriers: better than 50 Hz. Distortion: better than 0.1%. Stereo cross-talk can be measured down to-60 dB.

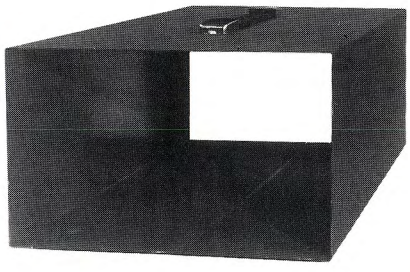
Blind plate PM 8517



This panel is used with the PM 8510 19" rack cabinet, which can house two waveform monitors or two vectorscopes or one of each. If only one waveform monitor or vectorscope is inserted in the PM 8510, the "empty" hole can be closed with the PM 8517 blind plate.

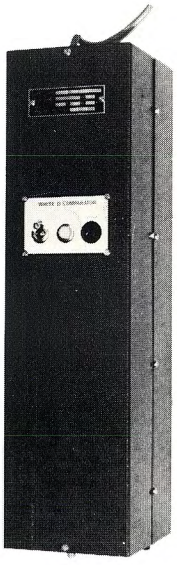
The blind plate is supplied with two brackets, which "clicks" into 19" cabinet.

Carrying case PM 8518



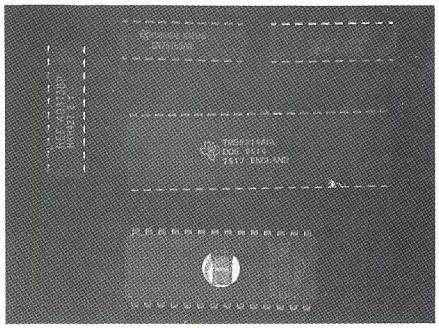
This cabinet is used instead of the normal cabinet supplied with PM 5565 waveform monitor or PM 5567 vectorscope, when the instrument is often carried around, or when is has to be moved from time to time.

White-D comparator PM 8519



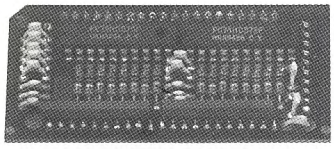
Calibration tool for the PM 5539, see page 82

IEEE interface PM 8520



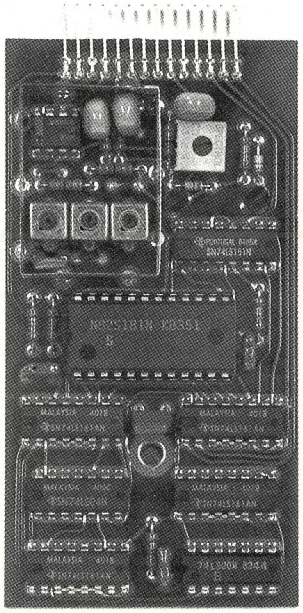
The PM 8520 IEEE interface to the PM 5631/32/33 allows most functions of the units to be computer controlled via the standard IEEE interface bus. In addition to that, the IEEE bus has access to the internal line library so that the user can generate new patterns out of the existing lines. The PM 8520 consists of a set of integrated circuits and a special control PROM that fit into existing sockets.

TTL interface PM 8530



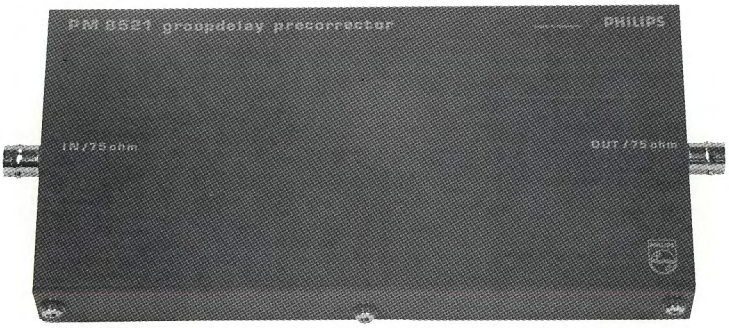
The PM 8530 TTL-control allows remote control of the pre-selector of the PM 5631/32/33 with TTL level control signals.

Source code generator PM 8523

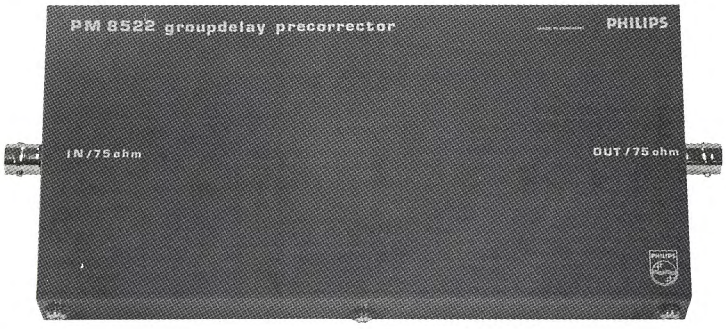


The PM 8523 Source code generator consists of a small printed circuit board that plugs into a socket in the mother board of the PM 5651 Studio VITS generator. The pcb contains a programmable read-only memory that can be coded to generate a data signal in accordance with the users wishes. The data signal can be inserted into lines 8-22 of the vertical blanking interval. Clock frequency of the data signal: 5 MHz.

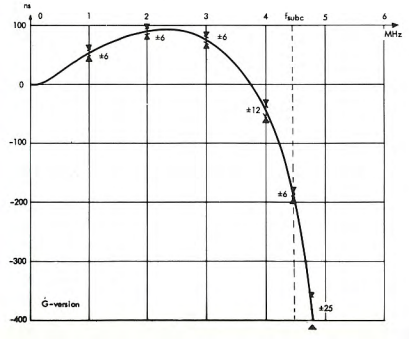
Group delay pre-corrector PM 8521

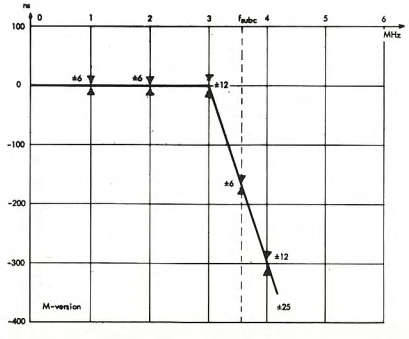


Group delay pre-corrector PM 8522



The PM 8521 and PM 8522 are passive precision group delay pre-correctors for TV systems B/G and M (other versions may be available on request). The pre-correctors may be used to improve the performance of inexpensive modulators when critical signals are transmitted (Teletext, etc.). Accuracy: in the order of ± 10 ns (special data sheet available on request).





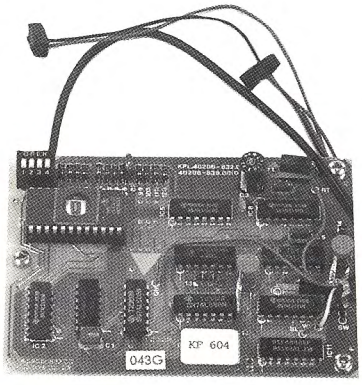
Options

10 MHz TCXO
PM 8524



The PM 8524 TCXO is a 10 MHz temperature compensated precision crystal oscillator to be used in the PM 5670/71/72, when the accuracy and stability of the built-in crystal oscillator is insufficient. Accuracy: 2 ppm (can be annulled). Temperature drift: < 0.01 ppm per "C.

Text generator
PM 8526



The PM 8526 Text generator adds a caption (text) to the composite pattern of the PM 5646. Up to 16 different text lines can be programmed to customers wish, each line having maximum 15 characters. One line is displayed at the time or all texts are displayed sequencially (by internal selection).

19" rack mount
PM 8531

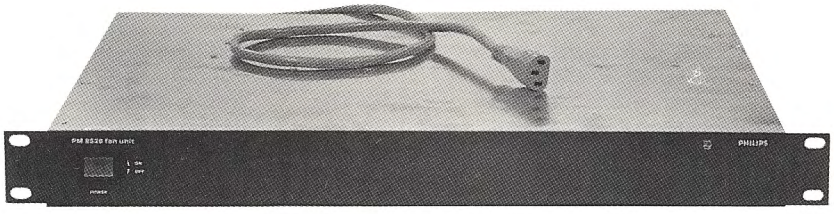
The PM 8531 Rack mount allows the PM 5625 Colour monitor to mounted in a 19" rack. The exact dimensions of the rack mounted monitor is shown on page 97.

19" rack mount kit
PM 8527



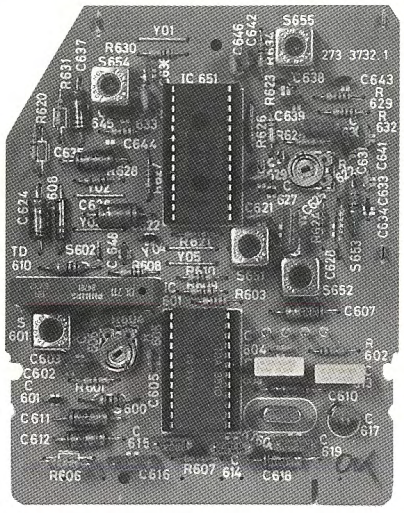
The PM 8527 consists of two rack mount brackets that are mounted on the sides of the PM 5646 TV test signal generator. The generator can then be mounted in 19" racks.

Fan unit
PM 8528



This fan unit contains two fans and an air flow detector that interrups the mains supply to the equipment being cooled, when sufficient air flow fails to appear. The fan unit is used to cool critical at high ambient temperature or when improved reliability and stability is wanted.

PAL/SECAM module PM 8529

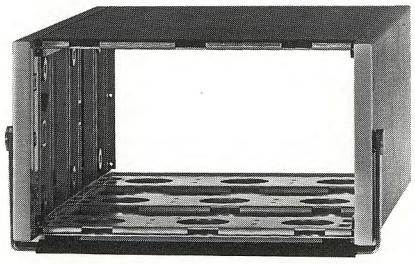


The PAL/SECAM decoder module turns the PM 5625 colour monitor into a multi standard PAL/SECAM colour monitor. The decoder adapts automatically to the standard of the supplied video signal.

Extention board PM 8532

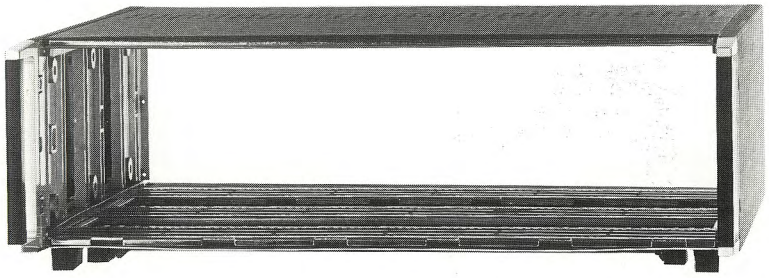
This is a service tool developed for critical repair and calibration of the PM 5560 TV demodulator.

Table cabinet PM 9713



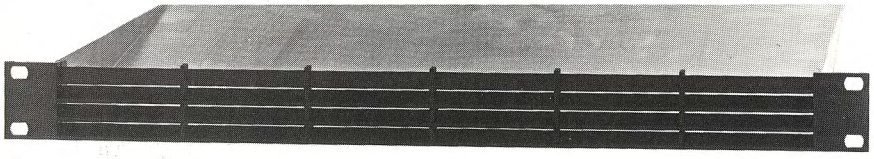
Most PTV instruments include a cabinet, however, due to the flexible plug-in unit system, the user may wish to have a free choice of cabinet (this is valid for instruments equal to, or smaller than 3/6 plug-in units). The PM 9713 cabinet can house one 3/6 unit, three 1/6 units, or one 1/6 unit plus one 2/6 unit. Width: 235 mm. Height: 132 mm. Weight: 1.7 kg.

19'' rack/table cabinet PM 9716 A



Most PTV instruments include a cabinet, however, due to the flexible plug-in unit system, the user may wish to have a free choice of cabinet (this is valid for instruments equal to, or smaller than 3/6 plug-in units). The PM 9716 A cabinet can house any combination of plug-in units up to 6/6. The cabinet is delivered in the table version, but a rack mount kit is included, so that the user can easily convert the cabinet to the rack mount version. Width: 19" (444 mm). Height: 3 U (132 mm). Weight: 2.7 kg.

Air flow unit PM 9799



The air-flow unit provides efficient cooling of one or two 19" rack instruments without the inconvenience of electric ventilators. The air-flow unit is using the chimney-effect of the heated air in the instruments. Cool air is piped from the front below the instruments to the rear above the instruments (see page 176). Width: 19" (490 mm). Height: 1 U (44 mm). Weight: 1.0 kg.

Every day, over a billion people watch us work.

Reducing the temperature in racks

Manuals for electronic instruments normally state an ambient temperature range within which the instrument is properly operating. This ambient temperature range is derived from the permissible temperature for the components minus the internal increase in temperature caused by the instrument itself.

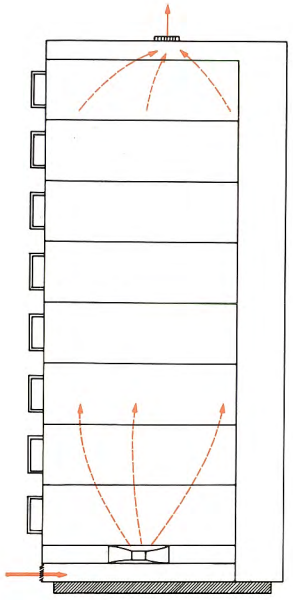
The permissible temperature for most components is 70° C and the internal temperature increase for an instrument placed on the bench (normal air circulation) is about 25° C. This leads to a specified max. ambient temperature of 45° C for most instruments.

When several instruments are mounted in close proximity, it is obvious that internal temperature can rise to higher levels compared to operating on the bench.

Quite often the internal temperature (= ambient temperature for components) may even exceed the temperature tolerances for components, resulting in rapid ageing of the components or even a breakdown.

Therefore the PHILIPS programme includes ventilation units in order to keep the internal temperature at an acceptable level.

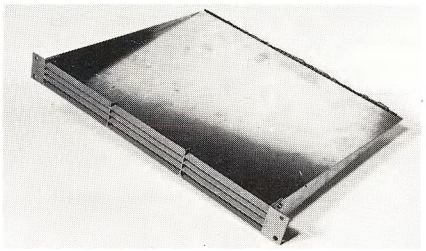
These units can employ forced or natural cooling. Forced cooling can be done with ventilation unit PE 1373, containing two fans. The dimensions are 1E high (= 4.5 cm) and 19" wide.



Cooling a 19" rack by means of the PE 1373 fan unit.

This ventilation unit placed underneath the instruments in a rack with sidewalls and with a ventilation grill in the top should give adequate air circulation.

When the covers of the instruments are removed, and the printed circuit boards inside the instruments are mounted vertically (free air circulation through the instrument), this method can be very effective. The noise from the fans may be a slight disadvantage.

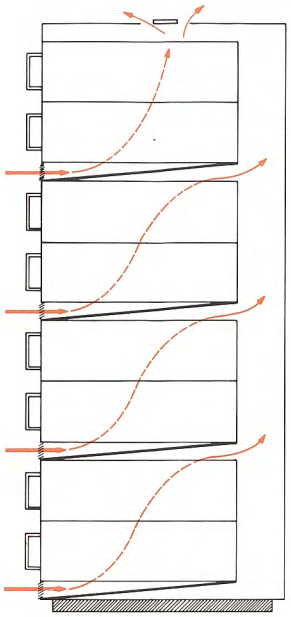


Ventilation unit PM 9799.

Natural cooling can be obtained by using air-flow units type PM 9799. This unit, 1E high and 19" wide, simply eliminates actual physical contact and allows air circulation through the instruments.

Several air-flow units can be mounted between the instruments, so that the warm air from the instruments undermeath passes to the surroundings via the rear of the air-flow units. In this way, mutual heating-up is avoided and the internal temperature of the instruments is kept at an acceptably low level.

The number of such units to be used in a given case depends on the amount of heat generated in the equipment. Differences between instruments (power consumption, mechanical design etc.) make it impossible to give a general rule concerning the total number of instruments or the maximum permissible power between two air-flow units. However, a rule of thumb is to use one air-flow unit per two instruments. In general, the system should be designed to keep the internal air temperature below 70°C, which is the maximum permissible ambient temperature for most components.



Cooling a 19" rack by means of four PM 9799 ventilation units.



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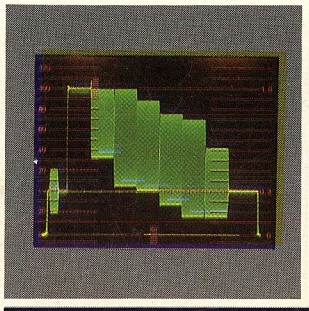



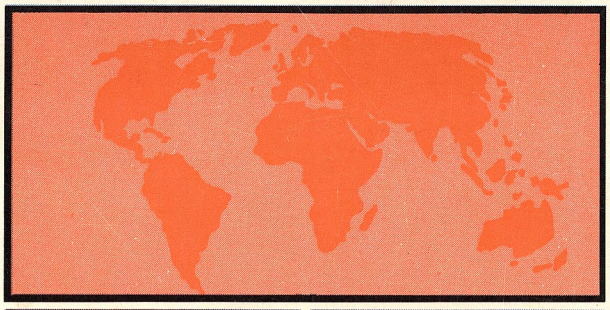

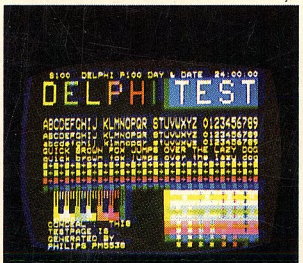
DELPHI TEST



