DK-Technologies

Digital & Analogue Component/Composite Waveform Monitor, PT 5664

Solutions in Audio & Video

- **SDI, analogue component and analogue composite inputs**
- **SDI Component Waveform and Vector Display**
- **Star Display and Vector Display of component signals**
- **Y, P_B, P_R , RGB, Parade, Overlay and Analogue Composite Displays**
- **Static non-linearity measurements**
- **Colour Gamut error indication**
- **Easy alignment of SDI timing against composite PAL signal by help of overlay display**
- **Easy operation with on-screen menus**
- **All lines selectable in single line display**
- **Bow-tie Display**
- **Re-clocked SDI output**
- **Analogue output for picture monitors**
- **Multi-standard 525- and 625 lines**

The PT 5664 Digital & Analogue Component/Composite WFM provides new dimensions in alignment and monitoring in component and composite video environments. It features the well-known analogue displays for Serial Digital Component, Analogue Component and Analogue Composite signals. Its natural application is in Studios, OB vans, Production- and Post Production Houses.

Signals generated in Graphics Stations, DVEs, VTRs, Cameras and mixers can be quality checked both before and after their encoding to PAL or NTSC.

Incorrect adjustment of such equipment quite often jeopardizes the quality of the video signal. Errors in amplitude and timing of the component signals can cause serious faults in the picture, such as wrong colours and badly defined transitions.
Some digital non-linear editors and DVEs quite often result in signals with illegal colours, i.e. video signals with colours outside the valid colour gamut range. This may cause errors later in the encoding processes, for instance when coding to analogue composite or MPEG.

In order to ensure high quality of the program material, it is therefore necessary, not only to monitor the video signals on the picture monitors, but also quantitatively check the signals.

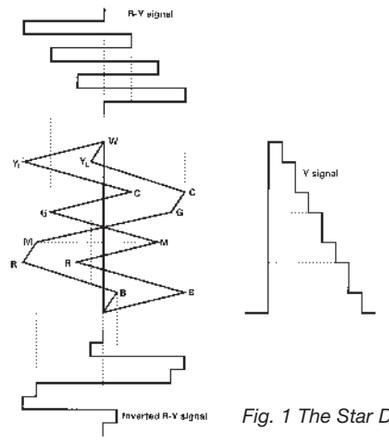


Fig. 1 The Star Display

The unique Star Display in the PT 5664 is obtained by deflecting the luminance signal vertically and the B-Y and -(R-Y) signals alternating horizontally.

The R-Y signal is inverted in order to obtain the three lines cross point in the center of the display. This makes it possible to detect timing differences between any of three components at a glance on analogue basis.

If, for instance, the B-Y signal is delayed, then the B-Y/Y trace will curve downwards and this will results in a triangle instead of a three-line cross point.

Any amplitude error of the components signals can be checked with the calibrated graticule.

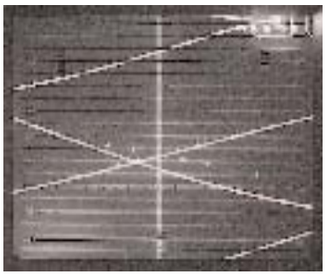
The PT 5664 Digital & Analogue Component/Composite WFM has all functions neccessary to solve most video adjustment problems in studios, OB-vans, (Post) Productions houses etc.

The PT 5664 has one SDI input, one set of Analogue Component inputs and one Analogue Composite input. Push buttons on the front panel select the display.

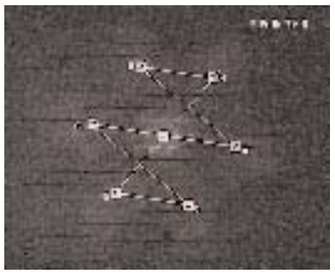
The digital interface provides a buffered cable equalized digital output of the incoming SDI signal. This output is available to supply other equipment with a reclocked digital signal.

The SDI input operates with component 625 line and 525 line signal formats. Detection of the signal format takes place automatically.

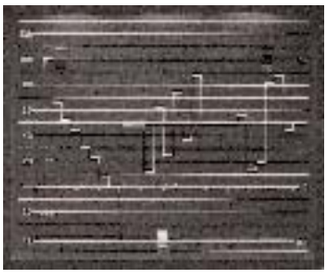
Via the menu it is possible to select the SDI- and the analogue component signals to be displayed in Y, P_B, P_R or RGB format. The latter makes camera white balancing and graphic station checks an easy task.



Star display in magnified modes showing a 50 ns delay of the B-Y signal



Vector mode (colour bar)



Parade display of colour bar (YC_BC_R)

Star Display

The star display is a display mode, which uses the readily available colour bar signal to reveal timing and amplitude errors. This renders special test signals like the bow tie superfluous. However, the bow tie display is still incorporated in the PT 5664. The Star display uses the Y-signal for vertical deflection and the P_B, $-P_R$ alternating as horizontal deflection signals.

Timing errors are easily detected by looking at the center of the star display. Markers indicate the magnitude of any timing differences between the Y, P_B, P_R signals. Use of the magnifier increases the resolution.

The components can be switched off one by one to detect which signal is delayed.

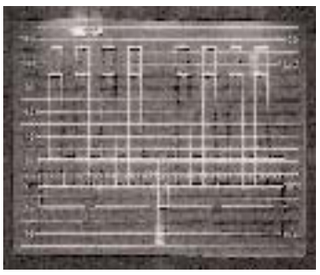
Magnitudes of amplitude errors are indicated by the calibrated boxes. Colour bar dots located within the boxes are accurate within ±2%.

Vector Display

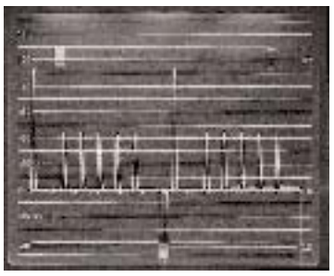
In the vector mode the PT 5664 displays the SDI and the Y, P_B, P_R signals in the well known vector scope form as we know it from the composite Vectorscope. If the input format is RGB an internal transcoder can change the signal to Y, P_B, P_R format in order to obtain the “same” display. This way of displaying a RGB signal makes the setting of white balance on the camera very easy.

Parade Display

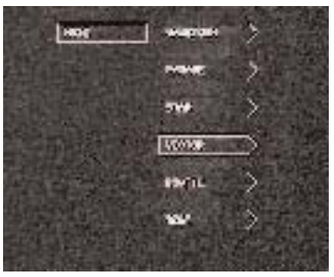
The parade display is the normal display mode in a monitoring situation. The component signals are displayed side by side and any amplitude errors are easily detected. In Y, P_B, P_R mode the PT 5664 will clamp the colour difference signals P_B and P_R to the 50% level on the screen.
It is also possible to display one line of composite video together with one of the component signals, side by side. This is very helpful, for instance, when monitoring encoding processes.



Amplitude calibrator



Statistic non-linearity display



PT 5664 menu operation

Overlay Display

In the overlay display mode the component signals are displayed on top of each other. This offers the possibility of comparing many details of the signals. Amplitudes can be compared very accurately - especially when the magnifier is used. The component signals can be switched on one by one for detailed studies. Another form of overlay display is obtained by selecting the composite input and displaying this with one of the component signals. This is a valuable tool for diagnosting amplitude errors, and for checking timing of the SDI signal against the PAL signal.

Test Mode

The test/calibrate mode of the PT 5664 offers the following measuring facilities:

- Subtracting the external reference signal from the G(Y) input reveals timing errors with great accuracy
- A variable, calibrated square wave signal can be added to the input signal. This not only makes amplitude measurements extremely easy, but subcarrier amplitude measurements as well. The process of comparing two signals using a square wave also reduces uncertainty when measuring signals with noise. A fixed 700mV signal is also available
- Internally generated 100 kHz, 1V signal, for checking instrument calibration
- Display of the external reference signal alone or with the G(Y) signal

Static Non-Linearity

Static non-linearity or “line-time non-linearity” measures gain errors as a function of the video amplitude. This measurement is based on measuring the height of the steps on a staircase signal. Differentiation of the stair step transitions, from one step to the next, quantifies the linearity errors.

Gamut Error Detection

Some editing processes - most often with DVEs - may generate illegal colours. These signals are exceeding the colour gamut range and they may create problems in coders or other connected equipment.
With the PT 5664 any gamut error will be displayed with flashing LEDs on the front plate, indicating positive or negative errors, and with a flashing white area on a Colour Monitor connected to the PIX monitor output.

Operating

The many features of the PT 5664 are easily accessed through the menu. Every function, test and configuration mode is displayed on the CRT and the corresponding menu buttons are highlighted.

The unit automatically detects whether the signals are 525 line or 625 line.

In the single line display the selected line will be highlighted in the field mode. The line and field numbers are displayed on the screen.

Memory and Remote Control

Although the PT 5664 is easy to operate, a front panel set-up can be stored in a non-volatile memory. This preferred set-up are quickly recalled by pushing the memory button. For installations requiring more standard set-ups, a TTL remote control is available. The user can program up to seven different set-ups. Ground closure of appropriate pins will recall the set-ups.
On request a remote LED driver is available for installations where a number of LEDs are required to indicate which set-up has been selected.

Versions

The PT 5664 automatically adjusts to the correct television system. If the system is non-interlaced (like 524- or 624 line) this will be indicated by an “NI” on the screen.

PT 5664 Digital & Analogue Component/Composite WFM

Standard graticule with % of white indication and for composite and component signals. The PT 5664 has a built-in SMPTE/EBU transcoder.

Conforms to relevant parts of:
ITU, SMPTE and EBU specifications.

Video Input selection
The SDI input, component video inputs and the composite video input on the rear panel can be selected from the front panel for display on the CRT.
The component channels can be switched off individually and one input can be substituted with the composite video input signal.

Serial Digital Component Format
Serial Interface: SMPTE 259M, ITU-656

SDI Input
- Return Loss: >15 dB, 5 - 270 MHz
- Cable EQ: 0-300 meters typical, Belden 8281

SDI Output
- Return Loss: >15 dB, 5 - 270 MHz
- Rise Time: 600 ps typical
- Jitter: ±250 ps typical (with 250 ps input jitter)

Analogue Video Inputs
The analogue component video inputs can either be in the Y, P_B, P_R or in the RGB format. The composite input can be selected for display as one of the channels.

- Input 1: G or Y: marked G(Y)
- Input 2: B or B-Y: marked B(-Y)
- Input 3: R or R-Y: marked R(-Y)
- Input 4: Composite Video

Note: The colour difference signals B-Y and R-Y equals the P_B and P_R signals respectively.

- Connector: 8 x BNC
- Impedance: high ohmic, 75 Ω looped through
- Return loss: >40 dB up to 7 MHz
- Max. input level: 2 V_{PP} AC, -2/+6 V DC
- Gain difference between inputs: < 1% at 0.5 MHz and 5 MHz
- Timing error between inputs: < 5 ns
- Crosstalk from input to input: <-70 dB up to 5 MHz
- Crosstalk from non selected input to screen: <-46 dB up to 5 MHz

External Reference Input
The timebase, the sequence switch and the clamp function are all locked to the sync information from one of four different inputs: the SDI input, the “G(Y)” input, the composite input or the external reference input. Front panel push button selects between synchronization from the Video inputs or from the external reference input.

Signal requirement: Composite sync 150 mV to 4 V or composite video nominal level ±6 dB.

- Connector 2 x BNC
- Impedance: high ohmic, 75 Ω looped through
- Return Loss: > 40 dB up to 7 MHz
- Max. input level: 5 V_{PP} AC, 2 DC
- Max. superimposed hum: 1 V
- Crosstalk between EXT REF and inputs 1, 2, or 3: < -60 dB at 5 MHz

Analogue PIX Monitor Output
The output is in RGB format, and derived from the SDI or the analogue component inputs. Inputs in colour difference format, (such as Y, P_B, P_R), causes an automatic transcoding to RGB format.

- Connector 3 x BNC
- Impedance: 75 Ω
- Return Loss: <-36 dB up to 6 MHz
- Gain Ratio: within 0.3 dB
- Frequency response when the input signal is not transcoded: 50 kHz to 6MHz within 0.5 dB
- Frequency response when the input signal is transcoded: 50 kHz to 6 MHz within 1 dB

Analogue Video Output
The analogue composite input is AC-coupled and buffered to the composite video output.

- Connector 1 x BNC
- Impedance: 75 Ω
- Return Loss: <-36 dB up to 6 MHz
- Gain Ratio: within 0.3 dB
- Frequency response: 50 kHz to 6 MHz within 0.5 dB

Gamut Error Detector
Detects illegal colours on the component input signals after the transcoding to the RGB domain.
Limits can be adjusted inturnally.

- Lower limit preset: -35 mV ±5 mV
- Upper limit preset: 735 mV ±5 mV

Filters
Filters for various frequency responses are menu selectable.

- Flat amplitude response: within 2% from 50 kHz to 6 MHz (5.75 MHz for SDI)
- Low pass amplitude response: attenuation less than 3 dB at 1 MHz ±0.1 MHz, more than 26 dB at f_{SC}
- Non-Linearity amplitude response: bandpass filter, center frequency at 325 kHz with increased gain (280 mV display) of pulses from 140 mV riser staircase. Inherent non-lin. error: < 0.25%

Vertical Amplifier

Deflection Sensitivity
- Video input: 1 V full scale ±1%
- 5 x magnifier: 0.2 V full scale ±2%
- Max. deflection (Y-mag off): 2 x screen height
- Gain range: fixed gain +3 dB to -11.5 dB

The following apply to the display of 1 V video signal through the video inputs with nominal gain, filters off and clamp on.

Distorsions
- 2T K-rating: < 0.25%
- 2T pulse-to-bar ratio: 100% ±1%
- Bar tilt: < 1%
- Field square wave tilt: < 0.5%

Clamp
The slow clamp can be switched on and off by a front panel push button and has barely any attenuation of superimposed hum. This means that the clamp is slow enough to let hum pass to the display for evaluation.

- Hum attenuation: < 1 dB
- Black level shift due to change in APL from 10% to 90%: <10 mV

Calibration

The calibration generator can be activated in the TEST mode through the menu.

Time Calibration

- Internal calibration signal: 100 kHz square wave, ±100 Hz, crystal controlled
- Amplitude: 1 V_{PP} ±2%
- G(Y) & EXT REF inputs alternating: input G(Y) and EXT REF signals superimposed
- Timing error between input G(Y) and EXT REF.: < 10 ns
- Comparison of G(Y) and EXT REF: Input G(Y) and EXT REF subtracted
- Accuracy better than 3%

Amplitude Calibration

- Signal type: half sweep rate square wave, selectable superimposition on input signal: G/R-Y, B/B-Y, R/R-Y, or composite video
- Internal calibration signal: 700 mV square wave, accuracy ±1%

Variable Level Square Wave

- Signal type: half sweep rate square wave, selectable superimposition on input signal: G/R-Y, B/B-Y, R/R-Y or composite video
- Amplitude range: -500 mV to +1500 mV in 1 mV steps, accuracy ±1% of reading ±1 digit, monotonic

Horizontal System

Time Base

- All lines:
  V (field display): equal to field rate 2V (two field or frame display): equal to frame rate H (two line display): equal to line rate 2H (two line display): equal to half line rate
- Line selector:
  F1: single line of field 1
  F2: single line of field 2
  Both: single line of all fields
- Selectable line numbers:
  625 line system: line 1 to 625
  525 line system: line 1 to 263 in field 1 and line 1 to 262 in field 2. Automatic switching between 625 lines and 525 lines, depending on the input signal
- Magnification (X-mag):
  V: 25 times
  2V: 25 times
  2H: 10 times, equals 1 µs/div.
  H and 1 line modes: 25 times, equals 0.2 µs/div.
- Sweep length:
  2V: 12.8 div. ±0.5 div.
  2H: 12.4 div. ±0.5 div.
  H and 1 line modes: 11.9 div. ±0.5 div.
- Accuracy 1 µs/div. (2H and X-mag): better than 3% excluding first and last major division
- Linearity: better than 3% excluding first and last major division

Parade Display

- Sweep repetition (time base): H/3 or V/3 rate
- Display sequence: Y, B-Y, R-Y when displaying difference signals RGB for RGB input or transcoded Y, B-Y, R-Y signals

Bow-tie Display

- Input sequence: G/Y–B/B-Y, G/Y–R/R-Y

X-Y Display

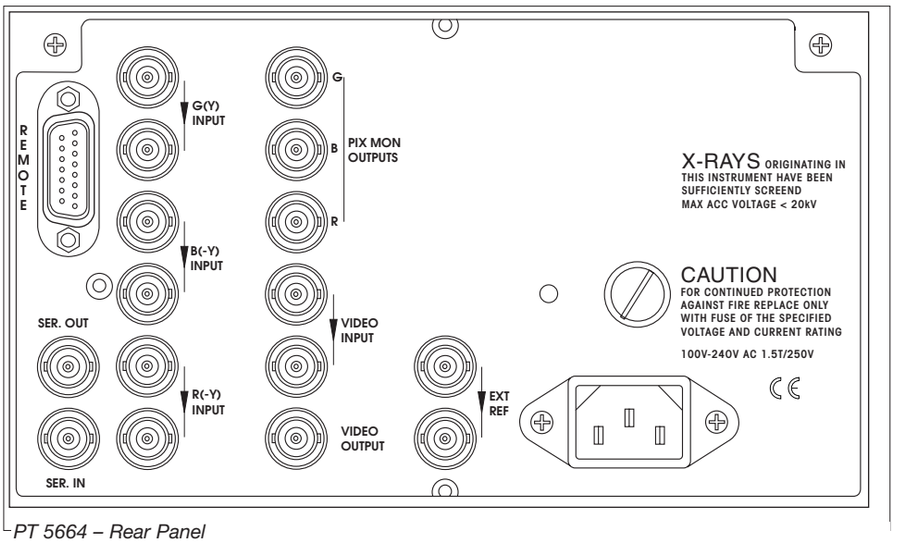
- The vector and STAR mode displays are selected by menu operation

Vector Display

- Vertical input: R/R-Y (P_R for SDI)
- Horizontal input: B/B-Y (P_B for SDI)
- 3 dB bandwidth: 1 MHz ±0.1 MHz
- Horizontal to vertical matching: no eye openings with 250 kHz T/2 square wave signal
- Gain accuracy: ±1%
- X-mag and Y-mag gain: 5 times ±2%

Star Display

- Vertical input: G/Y
- Horizontal input: B/B-Y and -R/R-Y lines alternating (P_R and $-P_B$ for SDI)
- 3 dB bandwidth: 1 MHz ±0.1 MHz
- Horizontal to vertical matching: no eye openings with 250 kHz T/2 square wave signal
- Gain accuracy: ±1%
- X-mag and Y-mag gain: 5 times ±2%
- Markers: 40, 40, 80 ns



PT 5664 – Rear Panel

General Specifications

Power Supply
- Voltage: 85-250VAC
- Frequency 48 - 65 Hz
- Power consumption 55 W at 100 to 240 V

Mechanical Data
19" rack/table cabinet
- Height: 133 mm (5.25")
- Width: 216 mm (8.5")
- Depth: 465 mm (18.3")
- Weight: 6.5 kg (14.3 lbs)

Environmental Conditions
- Storage temperature: -30° to +70°C (-22°F to 158°F)
- Operating temperature: 0° to +45°C (32°F to 113°F)

Electromagnetic compatibility
- EMI data: complying with VDE 0871/DIN 57871 class B

Safety
- In accordance with IEC 348, class 1

Ordering Information

Base unit

PT5664/50	Digital & Analogue Component/Composite WFM

Options

PM8539	19” Rack cabinet, 3U high
PM8540	Blank panel for PM8539
PM8541	Carrying case
PM8543	Cabinet, plain

Note: For safety reasons, the PT5664 must be mounted on one of the cabinets PM8539, PM8541, or PM8543before it is switched on.

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