THE CHIEF RADIO INSPECTOR,
P.O. BOX 9228,
COURTENAY PLACE.

PHILIPS


**Operating manual**
**Bedienungsanleitung**
**Gebruiksaanwijzing**
**Notice d'emploi**

**C.T.V. Pattern generator**
**Schwarz/weiss-und Farbbildmustergenerator**
**Zwart/wit-en kleuren testbeeld generator**
**Générateur de mire couleur-pal**

# PM5509

9452 055 09013

PHILIPS

9499 520 05677

740221

**IMPORTANT**

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

**WICHTIG**

Beim Schriftwechsel über dieses Gerät wird gebeten, die genaue Typenbezeichnung und Seriennummer anzugeben.
Diese befinden sich auf dem Typenschild an der Rückseite des Gerätes.

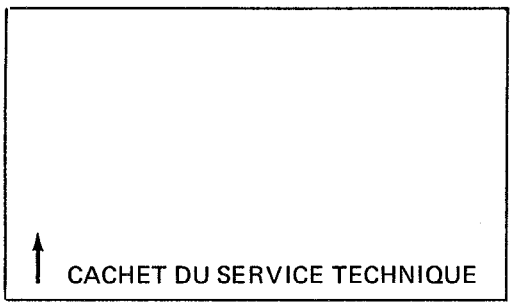
**BELANGRIJK**

Vermeld bij correspondentie betreffende dit apparaat het typenummer en het serienummer, die op het typeplaatje aan de achterzijde van het apparaat staan aangegeven.

**IMPORTANT**

**RECHANGE DE PIECES DETACHEES**
**(Réparations)**

Dans votre correspondance et dans vos réclamations se rapportant à cet appareil, veuillez TOUJOURS indiquer le n° de type et le n° de série qui sont marqués sur la plaquette de caractéristiques fixée sur la paroi arrière de l'appareil.
Lorsque l'appareil doit être retourné à notre Département Service pour réparation importante, il doit être muni d'une étiquette comportant, outre les indications de série et le nom du propriétaire, les renseignements indispensables concernant les défauts constatés; ceci permet une immobilisation plus réduite de l'appareil et diminue considérablement le prix de revient de la réparation. Emballer avec précaution l'appareil si possible dans son emballage d'origine.



# Contents

## LIST OF FIGURES

# 1. General information

## 1.1. INTRODUCTION

The PM 5509 is a TV Service pattern generator for use in TV/Colour TV Service and Video equipment like VCR (video-cassette recorders). It features 10 test patterns 5 of them in colour, modulated on an rf carrier which can be tuned to practically all available TV channels including IF.
The tuning is carried out electronically. Two small meters on the front panel indicate the TV Band in use and the channel frequency.

Test patterns include a checker board, dots, cross hatch, grey scale and a simple circle pattern for the usual Black and White alignments. For colour a red pattern, a white pattern, a standard colourbar with white reference and 1 special test pattern is available. This last pattern enables "on the screen" alignment of PAL-delay line and PAL demodulators. Furthermore the greyscale pattern is combined with definition-lines up to 5 MHz for checking video equipment e.g. video recorders. For the V.C.R. another special test pattern is used. An eight step saturation Bar combined with a colour definition-line signal up to 1 MHz.
Chroma (including) Burst can be continuously adjusted from 0 - 100 % and the RF output amplitude is adjustable to at least 60 dB down, far enough to check the C.T.V. receivers sensitivity.
Sound carrier of 5.5 MHz can be switched off (other frequencies e.g. 4.5 or 6.0 MHz can be choosen by changing a solder joint inside the instrument). It can also be modulated with the internal 1 KHz sinewave but external modulation allows the connection of e.g. a record-player or tape recorder. A special DIN-plug for this purpose is located at the rear side of the instrument.

For a.o. external triggering of an oscilloscope either a field or line-pulse is available. Video output signal is the standard 1 Volt in 75 ohms. The polarity of the video signal can be changed inside the instrument but is normally positive. External video-modulation is also possible so that one can use the PM 5509 as a simple modulator for e.g. camera signals. For connection of a VCR there is a special DIN-plug available on the rear side of the PM 5509.

## 1.2. TECHNICAL SPECIFICATION

Properties expressed in numerical values with tolerances stated are guaranteed by the factory.
Numerical values without tolerances stated represent the properties of an average instrument and merely serve as a guide.

### 1.2.1. Test signals

| | |
|---|---|
| – "CHECKER BOARD" | : 6x8 squares, accurately centred |
| – "CIRCLE" | : circle on grey background |
| – "CROSSHATCH" | : 11 horizontal and 15 vertical lines |
| – "DOTS" | : 11x15 |
| – "DEFINITION LINES" and "GREYSCALE" | : 8 sets of definition lines ranging from 0.5 to 5 MHz and a staircase signal with 8 identical steps |
| – "RED" | : Red signal with 50 % saturation |
| – "WHITE" | : 100 % white signal (with alternating burst) |
| – "DEM" | : Special bar pattern 4 vertical bars: with special encoding 1st bar (G–Y) = 0; 2nd bar grey; 3rd bar (R–Y) NTSC encoded with alternating burst 4th bar (±B–Y). The 2nd bar and lower part of the screen are for reference |

– "COLOUR BAR" : 75 % contrast standard colour bar with reference white field in lower part of screen.

| Bar | Relative luminance amplitude | Chroma phase | Relative chroma amplitude |
|---|---|---|---|
| White | 0.75 | – | – |
| Yellow | 0.67 | 167° | ±0.33 |
| Cyan | 0.53 | 283° | ±0.47 |
| Green | 0.44 | 241° | ±0.44 |
| Magenta | 0.31 | 61° | ±0.44 |
| Red | 0.23 | 103° | ±0.47 |
| Blue | 0.08 | 347° | ±0.33 |
| Black | 0 | – | – |

– "VCR" : VCR pattern (R–Y signal) 8 sets of colour definition lines ranging from 100 kHz - 1 MHz and with 8 steps of linear in creasing saturation from 0 - 100 %

### 1.2.2. TV Systems

PM 5509-G : 5.5 MHz (CCIR system G)

PM 5509-I : 6 MHz (CCIR system I)

PM 5509-M : 4.5 MHz (RTMA system M)

### 1.2.3. Video

– Video carrier

Range + frequency selection : 5 push buttons to select the freq. range.
- Push buttons 1+2: preset for IF and band I (38 - 85 MHz)
- Push button 3 : preset for band III (170 - 250 MHz)
- Push buttons 4+5: preset for bands IV and V (470 - 790 MHz)

: Channel frequency adjustable by corresponding fine tuning adjustments

Scale : Indication of range and frequency with two meters on front-panel

– RF output : BNC connector (front-panel)

Impedance : 75 Ω

Output voltage : > 10 mV

Attenuator : continuously > 60 dB

– Video modulation : AM, negative (or positive with internal change of solder joint); modulation will take place on IF.
This modulated signal is then mixed up on RF basis.

– Video outputs : 1. DIN connector on rear side for VCR
2. BNC connector on front panel, combined with video input and selectable by front panel switch

Impedance : 75 Ω

Output voltage : 1 $V_{p-p}$ loaded with 75 Ω

Polarity : Positive (or negative, with internal change of solder joint)

– Video input : BNC connector on front panel, selectable by front-panel switch

Impedance : 75 Ω

Input voltage : 1 $V_{p-p}$

| | |
|---|---|
| Polarity | : Positive |
| Max. permissible ext. voltage | : ±4 V |

### 1.2.4. Sound

| | |
|---|---|
| – Sound carrier | |
| Frequency | : choice of: 4.5; 5.5; 6.0; 6.5 MHz can be changed internally. Standard is 5.5 MHz |
| Frequency tolerance | : < 0.2 % |
| – Sound modulation | : FM (or AM, by internal change) |
| Internal signal | : 1 kHz - sine wave |
| – FM-sweep | : (40 ± 5) kHz on 5.5 MHz and slightly different at other carrier frequencies. |
| – AM-modulation depth | : (30 ± 5) % |
| External signal | : 0.2 $V_{rms}$ for the same "modulation" depth as internal signal |
| – Bandwidth | : 100 Hz - 10 kHz |
| – Pre-emphasis | : 50 $\mu$s (can be interrupted) |
| – Sound input | : DIN connector on rear panel |
| Input impedance | : 0.5 MΩ |
| Max. permissible voltage | : 28 Vdc or 5 $V_{p-p}$ |
| – Sound switch | : carrier on - off<br>modulation on - off<br>modulation intern - extern |

### 1.2.5. Sync. part

| | |
|---|---|
| Line frequency | : 15625 Hz or 15750 Hz (switch inside the instrument) |
| – Tolerance | : 0.1 % |
| Line sync. signal | : adapted to CCIR-norm (or RTMA-TV system; can be changed internally) |
| Lines/field | : 312 lines for $f_{line}$ = 15625 Hz or<br>260 lines for $f_{line}$ = 15750 Hz |
| Field frequency | : 50 Hz for $f_{line}$ = 15625 Hz or<br>60 Hz for $f_{line}$ = 15750 Hz |
| Frame sync. signal | : adapted to TV-system; no interlacing |
| – Sync. output | : BNC-connector on front panel |
| Output signal | : field and line sync. pulse selection with switch TRIGG. on front panel |
| Output voltage | : 5 $V_{p-p}$ |
| Impedance | : 10 kΩ |
| Polarity | : Positive |
| Max. permissible ext. voltage | : +10 V |

### 1.2.6. Chroma unit

| | |
|---|---|
| Systems | : PAL according to TV-system I; G or M |
| Subcarrier frequency | : 4.433619 MHz; or 3.57611 MHz for PAL-M (by changing the cristal) |
| – Tolerance | : $\pm 5.10^{-6}$ (+5 ... +45 °C) |

| | |
|---|---|
| Burst | : according to TV-system |
| – Number of periods | : 10 |
| – Burst phase | : 135° and 225° |
| Amplitude | : burst and chroma amplitude continuously adjustable from 0 - 100 % or fixed position at 100 % |
| – Attenuation | : > 40 dB |
| – Difference between even- and odd lines | : ±3 % |

### 1.2.7. Power supply

| | |
|---|---|
| Mains voltage | : 115 V or 230 V ± 15 % |
| Mains frequency | : 48 - 60 Hz |
| Power consumption | : 17 Watt |

### 1.2.8. Environmental conditions

| | |
|---|---|
| Reference temperature | : 23 °C |
| Normal operating temperature | : +5 to +40 °C |
| Temperature range for transport and storage | : –40 to +70 °C |

This instrument conforms to VDE 0411 class I protection standard.

### 1.2.9. Dimensions (over all)

| | |
|---|---|
| Height | : 195 mm |
| Width | : 235 mm |
| Depth | : 270 mm |
| Weight | : approx. 3.7 kg |

## 1.3. ACCESSORIES

**Supplied with the instrument:**

Manual
Mains cable

**Optional:**

PM 9538 Cable BNC - TV connector 75 Ohms
PM 9539 Cable BNC - impedance transformer 75 - 300 Ohms
PM 9075 Cable BNC - BNC 75 Ohm

## 1.4. PATTERN SURVEY

| *Signal content* | *B/W* | *Colour* | *VCR* | *For checking* |
|---|---|---|---|---|
| **Checkerboard** | | | | |
| 6x8 rows | ● | ■ | | Focus adjustment |
| | ● | ■ | | HOR/Vert. sync |
| | ● | ■ | | HOR/Vert. linearity |
| | ● | ■ | | HOR/Vert. deflection |
| | ● | ■ | | Amplitude/aspect ratio, geometry ringing |
| | ● | ■ | | Bandwidth by observation of vert. transitions |
| | ● | ■ | | Mains Hum interference in synchronisation |
| | | | o | Black/white transitions |
| **Circle** | ● | ■ | | Overall linearity |
| | ● | ■ | | Overall geometry |
| **Crosshatch** | | | | |
| 11 horizontal and | | ■ | | Dynamic convergence |
| 15 vertical lines | ● | ■ | | Pincushion correction |
| | | ■ | | E/W - N/S corrections in 110° CTV receivers |
| **Dots** | | | | |
| 11 horizontal lines of 15 dots | | ■ | | Static convergency |
| **Grey Scale** | ● | ■ | | Brightness and contrast circuit |
| Staircase signal with | ● | ■ | | Grey scale tracking |
| 8 identical steps | ● | ■ | o | Linearity of video amplifier |
| combined with | | | | |
| **Definition lines** | ● | ■ | o | Video Bandwidth |
| 1-5 MHz | | | | |
| **Red pattern** | | ■ | | Purity |
| red signal with 50 % saturation | ● | ■ | | Interference between sound and chroma-carrier |
| | | | o | Colour A.G.C. |
| | | | o | Chrominance writing currents of video head |
| **White pattern** | ● | ■ | | White –D |
| 100 % white signal | | ■ | | Constant brightness |
| (with burst) | | ■ | | Beam current of picture tube |
| | | | o | Luminance writing current |
| **Special Bar pattern** | | ■ | | PAL Delay-line; amplitude + phase |
| | | ■ | | Demodulators; subcarrier frequency (phase) to (R–Y) – (B–Y) demodulators |
| 4 vertical Bars. | | ■ | | PAL Switch |
| Special encoding | | | | |
| **Colour Bar with white pattern** | | ■ | | Overall colour performance |
| | | ■ | | Burst keying |
| 75 % contrast standard | | ■ | | Subcarrier regenerator |
| colourbar with white | | ■ | | PAL identification circuit |
| reference field in lower | | ■ | | Matrix circuit |
| part of screen | | ■ | | RGB amplifiers |
| | | | o | Delay Colour versus B/W signal |
| | | | o | Saturation check |
| | | | o | 562.5 kHz interference check |
| **Saturation Step** | | ■ | o | Linearity of chroma amplifiers |
| **Signal** | | ■ | o | Sensitivity colour amplifiers |
| 8 steps of linear increasing saturation (red signal) combined with | | | | |
| **Colour Definition Lines** | | ■ | o | Resolution of the chroma part. |
| 100 kHz - 1 MHz | | | | |

# 2. Directions for use

## 2.1. INSTALLATION

### 2.1.1. Safety regulations

Before operating the instrument, please check that no transport damage has occured.
If, for any reason, you suspect that the safety of the instrument is not in accordance with the regulations, please do not operate the instrument and have it checked by a qualified technician.
In any case do not open the instrument before it has been disconnected from the mains. The mains cord with earth connection is an integral part of the safety precautions in the instrument.
Therefore the earth connection should not be made inoperative.

### 2.1.2. Controls and sockets

(See Figs. 1 and 2)

### 2.1.3. Adapting the PM 5509 to other PAL-television systems

The generator PM 5509 is adaptable to other PAL-television systems as indicated in table I by dots. For this purpose special solder joints have been provided on the printed circuit boards unit 1, 2 and 3 as well as a switch on unit 1.

The solder joints are accessible as follows:
– on unit 1 after removal of the bottom cover
– on unit 2 after removal of the top cover
– on unit 3 after removal of the left side cover
This left side cover can only be removed after the carrying handle has been taken off.

The slide switch is located at the left side of unit 1 (Fig. 6). The locking cover should be removed before the switch position is changed (do not forget to disconnect the instrument from the mains).
To facilitate the location of the solder joints, the figures 3, 4 and 5 have been included. Changing the soldering connections is done as follows:

For removal of the existing connections, use a desoldering iron. Make sure that the joints are clean and that no solder is left around them. Then make the connections as indicated in table I and clean the board to remove excessive flux.

### 2.1.4. Programming the frequency selector for the T.V. ranges

Each one of the five frequency selection push-buttons can be preset by the varicap-fine tuning to any required channel within a television range. The instrument is delivered with the push-button selection switches preset as follows:
– push-buttons 1 and 2 in range I (38.9 to 85 MHz)
– push-button 3 in range III (170 to 250 MHz)
– push-button 4 and 5 in the UHF range (470 - 790 MHz)

If you desire to change the preset ranges you must do this according to the following instructions:
– Remove the top cover by loosening the screws on the backside of it.
– The solder joints of the push-button switches are located on the front right-hand side of the printed-circuit board unit 2. Each solder joint has been indicated with a letter and a number. The numbers correspond with the numbers on the front plate above the push-buttons. For each range the solder joints must be connected in accordance with table II.
The changing of the soldering connections has been described in chapter 2.1.3.
In operation, the range, for which a push-button switch has been preset, is shown on the range indicator.

### 2.1.5. Position

The instrument can be used in any desired position. Take care that the instrument is not subjected to excessive ambient temperatures.

### 2.1.6. Adjusting to the local mains voltage

The instrument must be connected to a.c. mains voltages only and has been adjusted by the factory to a mains voltage of 230 V ± 15 %.
Before connecting the instrument to 115 Va.c. the connections at the primary side of the mains transformer must be interchanged:
- remove the left handle bracket screw and take off the left-hand side plate
- hinge out unit 3 after removing the two corner screws (see Fig. 6)
- remove the bottom plate after removing the appropriate screws on the rear of the instrument
- resolder the tappings on the transformer in accordance with the connection diagram on the transformer
- change the mains-indication at the rear to match the relevant mains voltage
- re-assemble the instrument

### 2.1.7. Earthing

The instrument must be earthed in conformity with the local safety regulations. The supplied mains cable contains an earth core which is connected to the earth contacts of the plugs. The instrument must be connected to a mains socket with earth contacts by means of the supplied- or a similar mains cable. Only in this way an effective earthing is ensured.
The circuit earth lies on chassis potential as do the outer contacts of the BNC-sockets, contact 2 of DIN-socket AUDIO, contact 3 of DIN-socket V.C.R. and the non-insulated 4 mm-socket of the D.C.-BIAS connection.
The mentioned contacts should on no account be used as a connection point for a protective-earth lead!

## 2.2. OPERATION

### 2.2.1. Safety precautions

Instruments which have to be tested with generator PM 5509 must be connected to the mains via a separating transformer. The separating transformer must be provided with symbol 0/0 and the secundary side must not have a connection point for a protective-earth lead.

### 2.2.2. Switching on

After connecting the instrument to the mains in accordance with chapt. 2.1.4. it may be switched on by depressing push-button POWER. The lamps in the indicators FREQUENCY and RANGE should light up. This is an indication that the instrument is ready for use.
The white spot inside the mains switch is a mechanical indication for the ON-position of the mains switch.

### 2.2.3. Setting the frequency and voltage at RF output socket

The video carrier frequency of the generator is continuously adjustable within the ranges.
Each push-button of the frequency selector has a correspondingly numbered fine-tuning adjustment for this purpose. The adjustment can be made with a screwdriver.

In order to tune the generator to the preset frequency of the television set to be tested, proceed as follows:
- Connect both generator and television set to the mains.
- Connect the RF output of the generator with the aerial input of the receiver by using a PM 9538 for receivers with a 75 Ω-aerial input or use a PM 9539-cable for receivers with a symmetrical aerial input.
- Now switch on the receiver and tune it to the required channel.
  **N.B.** To avoid interference make sure that the receiver is not tuned to a channel which is occupied by a signal of a local transmitter.
- Set the generator RF output amplitude to 100 μV.
- Set the CHROMA control to NOM.
- Depress the test-pattern selection push-button checkerboard.
- Depress the push-button for selection of black/white.
- Depress the push-buttons SOUND ON and MOD.
- Make sure that the push-button VIDEO EXT. has not been depressed.
- Now switch to the generator. Both indicators should now be illuminated.
- Now depress a frequency selection push-button which has been preset to the range to which the television receiver has been tuned.

– Check this on the range indicator.
– Now adjust the corresponding fine tuning for optimal video- and sound reproduction.
– To obtain a clear, noise-free picture adjust the RF amplitude to a higher value. For orientation purposes this adjustment is provided with a scale.

### 2.2.4. Adjustment of the sound signal

Sound information may be added to the RF signal of the generator in accordance with international television standards.
For this purpose depress the push-button SOUND ON. In order to modulate the sound carrier with a 1 kHz sine-wave, depress push-button MOD. This 1 kHz signal is generated internally. By depressing both the push-buttons SOUND ON and EXT. the sound carrier may be modulated by an external sound signal. A DIN socket, carrying the indication AUDIO, has been provided at the rear panel for the connection of this signal.

### 2.2.5. Video signal

The video output of the generator is available at BNC-connector VIDEO as long as the push-button VIDEO EXT. has not been depressed.
The same signal is also available at DIN-socket. VCR at the rear ⚠.
This VCR output socket supplies a video-signal for recorder tests (e.g. PHILIPS N1520).
The connection for the VCR control-DC-voltage has to be used with the VCR-output, to check the video recorder in combination with a CTV.
The same d.c. voltage can be used in combination with the LDL 1301.

By depressing the push-button VIDEO EXT. the RF output of the generator may be modulated with an external video signal. In this case the external signal should be connected to BNC-connector VIDEO (front plate).
In the position VIDEO EXT. the supplied video signal is also available on socket VCR.
Beside the nominal setting (100 %) the Burst and Chroma content of the RF signal may be continuously adjusted in amplitude from 0 to 100 %.

### 2.2.6. Selecting the test patterns

To obtain a selection of five black and white test patterns, depress the push-button BL/WH.
To obtain a selection of five different colour test patterns, depress the push-button COLOUR.
The symbols indicating the different test patterns, are indicated above the test pattern selection switches for black and white and below them for colour.

### 2.2.7. Sync. pulses

When the generator is used in conjunction with an oscilloscope, the output, available at BNC-connector TRIGG. can be used for triggering purposes. When the push-button TRIGG. is not depressed, line pulses are obtained, while depressing it results in field pulses.

## 2.3. APPLICATION

The generator supplies ten specially selected test signals for checking and alignment of colour- and black/white TV as well as video recorders and VCR (video cassette recorder). Fig. 7 shows a measuring arrangement.
All these signals can be switched on by means of push-buttons, which are arranged for obtaining the signals in the logical sequence for testing.
First the basic black/white tests are made and then the special colour tests.

- ■ The sections marked with a black square are for colour-receivers only
- ● The sections marked with a black dot are for colour as well as for black/white receivers
- o The sections marked with a circle are for V.R. and V.C.R.

**Checking the tuner(s) of the receiver**

*Note: Before measuring on the receiver, connect it to the mains via a separating transformer!*

The PM 5509 has the possibility to deliver an I.F.-signal i.e. 38.9 MHz (G), 39.5 MHz (I), 45.75 MHz (M).
The user can now determine whether the incorrect functioning of the receiver is due to a defect in the channel selector or other stages.

**Procedure:**

If, when following the procedure described in chapter 2.2. "OPERATION", there is doubt whether the incorrect functioning of the receiver is due to a defect in the channel selector, proceed as follows:

1. Depress button "checkerboard" and set switch SOUND to position ON.
2. Connect socket RF, via a coaxial cable (without matching transformer) and an isolating capacitor, to the input of the first IF-stage of the receiver.
   If necessary, temporarily unsolder the IF connection of this stage with the channel selector.
3. Tune the PM 5509 to the IF of the receiver, ensuring that the receiver is not overloaded (use control RF AMPL. of the PM 5509).
4. If the receiver does operate properly yet, the defect will be located in the channel selector.
   We would like to emphasise that this IF signal of the PM 5509 should not be employed for any purpose other than described above.

### 2.3.1. Pattern survey

#### A. PATTERN 1 (Fig. 8)

*"checkerboard"; consisting of 6x8 squares.*

1. ● Check for correct horizontal and vertical synchronisation.
2. ● Check for correct position of the picture (deflection yoke)
3. ● Check for correct horizontal and vertical amplitude of the deflection (picture height and - width).
4. ● Check for correct horizontal and vertical linearity of the deflection.
5. ● Check for correct horizontal and vertical centring of the picture.
6. ◌● Check the bandwidth. The vertical black/white transitions should be sharp and not "double" (rise time and ringing resp.).
7. ● Check the step-function response. The vertical transitions should not show any overshoot.
8. ● Check for mains-hum interference in the synchronisation of the picture.
9. ● Check the sensitivity of the receiver by means of control RF AMPL.
10. ● Check the suppression of the sound intercarrier.
    No "sound" should appear in the picture when switch SOUND is set to position ON.
11. ● Check for correct focusing of the picture.
12. ● Check the proper functioning of the sound section of the receiver, e.g. by operating switch SOUND.

#### B. PATTERN 2 (Fig. 9)

*"circle"*

1. ● Check for correct overall picture linearity.

*"Circle and crosshatch"*

1. ● Check for correct overall geometry.
   By depressing both buttons, circle and crosshatch, it is easier to check the geometry of the picture (see Fig. 10).

#### C. PATTERN 3

*"Crosshatch"*

1. ■ Check and if necessary re-adjust the horizontal- and vertical dynamic convergence and corner convergence. This should be done according to the instructions of the manifacturer of the receiver. Fig. 12 shows incorrect horizontal dynamic convergence. Fig. 13 shows a picture detail in case of incorrect dynamic convergence.

2. • An impression of the horizontal and vertical linearity of the deflection can be obtained as the horizontal and vertical white lines should form squares.
Moreover, it can also be determined if the receiver's amplitude response is correct. The vertical white lines have a width of 200 ns.
If these lines appear "unsharp" and show considerably less intensity than the horizontal ones, the amplitude response of the receiver is insufficient.
If the vertical white lines appear "double", the circuits of the receiver cause ringing.

3. • Check the pin-cushion correction of the receiver.
This correction requires readjustment if the white lines, horizontal as well as vertical, do not seem to be straight and parallel at normal viewing distance.
See the service notes of the relevant receiver.

## D. PATTERN 4

*"Dots"*

1. ■ Check and, if necessary, re-adjust the static convergence in the centre of the screen at low ambient brightness. This should be done according to the instructions of the manufacturer of the receiver.
Fig. 14 shows a detail of an incorrectly converged picture.

## E. PATTERN 5

*"Definition lines and a 8-step grey scale combined"*

**Definition lines** (see Fig. 16)

1. o/• The top two-thirds of this pattern contains 8 sets of definition lines ranging from 0.5 MHz to 5 MHz.
The definition lines are for measuring the bandwidth of a video- or luminance amplifier of a TV/C.T.V.
This part of the pattern can also be used for checking the resolution of the black and white part of a video recorder. The resolution must be adjusted to an optimum because the bandwidth for black and white signals is already limited. A difficulty for the adjustment of a V.C.R. is that the resolution, and hence the bandwidth, must be sufficient and without intermodulation with the colour signal.

**Grey scale (bottom third)** See Fig. 16

This greyscale signal is a linear staircase signal.
It has not been derived from the colour bar signal by removing its chroma-information.

1. • Check the proper functioning and the range of the brightness- and contrast controls of the receiver.
In some receivers the black level is kept constant and is not effected by operation of the contrast while each of the 6 steps in between should show an equal increase of grey from left (black) to the right (white)

2. ■ Check the proper greyscale setting of the colour receiver. The various greybars should not contain any colour (if the greyscale setting is not correct, the ratio between the beam current and the control-grid curves of the three guns of the picture tube is not constant; re-adjust according to the instructions in the Service Notes of the relevant receiver).

3. • The following check with this pattern requires the aid of the oscilloscope.
Check the non-linearity of the video amplifier of the receiver with the contrast control at maximum.
Check that each step of this greyscale signal at the output of the video amplifier is equal. This can easily be measured by comparing it on the dual trace oscilloscope PHILIPS PM 3110 with the signal on socket VIDEO.

4. o Checking the linearity of the video amplifier and the FM-demodulator of a V.C.R.

## F. PATTERN 6

*"Red"*

This pattern has a 50 % saturated red signal (see Fig. 17)

1. ■ Set the brightness and saturation controls of the receiver so that a red pattern with a good intensity appears.

2. ■ Check the purity of red (this pattern offers the adventage that the green and blue guns need not be switched off). Larger convergence errors may have an effect on this check.

3. ● This pattern can be used to check whether a T.V. receiver suffers from excessive interference due to the colour subcarrier. Moreover can be checked that no interference appears between sound and colour carrier.

4. o This pattern gives the possibility to align the chroma-writing current of the video head.
This alignment is critical. The total writing current (for PHILIPS N1500) consists of the luminance current (which is about 25 mA) and the chroma-writing current (1 mA; with the red pattern).
The luminance writing-current magnetizes the tape very strongly and works on the principles as the H.F. bias in an audio-recorder.

## G. PATTERN 7

*"White"*

This pattern consists of a 100 % white signal with alternating burst (see Fig. 18).

1. ● Check the picture for constant brightness over the entire screen (no hum, etc.).

2. ■ Check for a good "white-D" of the colour-picture tube (re-adjustment is required after e.g. replacement of the picture tube). This should be done with control CHROMA in position NOM. Some colour receivers switch automatically from "mono" white to "colour"-white (white-D).
This, the so-termed preferred-white adjustment, can be checked by setting control CHROMA from NOM to 0 % and back.

3. ■ This pattern is also necessary to check and readjust the limiting of the beam-current of the colour picture tube. For details about this adjustment, refer to the Service-Notes of the receiver under test.

4. o For video recording this pattern, containing a 100 % white signal, is ideal to align the luminance-writing current.
Secundly this pattern can also be used for adjusting the FM demodulator (white-level adjustment).

## H. PATTERN 8

*"Dem"*

Special bar pattern (4 vertical bars and horizontal reference bar).

This pattern is especially designed for checking the PAL-delay line with the PAL-switch, the demodulators and matrix circuitry. (see Fig. 19).
Bar 1 contains (R–Y) and (B–Y) information where (G–Y) = 0. This bar can be used for alignment of the G–Y-matrix.
Bar 2 and the horizontal reference bar contain no colour information, thus only a luminance signal.

1. ■ Checking the PAL-delay line circuit and the switch.
The (R–Y) information in bar 3 is N.T.S.C. coded i.e. the polarity of the (R–Y) signal does **not** change each line. The burst signal on the other hand is PAL-coded and so ensures normal operation of the PAL-switch in a colour receiver. This "Dem" pattern is designed for on-the-screen alignment of the 64 $\mu$s chrominance delay line in amplitude and phase.
Venetian-blinds will appear when adjustment is needed. One can distinguish between amplitude and phase faults by observing in which bar these venetian blinds appear.

   – Amplitude fault (see Fig. 20):
   the third bar gives every line the same (R–Y) information. A fault in the delay line gives a difference in amplitude between the direct and the delayed signal.
   This will be clearly visible as a venetian blind effect in bar 3.
   Do not look at the **colours** but only for the appearance of the venetian-blinds effect in the third bar.

   – Phase fault.
   a Phase fault will cause venetian blinds in bar 1 and 4. The fourth bar contains only (B–Y) information which is alternated 180° each successive line.
   The (B–Y) result will be zero if there is no phase fault in the delay line. If there is a phase difference between the direct- and the delayed signal this will result in a (R–Y) component. This fault will appear in the first and fourth bar (see Figs. 21 and 22).

2. ■ Checking the demodulators.
Make sure that the chrominance-delay line is aligned before continuing the (R–Y) (B–Y) demodulators.
The sub-carrier frequency should be applied to the (R–Y) and (B–Y) demodulator in a correct phase. If not, in the third and fourth bar colour will appear (see Fig. 23). This is a result of a difference in phase between the sub-carrier signal and the (R–Y) and (B–Y) signal.
When the demodulators are properly aligned, the third and fourth bar are grey. When the sub-carrier phase difference between both modulators is not exactly 90°, it has to be adjusted.
This phase fault will then appear as a coloured third **or** fourth bar (depending on the type of receiver) see Fig. 24. There are receivers with a 90° (R–Y) reference (third bar) or with a 90° (B–Y) reference (fourth bar).

3. ■ Checking the matrix.
When the blue- and red gun are switched-off, the first bar is grey when the G–Y matrix is properly aligned.

## I. PATTERN 9

*"Colour bar"*

The upper part of this pattern is produced by the standard colour bar signal (75 % contrast).
The bars are arranged in the sequence of decreasing luminance. From left to right the bars are: white D-yellow - cyan - green - magenta - red - blue and black.
This pattern is used to set the "customer's controls" of the receiver to the correct positions.
The lower part of this pattern serves as a reference to enable adjusting the amplitude of the colour-difference signals with respect to the luminance signal on the picture tube.
It is an ideal pattern for realigning the signal-amplitude from demodulators and matrix-circuitry where the output can be compared with the reference bar.
But above all this pattern is used to check for good overall-colour performance.
The colour-bar pattern can also be used for the following receiver- or V.C.R. checks and adjustments.

**Receivers:**

1. ■ Checking the burst keying
2. ■ Checking the colour AGC and the colour killer
3. ■ Checking the reactance circuit of the subcarrier regenerator
4. ■ Checking the synchronisation of the subcarrier regenerator
5. ■ Checking the PAL identification circuit

**V.C.R.:**

1. o Check the saturation of the V.C.R.
2. o Furthermore it is possible, by turning back the saturation control of the receiver, to recognize a line structure due to the 562,5 kHz-rest carrier and intermodulation with the luminance signal (wrong writing-circuit adjustment).
The alignments of the writing currents for the video head are critical. The ratio between the colour carrier, 562.5 kHz with 75 % saturation, and the black and white carrier measured on the video head is 1:10. Under these circumstances and when the filters, which determine the transmission range between luminance and chrominance, are adjusted properly there is no mutual influence.
3. o This pattern can also be used to check whether there is a delay between the colour- and the black and white signal. As the two signals are processed separately, there must not be any delay between the luminance- and the colour signal.

1. ■ Amplitude colour-difference signals (see Figs. 26 up to 32)
   – Switch-off the red and the green gun.
   – Adjust the contrast- and saturation controls so that there is no difference in brightness between the blue bars and the blue section of the lower part of the pattern.
   The same alignments can be done with the two other colour-difference signals red and green.
   Control phase (G–Y) will have to be used mainly to eliminate mutual differences in brightness in the first four green bars.

*Note:*

*In some types of colour-television receivers (e.g. in the PHILIPS K7-K8-K9-type) normal cathode resistors have been used for the picture tube instead of V.D.R.-resistors (like in the PHILIPS K6-type). As apposed to V.D.R.-resistors, normal resistors will cause negative feedback of the colour-difference signals to the Wehnelt cylinders. On account of this, the amplitude of these signals should be adapted to the degree of feedback. For servicing these types of receivers, the colour-bar pattern consists of colour bars with a white lower section.*
*The white lower section, which has the same video amplitude as the white bar in the upper part, serves as a reference so that the amplitude ratio of the colour-difference signals can be adjusted, using the picture screen as an indicator.*

### J. PATTERN 10

*"V.C.R." Colour definition lines and saturation steps.*

**Colour definition lines (top part):**

1. o Checking the colour bandwidth, or resolution, by using the top part of the pattern.
   This contains 8 sets of red definition lines ranging from 100 kHz to 1 MHz. The bandwidth for colour is less than 1 MHz. The bandwidth of the colour signal is limited and must be adjusted to an optimum without intermodulation with the luminance signal.

**Saturation steps (bottom part):**

2. o A check on the chroma amplifier's linearity and the A.G.C.-circuit can be carried-out quickly by observing the eight linearly increasing levels of saturation from 0 to 100 % in the bottom part of the screen.
   By a non linear amplification, the saturation steps indicate a not gratual increasing saturation impression.
3. o Further more it is possible to determine if the sensitivity of the colour amplifiers is sufficient.
   If this is incorrect, the first bars are without colour.
   The A.G.C. works properly if the last 3 bars have the same saturation impression. The A.G.C. of the colour part limits at 70 %.

## 2.3.2. Adjusting with the oscilloscope

For carrying out the adjustments described below, we recommend the use of a dual-trace oscilloscope e.g. Philips PM 3110.
Connections for adjusting the delay-line circuit and the chroma demodulators:
– Connect the YA input of the oscilloscope to the "red" grid of the picture tube via a 1:10 attenuator probe (PM 9336)
– Connect at the same way the YB input of the oscilloscope to the "blue" grid of the picture tube.
– Trigger the oscilloscope externally with the line trigger pulses from the socket TRIGG. (push-button in position TRIGG LINE).

*Note: The PM 3110 is an oscilloscope with internal automatic T.V. triggering selection.*

**1. Adjusting the delay-line circuit**

Depress push-button "DEM"

Adjust the phase- and amplitude controls of the delay-line, so that the signal to the red and the blue grid is zero in bar 3 and 4. Fig. 34 shows the upper trace (R–Y) and the lower trace (B–Y). It may seem that two successive lines on the oscilloscope screen show a different-signal level, so that the result cannot be made zero. This is an indication of cross-talk between the (B–Y) and (R–Y) channel of the receiver.
Another possibility is that the (R–Y) and (B–Y) demodulator has to be aligned.
In case of incorrect adjustments oscillograms as shown in Fig. 35 and Fig. 36 will be measured (upper trace (R–Y) lower trace (B–Y) ).
Fig. 37 shows a combination of a phase- and an amplitude fault in the delay-line circuit.

**2. Adjusting the chroma-demodulators**

Depress push-button "DEM"

Adjust both demodulator phases to obtain an oscillogram as shown in Fig. 34.
Fig. 38 and 39 show oscillograms that will be obtained in case of incorrectly adjusted demodulators. If the (R–Y) signal cannot be made for both successive lines the (R–Y) switch of the receiver does not switch exactly 180°.

**3. Checking the G–Y output signal of the matrix circuit**

Depress push-button "DEM"

- Connect the Y-input of the oscilloscope to the "green" grid of the picture tube via a 1:10 attenuator probe (PM 9336).
- Adjust the time-base setting of the oscilloscope so that 2 TV -lines appear on its screen.

The level of bar 1 ( (G–Y) = 0) and bar 2 (grey) should both be zero on the oscilloscope. If not, the signal of the matrix circuit is not correct. Because the (G–Y) signal is actually matrixed from the (R–Y) and (B–Y) signals the fault will not necessarily be due to an incorrect matrix, but could also be caused by, for example, an incorrect ratio of the output signals of the delay-line and/or the demodulator circuits.
If the "zero"-level of green does not remain the same as for grey, when the contrast- and saturation controls of the receiver are operated, the chroma gain is too high (incorrect chroma AGC), so that the (R–Y) and/or (B–Y) signal is clipped as a result of which their ratios change and the (G–Y) signal also changes.