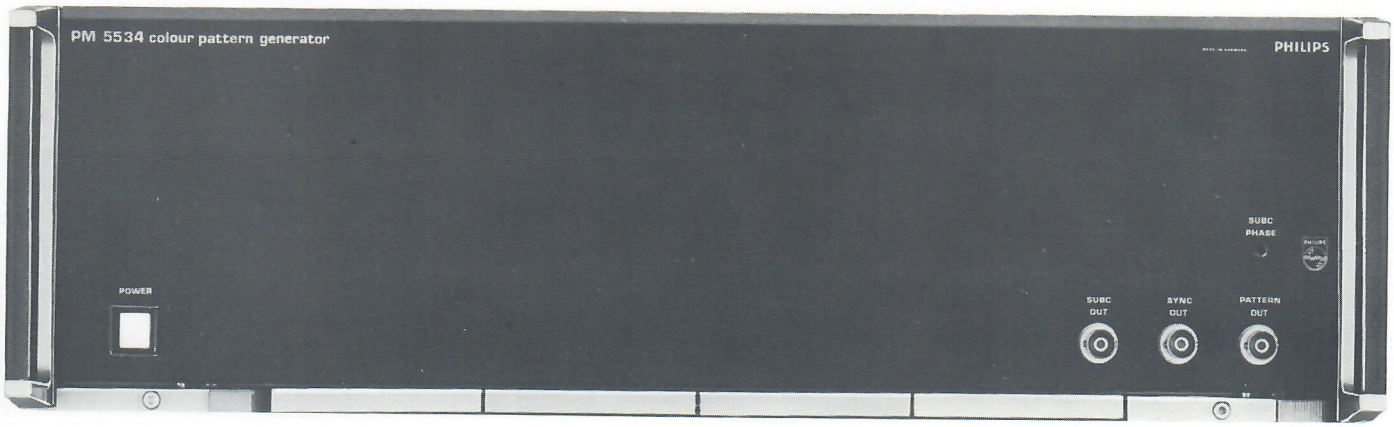
Colour pattern generator

PM 5534

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)



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.

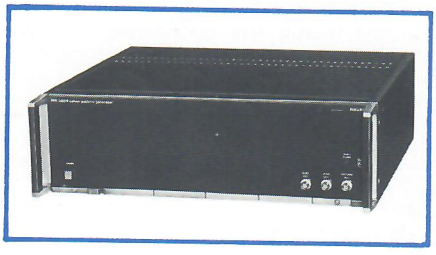
This test pattern has been adopted by the television authorities in more than 25 countries in all parts of the world as the test pattern to be transmitted outside the programme hours. Therefore the PM 5534 pattern has been made identical to that of the PM 5544, so that compatibility between the two instruments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

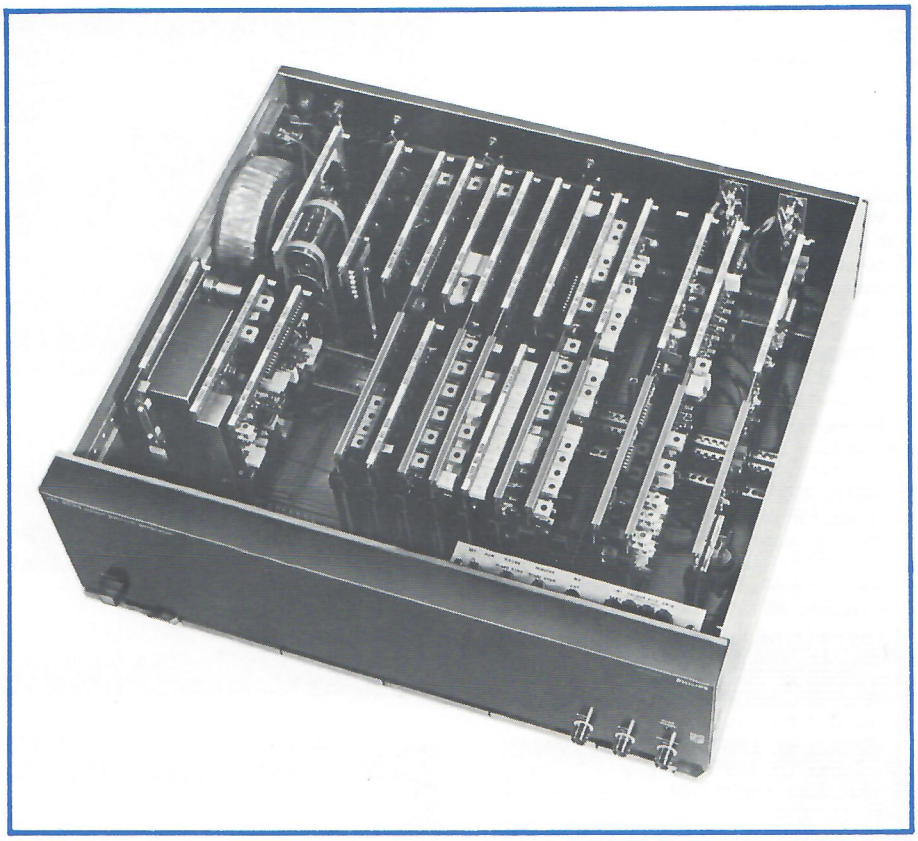
The yellow-red-yellow colour step shows clearly, when there is a delay error between the bl/wh component and the colour component of the picture.

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 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 - 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.

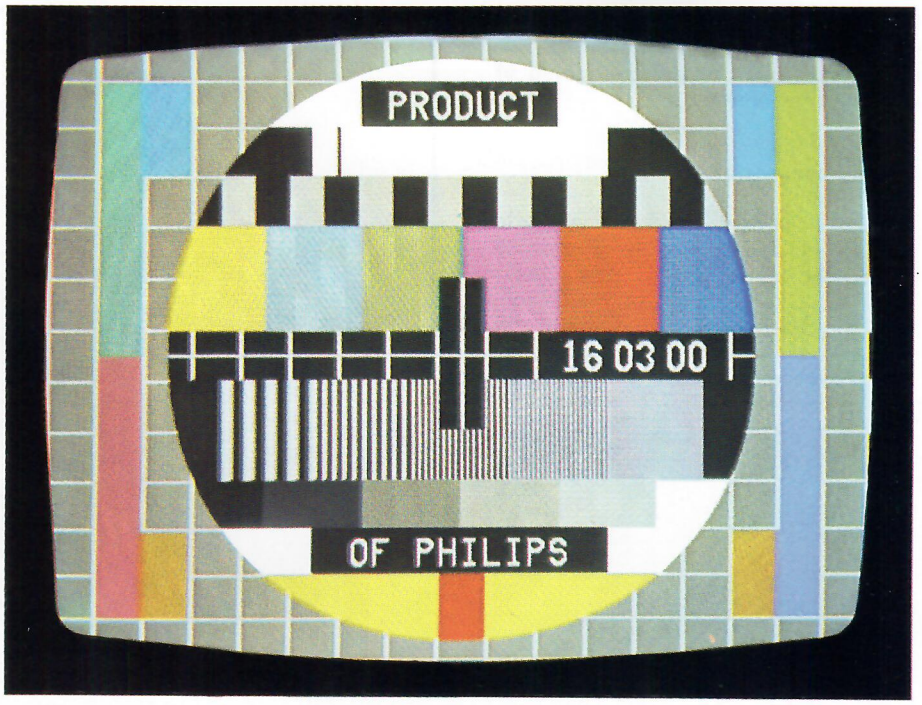
Outputs

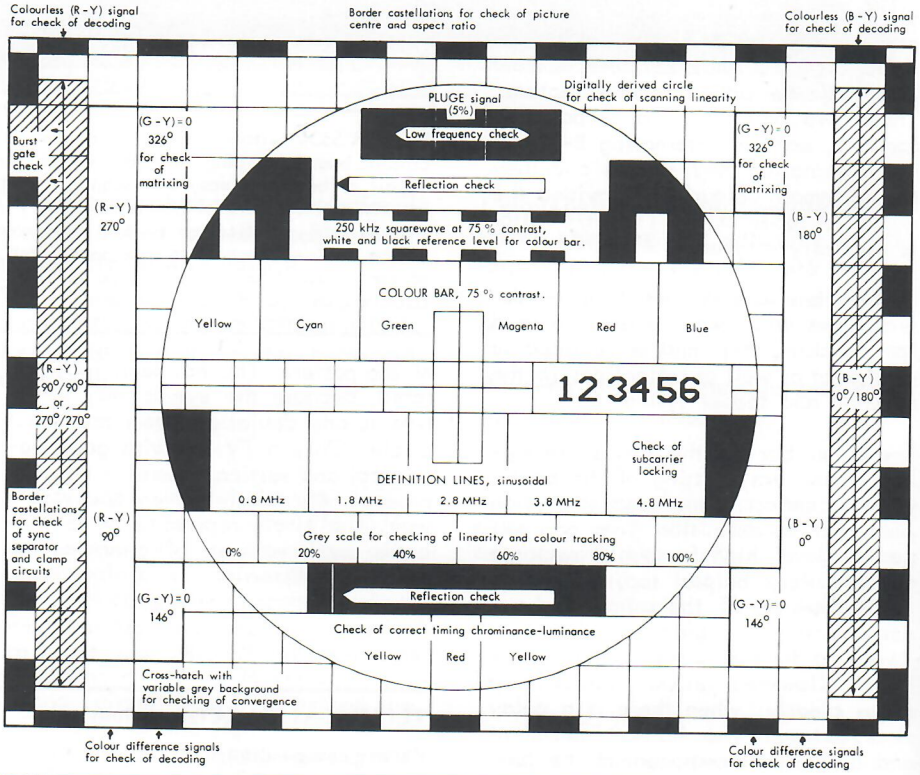
PATTERN — Number of outputs: 1 at the front, 2 at the rear. Impedance: 75 Ω ± 1%. Return loss: > 34 dB up to 7 MHz. Isolation between outputs: > 30 dB up to 4.43 MHz. Signal: composite video signal. Amplitude video: 700 mVpp ± 1%. Amplitude sync: 300 mVpp ± 1%. Amplitude colour burst: 300 mVpp ± 2% (M/NTSC: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





Outputs

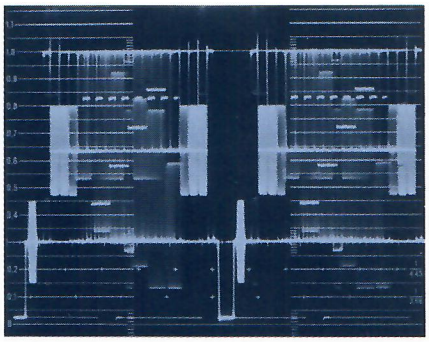
TEST OUTPUT — Can be used for service work to make the pulse pattern on the pwb's visible on a monitor. Impedance: 75 Ω. Rise and fall time: 100 ns ± 5% (125 ns).

Input

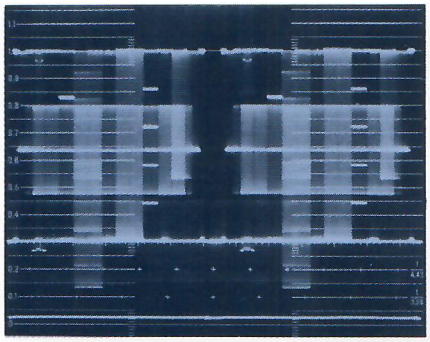
SYNCHRONIZATION — The instrument may be genlocked to a composite video signal or a black burst signal. Amplitude: 0.5 - 4 Vpp, high ohmic looped-through. Return loss: > 34 dB up to 7 MHz. Synchronization with a composite sync signal will only give bl/wh genlocking.

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).

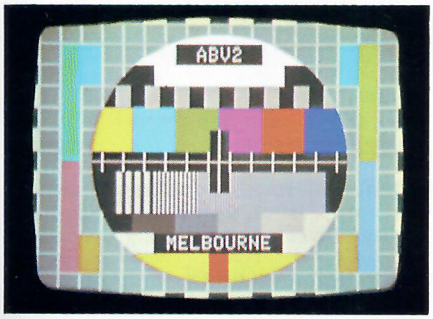


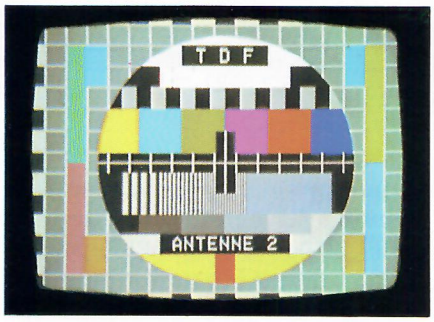
Waveform monitor display of the PM 5534 pattern (vertical time base).

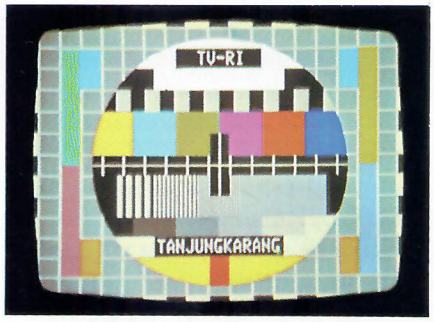
EXTERNAL FREQUENCY STANDARD (optional) — Via the 10 MHz interface card (optional) the PM 5534 can be controlled from an external frequency standard (i.e. atomic frequency standard). Amplitude: 0.1 - 2 Vrms. Impedance: 75 Ω. Return loss: > 26 dB at 10 MHz.

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





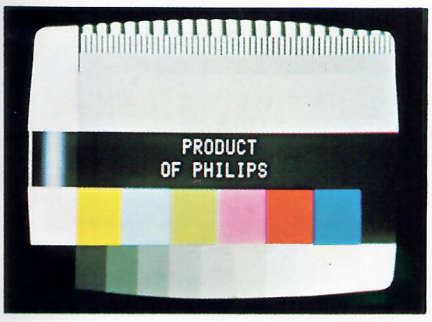


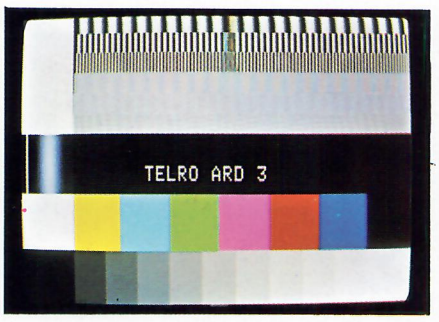
Philips patterns

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

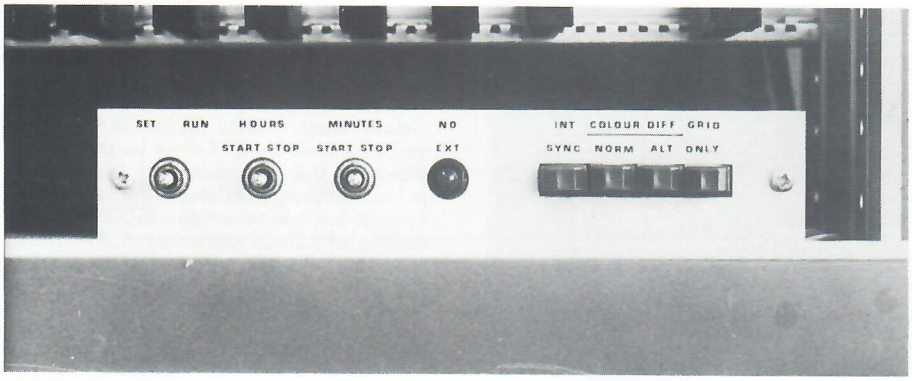


Photo showing the text panel of the internal controls. These are selectors for internal-external synchronization, modifications of the pattern (colour difference signals off), and grid with border castellations instead of the composite pattern. The LED indicates abscence of signal in the external sync 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 22). 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.