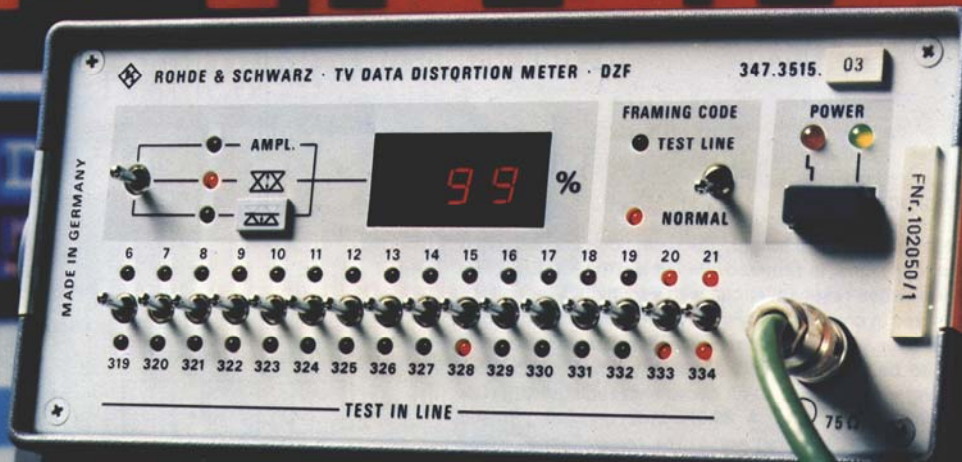
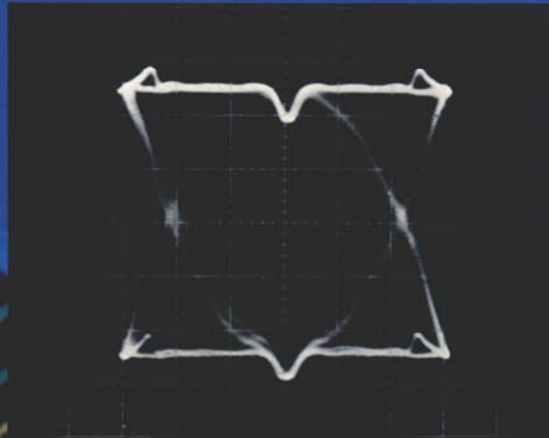


TV DATA DISTORTION METER

DZF

for quality assessment of videotext signals



The German videotext system corresponds to Teletext, Ceefax, Oracle in Great Britain and to Didon-Antiope in France. The DZF is suitable for all these methods.

TV DATA DISTORTION METER DZF

General

The **TV Data Distortion Meter DZF** measures the so-called eye height of **videotext (vtxt) signals** as well as their amplitude. Thus, for the first time, unambiguous quality criteria for videotext signals can be determined by objective and repeatable measurements. This is of special importance for transfer points, e. g. between systems run by the broadcasting corporations and those of the postal authorities.

The eye height is the standardized difference between the smallest high level and the largest low level in a serial data stream measured in the theoretical middle of each data bit; basically it can be determined in any serial data stream and is a measure of the transmission safety.

Control criteria

The TV Data Distortion Meter DZF includes an AGC amplifier which keeps the vtxt lines at a constant level so that standardized values are ensured. The following control criteria apply:

- At least one of the lines switch-selected from the front panel contains videotext with a valid framing code. If this condition is satisfied for several lines, they are all used for obtaining the control voltage.
- The 50% value of the vtxt data signal is always the mean DC value of the clock run-in. It is relatively easy to determine this voltage.
- Each vtxt signal contains spaces so that readable texts can be transmitted. A space has the bit sequence 00100000. Thorough experiments have shown that the third of at least five consecutive zeros as included in the space corresponds very accurately to the 0% value of the vtxt level even if linear or nonlinear distortions such as often occur in practice affect the signal; thus a precise measurement of the 0% value is possible.

Test procedure

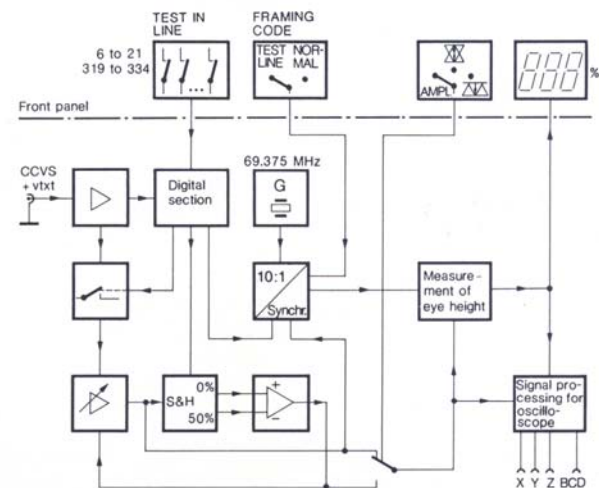
To determine the eye height, the data clock phase-locked to the vtxt signal is required. Based on the digitized vtxt signal, a series-resonant circuit with very high Q in the DZF recognizes in conjunction with an extremely accurate comparator after some 1-0 alternations of the run-in that a vtxt line is to be expected. This accurately timed comparator switching edge loads a 10-bit cyclic shift register with nine zeros and a logic one. A 69.375-MHz crystal-controlled clock is used as the shift pulse. The register bit at which the 14.4-ns pulse is exactly in the middle of the vtxt data bit is reshaped and used as a window pulse for eye height measurement.

However, this is only possible if the framing code selected on the front panel appears within a given time interval after the beginning of the vtxt line. Once this code has been recognized, the window pulses are enabled and a counter is started; beginning at 50% vtxt level, this counter symmetrically shifts two thresholds via a D/A converter. As soon as these thresholds reach the vtxt data high or low level within the 14.4-ns test window, the corresponding count is stored, processed and indicated on the readout. If several of the selected lines contain the valid framing code, the minimum eye height in these lines is determined. This yields an objective evaluation of the transmission safety and the recognizability of the received vtxt message.

When **measuring half the eye height**, only one of the two buffers is active. This mode permits limiting effects in the vtxt signal to be easily recognized by a comparison with the full eye height.

Basically, the **measurement of the vtxt amplitude** functions in the same way as that of half the eye height; however, instead of the vtxt signal itself, the control voltage for keeping the vtxt signal constant is used for evaluation.

After slight modification, the DZF will also measure **data lines with different bit rates**, such as lines 16 and 329 which contain the station identification of the broadcasting corporation and the dual-sound coding, for instance.



Block diagram of DZF

TV DATA DISTORTION METER DZF

Stopping the measurement

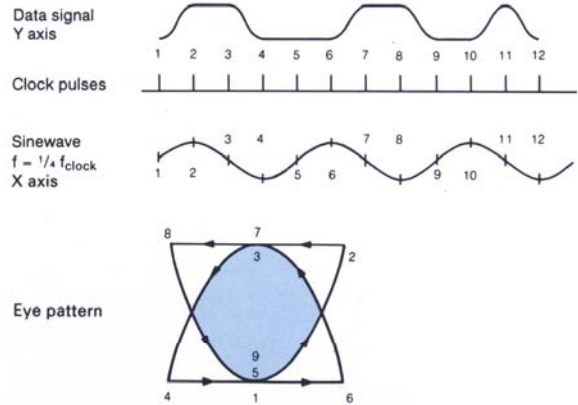
The vtxt line may contain up to 360 bits of 144.14 ns each. Thus the duration of the active vtxt line is 51.89 μs. Since the length of an active television line is 52 μs, this means that the timing of the vtxt line has very narrow tolerances. Thus it is possible for the very last bit, the 360th, to coincide with the end of the line. This might cause an eye height of 0% to be measured, although the transmission quality of the remaining information is excellent. For this reason the TV Data Distortion Meter DZF truncates the last 3 of the sequence of 360 possible bits and does not include them in the measurement.

Error indication

Monitoring circuits are included in the DZF to indicate faulty input signals. If, for instance, the DZF does not recognize any videotext with a valid framing code in the lines selected, the "Err" message is displayed on the readout. Or if the amplitude of the vtxt signal to be measured is too small (< 64% of 66% picture signal), "Err" also appears in the "Ampl." mode. If the amplitude is too high (> 190%), the measured value and "Err" alternately blink to signal that the limit of the permissible input voltage is close.

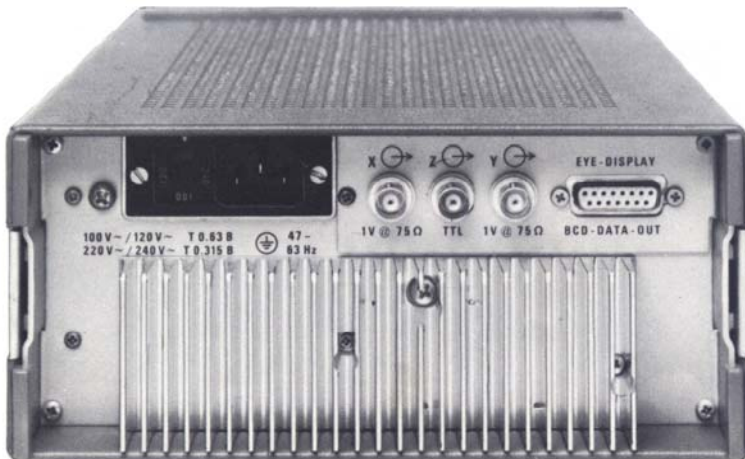
Eye pattern

The eye pattern is a particularly meaningful display for the assessment of data signals. It appears on the CRT if the three rear-panel X, Y and Z outputs of the TV Data Distortion Meter (see photo below) are connected to the corresponding inputs of the oscilloscope (in the XY mode). The individual output signals are shown in the diagram above. All the signals in the lines switch-selected on the front panel of the DZF are available at the Y output. The X-deflection signal and the unblanking pulse of the Z axis appear only in the vtxt lines with a valid framing code.



Output signals of TV Data Distortion Meter DZF. The eye pattern is produced if the X, Y and Z outputs are connected to the corresponding inputs of an oscilloscope

The eye height in the eye pattern given as an example is the voltage difference between points 1 and 3, and is thus comparable to the pupil aperture of the eye. Using this diagram, distorted vtxt signals can easily be adjusted for optimum signal shape and eye height with the aid of suitable equalizers. The eye pattern of the DZF is provided with markers permitting the exact middle of the vtxt data bits to be recognized. These markers can be shifted to compensate for unequal electrical lengths in the X and Y deflection or cabling of the oscilloscope.



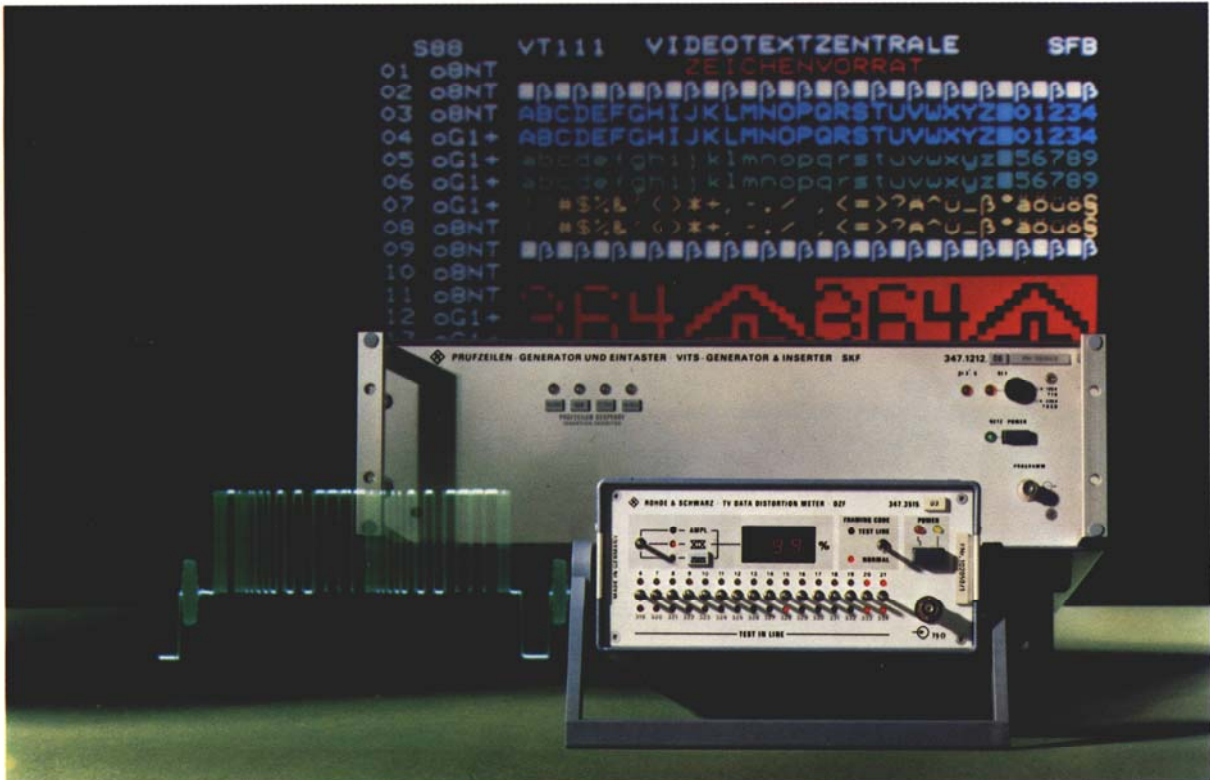
Rear panel of DZF

TV DATA DISTORTION METER DZF

Specifications	
Input level range (referred to 66% picture signal)	+6/-3 dB
Input impedance	75 Ω
Return loss	≥ 40 dB up to 10 MHz
Measurement modes	eye height, half-eye height, amplitude
Eye height measurement range	25 to 100%
Measurement error for indication	
≥ 60%	0.5% ± 1 digit
< 60%	1.5% ± 1 digit
Half-eye height measurement range	15 to 50%
Measurement error for indication	
≥ 35%	0.5% ± 1 digit
< 35%	1.5% ± 1 digit
Amplitude measurement range	64 to 190% (up to 210% as indicator)
Resolution	2%
Measurement error in range	
64 to 86%	2% ± 2 digits
86 to 120%	1% ± 2 digits
120 to 190%	2% ± 2 digits
Indication for vtxt signal being too small	Err
for signals > 190%	Err - measured value - Err ... (alternating) display is dark or signals Err or Err is blinking
Change of mode	
Framing code	
for test line (fixed)	11111111
for normal vtxt lines (free coding)	11100100 (factory-set)
Error indication	Err for vtxt with nonvalid framing code

Line selection	measurement in up to 16 lines per field possible simultaneously
Selectable lines	1st field: 6 to 21 2nd field: 319 to 334
Outputs	
Outputs for eye pattern display on oscilloscope in XY mode	BNC
Y output	1 V into 75 Ω; measured vtxt signal with identification of measurement timing
X output	1 V into 75 Ω; sine voltage with 1/4 f _{clock}
Z output	TTL levels; unblanked = 0 V, blanked = +5 V
Output of (digital) vtxt signal	TTL level; 15-pole female connector (Cannon DA 15 S-1A0N)
Output of measured value	BCD (with data-valid pulse); 15-pole female connector
General data	
Rated temperature range	+5 to +45 °C
Storage temperature range	-20 to +70 °C
AC supply	110/120/220/240 V +10%/-15%, 47 to 63 Hz (30 VA), safety class 1 (VDE 0411 or IEC 348)
Overall dimensions (W × H × D), weight	245 mm × 110 mm × 347 mm, 4 kg
Ordering information	
Order designation	▶ TV Data Distortion Meter DZF 347.3515.03
Recommended extras	
VITS Generator and Inserter SKF	347.1212.06

TV Data Distortion Meter DZF next to inserted videotext test line. Background: VITS Generator and Inserter SKF against videotext table 111 with character set, clock cracker and critical bit sequences



1. Characteristics

1.1 Description

The TV Data Distortion Meter DZF measures the most important distortion parameters on videotext (vtxt) lines in the field blanking interval. The following parameters of the vtxt signal can be measured:

Eye height

The eye height is the decisive parameter. It is the difference between the smallest voltage value at high level and the greatest voltage value at low level in the middle of the data bits of the videotext data signal.

Half the eye height

The DZF also measures half the eye height to determine limiting effects or other nonlinear distortions. In this case, half the upper or lower eye opening is displayed based on half the data signal amplitude.

Amplitude

The signal amplitude is the third parameter important for the quality of the vtxt signal.

These three parameters accurately determine the characteristics of the vtxt signal since the eye height is an indirect measure for the edge jitter of the data signals.

To enable problem-free optimization of the eye height with the aid of equalizers, the TV Data Distortion Meter is fitted with three signal outputs for eye pattern display on a CRT. The following three signals are available:

- Y output: gated vtxt lines for Y deflection of the oscilloscope
- X output: 1.734-MHz sinewave (= 1/4 of vtxt data rate) regenerated from vtxt signal for X deflection
- Z output: unblanking pulses of vtxt lines

From the neatly arranged front panel, it is possible to switch-select 16 lines per field in which the vtxt signals are to be measured.

Since switchover between two vtxt identifications (the framing code) is possible, the data signals in the standard vtxt test line or in the normal vtxt lines can be measured independently.

The measurement results are available - also in the BCD code - on the rear-panel 15-way Cannon connector.

1.2 Specifications

Input signal

referred to nominal videotext level

(66% picture signal = 462 mV) -3/+6 dB

Input impedance 75 Ω

Return loss \geq 40 dB up to 10 MHz

Measurement of eye height

Measurement range 25 to 100%

Measurement error for indication \geq 60% 0.5% \pm 1 digit

Measurement error for indication < 60% 1.5% \pm 1 digit

Measurement of half the eye height

Measurement range 15 to 50%

Measurement error for indication \geq 35% 0.5% \pm 1 digit

Measurement error for indication < 35% 1.5% \pm 1 digit

Amplitude measurement

Measurement range 64 to 200% (210%)

Resolution 2%

Measurement error in range 86 to 120% 1% \pm 2 digits

Measurement error in range \geq 64 to < 86% 2% \pm 2 digits

Measurement error in range \geq 120 to 200% 2% \pm 2 digits

Indication for vtxt signal being too small Err

Indication for vtxt signals \geq 192% Err-xxx-Err blinking

xxx is the measured value, the 2 being suppressed for values \geq 200.

Change of operating mode

The display is dark or signals Err
or Err is blinking until a new
measurement cycle is completed

Framing code identification, switch-selected

- test line (fixed) 1111 1111

- normal vtxt lines (free coding) 1110 0100 (factory-set)

Error indication (Err) if videotext with a valid framing code is not present.

Line selection

Measurement in up to 16 lines per field possible simultaneously.

Eye pattern display

The following signals are available for eye pattern display:

- Y output (gated vtxt signal with identification of measurement timing) 1 V into 75 Ω
- X output (vtxt clock/4-sinewave) 1 V into 75 Ω
- Z output (TTL level) for unblanking the CRT during valid vtxt lines

Output of digital vtxt signal TTL level

Output of measured value with data-valid pulse BCD code

Data rate freely codable between each and every 16th valid measured value.

Power supply

- Voltage 110/120/220/240 V
- Tolerance +10, -15%
- Frequency 40 to 63 Hz

Power consumption approx. 30 VA

Temperature range +5°C to 45°C

Weight approx. 4 kg

Order No. 347.3515.03