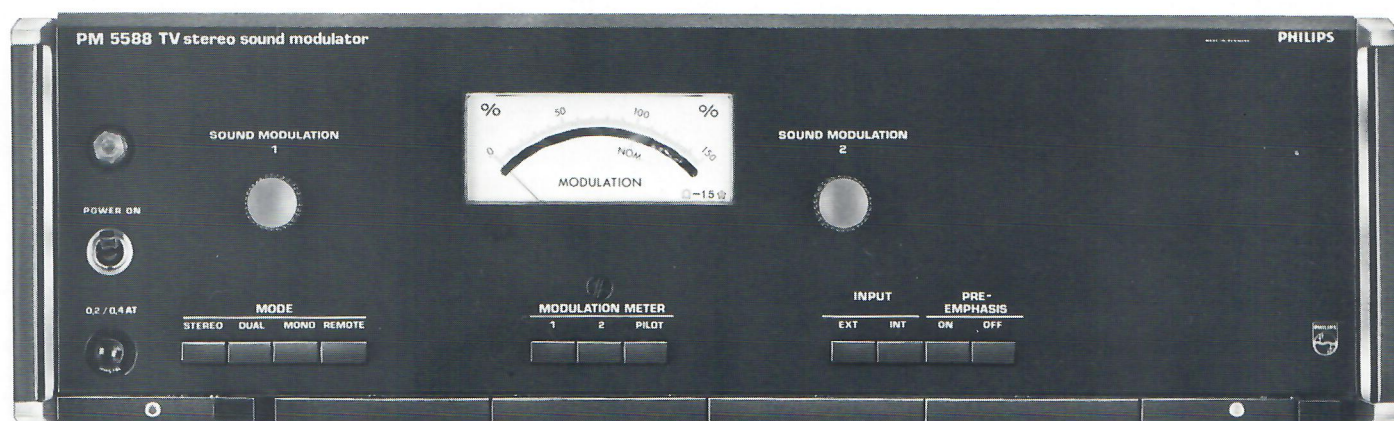


Code no. PM 5588:

9449 055 88003 (system G, German dual/stereo sound system)



Self-contained sound modulator for 2-channel/stereo transmission

In conformity with proposal for German broadcast service

Flexible construction allows adaptation to possible future modifications

The PM 5588 TV stereo modulator contains all the circuitry needed to generate the FM modulated sound signals for normal television transmissions (mono), two-channel sound transmissions (dual), and stereophonic sound transmissions (stereo). Together with a vision modulator, for instance the 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-converter (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 syn-

Options for inter-carrier output and internal vision carrier

Ideal for final test of TV receivers with 2-channel/stereo reproduction facilities

thesizers 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

Forms together with PM 5580 the most sophisticated television modulator for 2-channel/stereo sound modulation

Easy to use with existing vision modulators, in particular PM 5580

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

In order to command the TV receivers of the public to receive the programmes in the same mode as they are



PM 5588

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 54.6875 kHz ($3.5 \times f_H$).
- 3) Stereo mode. 117.5 Hz AM modulated on the same 54.6875 kHz carrier.

Adder circuits

The two modulated carriers are added together in a 3 dB coupler. The com-

bined 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 out-

put 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: $50 \mu s \pm 0.5 \mu s$ (switchable). Also $75 \mu s$ 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: $15.625 \text{ Hz} \pm 1 \text{ Hz}$.

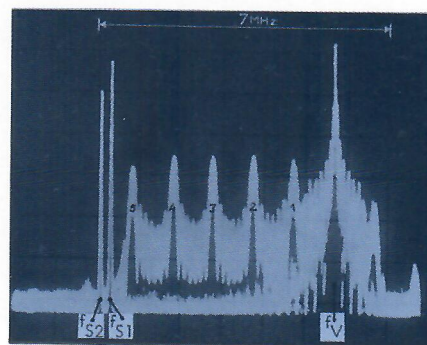


Fig.1. Spectrum of a TV signal with two sound carriers (IF base). The vision carrier is modulated with a multiburst signal and the two sound carriers with 1 kHz audio signals. The peaks on the photo are from right to left: vision carrier, multiburst frequencies no.1, no.2, no.3, no.4, no.5, sound carrier 1, and sound carrier 2.

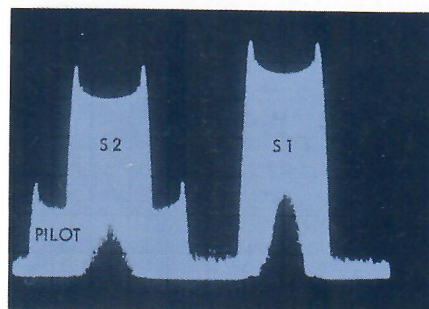


Fig.2. Same signal as fig.1, however the resolution is made larger in order to display the two sound carriers more clearly. The identification signal on carrier no.2 can be easily recognized.

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 compatible. Application: for external pilot signal instead of the internal 54.687 5 kHz signal.

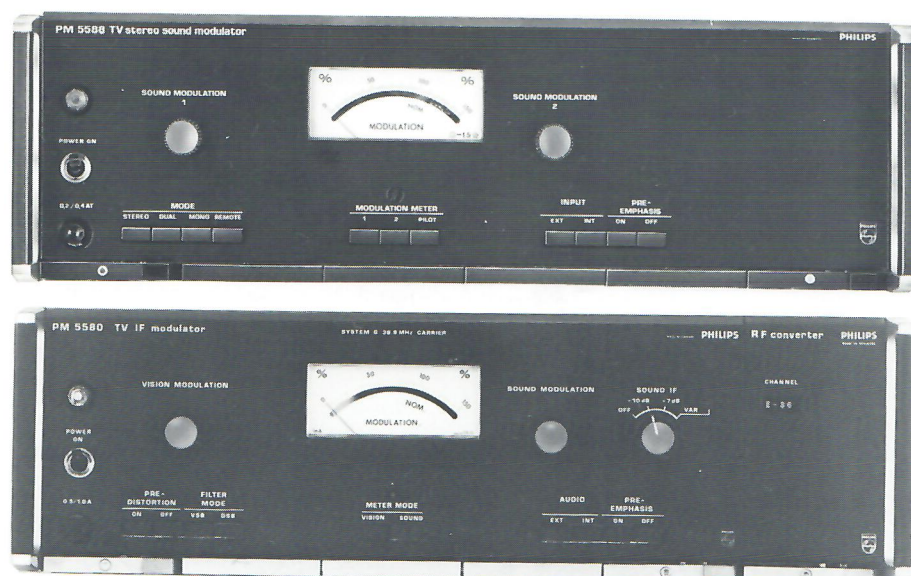


Fig.3. PM 5580 IF modulator (vision Part) and PM 5588 form a complete TV IF modulator for stereo and dual sound transmissions. A VHF or UHF up-converter can be housed in the PM 5580, providing channel frequency output from the set-up.

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 stögrad 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 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.

PM 5588

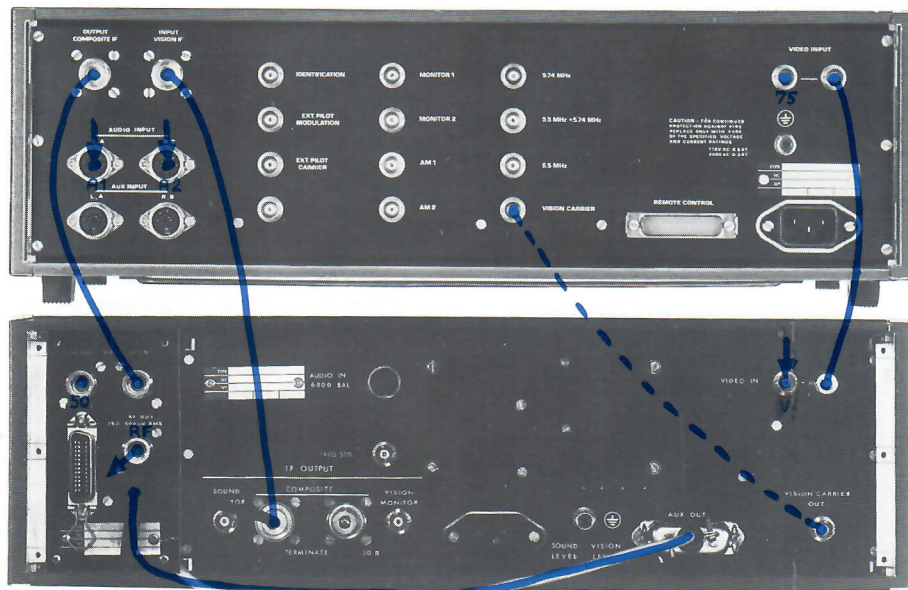


Fig.4. Rear panels of PM 5580 + PM 5588 stereo/dual sound modulator. The lines are indicating the interconnections between the two instruments.

