

R&S® UPP

Audio Analyzer

Specifications



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Definitions

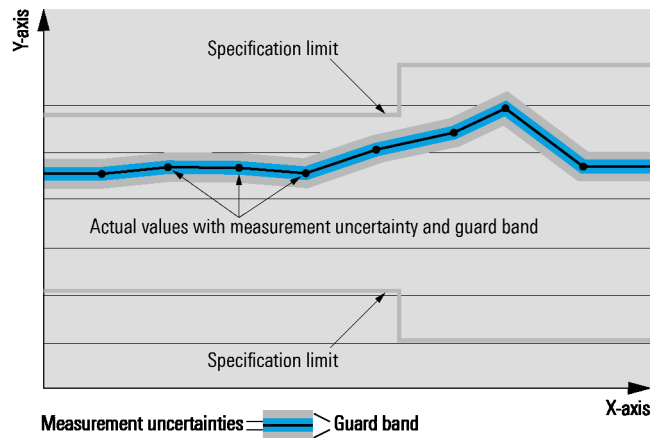
General

Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

Specifications with limits

Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as $<$, \leq , $>$, \geq , \pm , or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



Specifications without limits

Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

Typical data (typ.)

Characterizes product performance by means of representative information for the given parameter. When marked with $<$, $>$ or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

Nominal values (nom.)

Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Measured values (meas.)

Characterize expected product performance by means of measurement results gained from individual samples.

Uncertainties

Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

Analog analyzer

Input configurations

Analyzer		
Bandwidth 22 kHz	DC/AC coupling	DC/20 Hz to 21.76 kHz
Bandwidth 40 kHz	DC/AC coupling	DC/20 Hz to 40 kHz
Bandwidth 80 kHz	DC/AC coupling	DC/20 Hz to 80 kHz

Level measurements (RMS)		
Level error	at 1 kHz	±0.05 dB, ±0.025 dB (meas.)
Frequency response (referenced to 1 kHz)	20 Hz to 20 kHz	±0.1 dB, ±0.05 dB (meas.)
	20 kHz to 80 kHz	±0.2 dB

XLR connectors	pin 1 floating, 1 nF to ground ¹	2/4/8 channels, balanced (unbalanced measurements possible with BNC adapter set), AC/DC coupling selectable
Voltage range	RMS, sinewave	1 µV to 50 V
Measurement ranges		200 mV to 50 V, in steps of 12 dB
Input impedance	each pin to ground	100 kΩ ± 1 % 220 pF
	between pins 2 and 3	200 kΩ ± 1 %
		600 Ω ± 1 %, P _{max} 0.25 W
Crosstalk attenuation	< 20 kHz	> 100 dB
Common-mode rejection, DC coupling	< 20 kHz for V _{in} < 3 V	> 50 dB

Measurement functions

RMS wideband		
Level error at 1 kHz, sinewave	measurement speed: auto	±0.05 dB, ±0.025 dB (meas.)
	measurement speed: auto fast	±0.1 dB additional error
Integration time	auto fast/auto	min. 200/4000 sample, at least 1 cycle
	gen track	min. 100 sample, at least 1 cycle
	value	0.1 ms to 100 s
Noise (input shorted)	A weighted	< 1.5 µV, 1.0 µV (meas.)
	CCIR unweighted	< 2.0 µV, 1.5 µV (meas.)
Spectrum		post FFT

RMS selective		
Filter bandwidth	analyzer bandwidth 22 kHz/40 kHz/80 kHz	1 %, 3 %, 1/12 octave, 1/3 octave, fixed 20 Hz to 16 kHz/32 kHz/64 kHz, min. 20 Hz filter bandwidth
Selectivity	22 kHz bandwidth, bandpass, bandstop, elliptical filter 8th order	> 100 dB (nom.)
Frequency setting		automatic to input signal, tracked to generator, fixed or sweep
Level error		+0.2 dB/-0.3 dB

Peak		
Measurement modes		max. peak, min. peak, peak-to-peak, peak absolute
Level error	at 1 kHz	±0.1 dB
Interval length		20 ms to 10 s

DC voltage		
Voltage range		0 V to ±50 V
Level error		±(1 % of measured value + 0.1 % of measurement range)

¹ Pin 1 grounded with serial numbers below 120100, 140100, 180100.

S/N		
Measurement mode	RMS wideband, peak	reading in dB units
Error limits		±0.5 dB (nom.)

FFT analysis		see FFT analyzer section
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Total harmonic distortion (THD)		
Fundamental	bandwidth 22 kHz/40 kHz/80 kHz	10 Hz to 10.95 kHz/20 kHz/40 kHz
Frequency tuning		automatic to input or generator signal or fixed through entered value
Weighted harmonics		any combination of d_2 to d_9
Error limits	harmonics < 50 kHz	±0.5 dB
	harmonics < 80 kHz	±0.7 dB
Inherent distortion ² (analyzer bandwidth 22 kHz)	bandwidth 20 Hz to 22 kHz at 1 kHz, 2.5 V, all d_i	-110 dB (meas.)
Spectrum		bargraph showing signal and distortion, post FFT

THD+N and SINAD		
Fundamental	bandwidth 22 kHz/40 kHz/80 kHz	10 Hz to 21.75 kHz/40 kHz/80 kHz
Frequency tuning		automatic to input or generator signal or fixed through entered value
Input voltage		> 100 μ V with automatic tuning
Bandwidth		selectable upper and lower frequency limit, plus one weighting filter (selectable)
Error limits	harmonics < 50 kHz	±0.5 dB
	harmonics < 80 kHz	±0.7 dB
Inherent distortion ² (analyzer bandwidth 22 kHz)	bandwidth 20 Hz to 22 kHz at 1 kHz, 2.5 V	< -105 dB (meas.)
Inherent distortion ^{2, 3}	bandwidth 20 Hz to 22 kHz	< -100 dB + 2.5 μ V
	bandwidth 20 Hz to 80 kHz	< -94 dB + 3.5 μ V
Spectrum		post FFT

Mod Dist		
Measurement mode		in line with EN 60268-3
Frequency range	lower frequency (LF)	30 Hz to UF/8
	upper frequency (UF)	8 × LF to 80 kHz
Error limits		±0.5 dB
Inherent distortion ²	LF 60 Hz, UF 7 kHz, level ratio 4:1	< -80 dB, < -90 dB (meas.)
Spectrum		bargraph showing signal and distortion, post FFT

DFD		
Measurement mode		in line with EN 60268-3 or EN 60118
Frequency range	difference frequency (DF)	80 Hz to 2 kHz, depending on mean frequency
	mean frequency (MF)	200 Hz to 80 kHz
Error limits	mean frequency < 20 kHz	±0.5 dB
Inherent distortion ²	DFD d_2 , MF 7 kHz, DF 500 Hz	< -100 dB, < -110 dB (meas.)
	DFD d_3 , MF 7 kHz, DF 500 Hz	< -90 dB, < -100 dB (meas.)
Spectrum		bargraph showing signal and distortion, post FFT

² Total inherent distortion of analyzer and generator.

³ +5 dB when input voltage > 3 V.

Time domain display (WAVEFORM)		
Trigger		rising/falling edge
Trigger level		-50 V to +50 V
Trace length		max. 480 ksample per channel
Pretrigger		max. 19200 sample
Standard mode		each sample recorded
Compressed mode		peak value of up to 1024 recorded samples (envelope)
Undersample mode		undersampling factor up to 1024

Frequency		
Frequency range		20 Hz to 80 kHz
Frequency error		±10 ppm

Phase		
Frequency range		20 Hz to 80 kHz
Phase error	20 Hz to 20 kHz	±0.5°
	20 kHz to 40 kHz	±1.0°

Group delay		
Frequency range		20 Hz to 80 kHz

Polarity		
Measurement mode		measurement of asymmetrical signals
Display		+POL, -POL

Analog generator

Outputs

XLR connectors, two channels, electronically floating, balanced/unbalanced selectable, short-circuit-proof; max. current < 120 mA with external feed.

Balanced		
Voltage	balanced, RMS, sinewave, open circuit	0.2 mV to 14 V
	unbalanced, RMS, sinewave, open circuit	0.1 mV to 7 V
Crosstalk attenuation	frequency < 20 kHz	> 115 dB, 130 dB (meas.)
Source impedance	between pins 2 and 3 pin 1 not connected	25 Ω /600 Ω ⁴
Load impedance		> 400 Ω

Signals

Sinewave		
Frequency range	bandwidth 22 kHz/40 kHz/80 kHz	0.1 Hz to 21.75 kHz/40 kHz/80 kHz
Frequency error		± 10 ppm
Level error	at 1 kHz	± 0.05 dB
Frequency response (referenced to 1 kHz)	20 Hz to 20 kHz	± 0.1 dB, < ± 0.05 (meas.)
	20 kHz to 80 kHz	± 0.2 dB, < ± 0.10 (meas.)
Inherent distortion (THD+N) ⁵	20 Hz to 22 kHz	< -100 dB + 2.5 μ V
Sweep parameters		frequency, level

Stereo sinewave		
Frequency range	bandwidth 22 kHz/40 kHz/80 kHz	0.1 Hz to 21.75 kHz/40 kHz/80 kHz
Frequency		adjustable for each channel
Phase	same frequency in both channels	-360° to +360°
Level		adjustable for each channel or channel ratio 2/1
Sweep parameters		frequency, level of channel 1, phase

Mod Dist		
	for measuring the modulation distortion in line with EN 60268-3	
Frequency range	lower frequency (LF)	30 Hz to UF/8
	upper frequency (UF)	8 \times LF to 21.75 kHz/40 kHz/80 kHz
Level ratio (LF:UF)		selectable from 10:1 to 1:1
Level error		± 0.5 dB
Inherent distortion ⁵	level ratio LF:UF = 4:1	< -90 dB, -95 dB (meas.)
	at 7 kHz, 60 Hz	< -96 dB, -100 dB (meas.)
Sweep parameters		upper frequency, level

DFD		
	for measuring the difference frequency distortion in line with EN 60268-3 or EN 60118	
Frequency range	difference frequency	80 Hz to 2 kHz, depending on mean frequency
	mean frequency	200 Hz to 20.75 kHz/39 kHz/79 kHz
Level error		± 0.5 dB
Inherent distortion ⁵	DFD d ₂	< -110 dB, -115 dB (meas.)
	DFD d ₃	< -94 dB, -105 dB (meas.)
Sweep parameters		mean frequency, level

Sine burst		
Burst time		1 sample up to 60 s, 1-sample resolution
Interval		single burst
Low level		0 to burst level, absolute or relative to burst level
Frequency	bandwidth 22 kHz/40 kHz/80 kHz	0.1 Hz to 21.75 kHz/40 kHz/80 kHz
Sweep parameters		burst frequency, level

⁴ 600 Ω available only with serial numbers above 120099, 140099, 180099.

⁵ Total inherent distortion of analyzer and generator.

Arbitrary waveform		
Memory depth		max. 256 ksample
Clock rate	bandwidth 22 kHz/40 kHz/80 kHz	48 kHz/96 kHz/192 kHz
File format		*.arb

Play WAV files		
File length		max. 16 Msample
Clock rate	bandwidth 22 kHz/40 kHz/80 kHz	44.1 kHz/48 kHz/96 kHz/192 kHz
File format		*.wav

Polarity test signal		
		asymmetrical two-tone signal (fundamental + 2nd harmonic)
Fundamental frequency	bandwidth 22 kHz/40 kHz/80 kHz	0.1 Hz to 8 kHz/16 kHz/32 kHz

DC voltage		
Level range	balanced	0 V to ± 10 V
	unbalanced	0 V to ± 5 V
Level error		± 2 %
Sweep parameters		level

DC offset		
Level range	balanced	0 V to ± 10 V
	unbalanced	0 V to ± 5 V
Level error		± 2 %
Residual offset		± 1 % of RMS value of AC signal

Digital audio analyzer (R&S® UPP-B2 option)

Digital audio inputs

Balanced input		9-pin D-Sub connector (male), transformer coupling
Impedance		110 Ω
Level	V_{pp}	200 mV to 12 V
Unbalanced input		BNC, grounded
Impedance		75 Ω
Level	V_{pp}	100 mV to 5 V
Optical input		TOSLINK
Channels		1, 2 or both
Audio bits		8 to 24
Clock rate		30 kHz to 200 kHz
Format		professional format (AES3) and consumer format (IEC 60958)

I²S input

Input		25-pin D-Sub connector (male)
Level	low	< 0.8 V (min. -5 V)
	high	> 2 V (max. 10 V)
Impedance	level -0.5 V to +5.5 V	10 kΩ
	level -5 V to -0.5 V and +5 V to +10 V	100 Ω
Channels		1, 2 or both multiplexed
Word length		16 bit/24 bit/32 bit per channel
Audio bits		8 to 32
Word clock rate		6.75 kHz to 200 kHz

Measurement functions

All measurements at 24 bit, full scale.

RMS wideband		
Measurement bandwidth		up to 50 % of sampling rate
Level error	auto fast	±0.1 dB
	auto	±0.01 dB
	gen track	±0.001 dB
Integration time	gen track	min. 100 sample, at least 1 cycle
	auto fast	min. 200 sample, at least 1 cycle
	auto	min. 4000 sample, at least 1 cycle
	value	0.1 ms to 100 s
Spectrum		post FFT

RMS selective		
Bandwidth	> 20 Hz	1 %, 3 %, 1/12 octave, 1/3 octave, fixed 20 Hz to 80 % of sampling rate
Selectivity	bandpass, bandstop, elliptical filter 8th order	> 100 dB
Frequency setting		automatic to input signal, tracked to generator, fixed or sweep
Level error		+0.2 dB/-0.3 dB

Peak		
Measurement modes		max. peak, min. peak, peak-to-peak, peak absolute
Level error	at 1 kHz	±0.05 dB
Interval length		20 ms to 10 s

DC voltage		
Measurement range		0 to ±1 FS
Level error		±1 %

S/N		
Measurement mode	RMS wideband, peak	reading in dB units
Error limits		±0.2 dB (nom.)

FFT analysis		see FFT analyzer section
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Total harmonic distortion (THD)		
Fundamental		10 Hz to 47.9 % of sampling rate
Frequency tuning		automatic to input or generator signal or fixed through entered value
Weighted harmonics		any combination of d_2 to d_9
Error limits		±0.3 dB
Inherent distortion ⁶		< -155 dB
Spectrum		bargraph showing signal and distortion, post FFT

THD+N and SINAD		
Fundamental		10 Hz to 47.9 % of sampling rate
Frequency tuning		automatic to input or generator signal or fixed through entered value
Stopband range		fundamental ±28 Hz, max. up to 2nd harmonic
Bandwidth		selectable upper and lower frequency limit, plus one weighting filter (selectable)
Error limits		±0.3 dB
Inherent distortion ⁶	bandwidth 20 Hz to 21.90 kHz	< -142 dB
Spectrum		post FFT

Mod Dist		
Measurement mode		in line with EN 60268-3
Frequency range	lower frequency (LF)	30 Hz to UF/8
	upper frequency (UF)	8 × LF to 49.9 % of sampling rate
Error limits		±0.2 dB
Inherent distortion ⁶	level ratio LF:UF = 4:1	< -142 dB
Spectrum		bargraph showing signal and distortion, post FFT

DFD		
Measurement mode		in line with EN 60268-3 or EN 60118
Frequency range	difference frequency	80 Hz to 2 kHz, depending on mean frequency
	mean frequency	200 Hz to 49.9 % of sampling rate – 1 kHz
Error limits	mean frequency < 20 kHz	±0.2 dB
Inherent distortion ⁶	DFD d_2	< -155 dB
	DFD d_3	< -155 dB
Spectrum		bargraph showing signal and distortion, post FFT

Time domain display (WAVEFORM)		
Trigger		rising/falling edge
Trigger level		-1 FS to +1 FS
Trace length		max. 480 ksample per channel
Pretrigger		max. 19200 sample
Standard mode		each sample recorded
Compressed mode		peak value of up to 1024 recorded samples (envelope)
Undersample mode		undersampling factor up to 1024

⁶ Total inherent distortion of analyzer and generator.

Frequency		
Frequency range		20 Hz to 41.7 % of sampling rate
Frequency error		±10 ppm

Phase		
Frequency range		20 Hz to 41.7 % of sampling rate
Phase error		±0.4°

Group delay		
Frequency range		20 Hz to 41.7 % of sampling rate

Polarity		
Measurement mode		measurement of asymmetrical signals
Display		+POL, -POL

Digital audio generator (R&S® UPP-B2 option)

Digital audio outputs

Balanced output		9-pin D-Sub connector (male), transformer coupling
Impedance		110 Ω, short-circuit-proof
Level	V_{pp} into 110 Ω	0 V to 8 V, in 240 steps
Error limits		±1 dB
Unbalanced output		BNC, grounded
Impedance		75 Ω, short-circuit-proof
Level	V_{pp} into 75 Ω	0 V to 2 V, in 240 steps
Error limits		±1 dB
Optical output		TOSLINK
Channels		1, 2 or both
Audio bits		8 to 24
Clock rate		30 kHz to 200 kHz
Format		professional format (AES3) and consumer format (IEC 60958)
Synchronization		internal clock external word clock or DARS
Sync input (SYNC IN)		BNC, grounded
Level	low	< 0.8 V
	high	> 2 V
Impedance		75 Ω

I²S output

Output		25-pin D-Sub connector (male)
Impedance		50 Ω, short-circuit-proof
Level		3.3 V
Channels		1, 2 or both multiplexed
Word length		16 bit/24 bit/32 bit per channel
Audio bits		8 to 32
Clock rate		6.75 kHz to 200 kHz
Synchronization		internal clock external word clock or master clock
Master clock rate		432 kHz to 25.6 MHz
Sync input (SYNC IN)		BNC, grounded
Level	low	< 0.8 V
	high	> 2 V
Impedance		> 5 kΩ

Signals

All signals 24 bit, full scale.

General characteristics		
Dither	for sinewave, stereo sinewave, DFD and Mod Dist	
	distribution	rectangular
	level	0.5 LSB to 1 FS
Frequency error	internal clock	±10 ppm
	relative to clock rate	±1 ppm
DC offset		0 to ±1 FS, adjustable

Sinewave		
Frequency range		0.1 Hz to 49.9 % of sampling rate
Inherent distortion (THD) ⁷		< -155 dB
Sweep parameters		frequency, level

⁷ Total inherent distortion of analyzer and generator.

Stereo sinewave		
Frequency range		0.1 Hz to 49.9 % of sampling rate
Frequency		adjustable for each channel
Phase	same frequency in both channels	-360° to +360°
Level		adjustable for each channel or channel ratio 2/1
Sweep parameters		frequency, level of channel 1, phase

Mod Dist		
	for measuring the modulation distortion in line with EN 60268-3	
Frequency range	lower frequency (LF)	30 Hz to UF/8
	upper frequency (UF)	8 × LF to 49.9 % of sampling rate
Level ratio (LF:UF)		selectable from 10:1 to 1:1
Inherent distortion ⁸	level ratio LF:UF = 4:1	< -142 dB
Sweep parameters		upper frequency, level

DFD		
	for measuring the difference frequency distortion in line with EN 60268-3 or EN 60118	
Frequency range	difference frequency	80 Hz to 2 kHz, depending on mean frequency
	mean frequency	200 Hz to 49.9 % of sampling rate – 1 kHz
Inherent distortion ⁸	DFD d ₂	< -155 dB
	DFD d ₃	< -155 dB
Sweep parameters		mean frequency, level

Sine burst		
Burst time		1 sample up to 60 s, 1-sample resolution
Interval		single burst
Low level		0 to burst level, absolute or referenced to burst level
Sweep parameters		burst frequency, level

Arbitrary waveform		
Memory depth		max. 256 ksample
Clock rate		sampling rate of generator
File format		*.arb

Play WAV files		
File length		max. 16 Msample
Clock rate		sampling rate of generator
File format		*.wav

Polarity test signal		
		asymmetrical two-tone signal (fundamental + 2nd harmonic)
Fundamental frequency		0.1 Hz to 16.6 % of sampling rate

DC voltage		
Level range		0 to ±1 FS
Sweep parameters		level

⁸ Total inherent distortion of analyzer and generator.

HDMI/digital audio analyzer (R&S®UPP-B4 option)

Digital audio inputs

Unbalanced input		BNC, grounded
Impedance		75 Ω
Level	V _{pp}	100 mV to 5 V
Optical input		TOSLINK
Channels		1, 2 or both
Audio bits		8 to 24
Clock rate		30 kHz to 200 kHz
Format		professional format (AES3) and consumer format (IEC 60958)

I²S input

Input	max. 4 data lines	26-pin D-Sub HD connector (female)
Level	low	< 0.8 V (min. -5 V)
	high	> 2 V (max. 10 V)
Impedance	level -0.5 V to +5.5 V	10 kΩ
	level -5 V to -0.5 V and +5 V to +10 V	100 Ω
Channels		1 to 8
Word length		16 bit/24 bit/32 bit per channel
Audio bits		8 to 32
Word clock rate		6.75 kHz to 200 kHz

HDMI input

Input		HDMI type A
Input format		PCM
	with R&S®UPP-K41 option	Dolby coded signals
Channels		1 to 8
Word length		16 bit/20 bit/24 bit
Audio bits		16 to 24
Word clock rate	standard clock rates	32 kHz to 192 kHz ± 4 %

Measurement functions

All measurements at 24 bit (digital audio), full scale.

RMS wideband		
Measurement bandwidth		up to 50 % of sampling rate
Level error	auto fast	±0.1 dB
	auto	±0.01 dB
	gen track	±0.001 dB
Integration time	gen track	min. 100 sample, at least 1 cycle
	auto fast	min. 200 sample, at least 1 cycle
	auto	min. 4000 sample, at least 1 cycle
	value	0.1 ms to 100 s
Spectrum		post FFT

RMS selective		
Bandwidth	> 20 Hz	1 %, 3 %, 1/12 octave, 1/3 octave, fixed 20 Hz to 80 % of sampling rate
Selectivity	bandpass, bandstop, elliptical filter 8th order	> 100 dB
Frequency setting		automatic to input signal, tracked to generator, fixed or sweep
Level error		+0.2 dB/-0.3 dB

Peak		
Measurement modes		max. peak, min. peak, peak-to-peak, peak absolute
Level error	at 1 kHz	±0.05 dB
Interval length		20 ms to 10 s

DC voltage		
Measurement range		0 to ± 1 FS
Level error		± 1 %

S/N		
Measurement mode	RMS wideband, peak	reading in dB units
Error limits		± 0.2 dB (nom.)

FFT analysis		see FFT analyzer section
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Total harmonic distortion (THD)		
Fundamental		10 Hz to 47.9 % of sampling rate
Frequency tuning		automatic to input or generator signal or fixed through entered value
Weighted harmonics		any combination of d_2 to d_9
Error limits		± 0.3 dB
Inherent distortion ⁹		< -155 dB
Spectrum		bargraph showing signal and distortion, post FFT

THD+N and SINAD		
Fundamental		10 Hz to 45.6 % of sampling rate
Frequency tuning		automatic to input or generator signal or fixed through entered value
Stopband range		fundamental ± 28 Hz, max. up to 2nd harmonic
Bandwidth		selectable upper and lower frequency limit, plus one weighting filter (selectable)
Error limits		± 0.3 dB
Inherent distortion ⁹	bandwidth 20 Hz to 21.90 kHz	< -142 dB
Spectrum		post FFT

Mod Dist		
Measurement mode		in line with EN 60268-3
Frequency range	lower frequency (LF)	30 Hz to 2700 Hz
	upper frequency (UF)	$8 \times$ LF to 45.6 % of sampling rate
Error limits		± 0.2 dB
Inherent distortion ⁹	level ratio LF:UF = 4:1	< -142 dB
Spectrum		bargraph showing signal and distortion, post FFT

DFD		
Measurement mode		in line with EN 60268-3 or EN 60118
Frequency range	difference frequency	80 Hz to 2 kHz
	mean frequency	200 Hz to 43.5 % of sampling rate
Error limits	mean frequency < 20 kHz	± 0.2 dB
Inherent distortion ⁹	DFD d_2	< -155 dB
	DFD d_3	< -155 dB
Spectrum		bargraph showing signal and distortion, post FFT

⁹ Total inherent distortion of analyzer and generator.

Time domain display (WAVEFORM)		
Trigger		rising/falling edge
Trigger level		-1 FS to +1 FS
Trace length		max. 480 ksample per channel
Pretrigger		max. 19200 sample
Standard mode		each sample recorded
Compressed mode		peak value of up to 1024 recorded samples (envelope)
Undersample mode		undersampling factor up to 1024

Frequency		
Frequency range		20 Hz to 41.7 % of sampling rate
Frequency error		±10 ppm

Phase		
Frequency range		20 Hz to 41.7 % of sampling rate
Phase error		±0.4°

Group delay		
Frequency range		20 Hz to 41.7 % of sampling rate

Polarity		
Measurement mode		measurement of asymmetrical signals
Display		+POL, -POL

Lip sync		
	with R&S®UPP-K45 option	
Measurement mode		audio to video delay
Error limits		±1/sampling rate

BERT		
	with R&S®UPP-K45 option	
Measurement mode		deterministic patterns
Error limits		±100 × (1/(HSYNC freq. × meas. time)) %

HDMI/digital audio generator (R&S®UPP-B4 option)

Digital audio outputs

Unbalanced output		BNC, grounded
Impedance		75 Ω, short-circuit-proof
Level	V_{pp} into 75 Ω	0 V to 2 V, in 240 steps
Error limits		±1 dB
Optical output		TOSLINK
Channels		1, 2 or both
Audio bits		8 to 24
Clock rate		30 kHz to 200 kHz
Format		professional format (AES3) and consumer format (IEC 60958)
Synchronization		internal clock external word clock or DARS
Sync input (SYNC IN)		BNC, grounded
Level	low	< 0.8 V
	high	> 2 V
Impedance		75 Ω

I²S output

Output	max. 4 data lines	26-pin D-Sub HD connector (female)
Impedance		50 Ω, short-circuit-proof
Level		3.3 V
Channels		1 to 8
Word length		16 bit/24 bit/32 bit per channel
Audio bits		8 to 32
Clock rate		6.75 kHz to 200 kHz
Synchronization		internal clock external word clock or master clock
Master clock rate		432 kHz to 25.6 MHz
Sync input (SYNC IN)		BNC, grounded
Level	low	< 0.8 V
	high	> 2 V
Impedance		> 5 kΩ

HDMI output

Output		HDMI type A
Output format		PCM
	with R&S®UPP-K41 option, function play	Dolby coded signals
Channels		1 to 8
Word length		16 bit/20 bit/24 bit
Audio bits		16 to 24
Word clock rate	standard clock rates	32 kHz to 192 kHz ± 4 %

Signals

All signals with 24 bit (digital audio), full scale.

General characteristics		
Dither	for sinewave, stereo sinewave, DFD and Mod Dist	
	distribution	rectangular
	level	0.5 LSB to 1 FS
Frequency error	internal clock	±10 ppm
	relative to clock rate	±1 ppm
DC offset		0 to ±1 FS, adjustable

Sinewave		
Frequency range		0.1 Hz to 45.6 % of sampling rate
Inherent distortion (THD) ¹⁰		< -155 dB
Sweep parameters		frequency, level

Stereo sinewave		
Frequency range		0.1 Hz to 45.6 % of sampling rate
Frequency		adjustable for each channel
Phase	same frequency in both channels	-360° to +360°
Level		adjustable for each channel or channel ratio 2/1
Sweep parameters		frequency, level of channel 1, phase

Mod Dist		
	for measuring the modulation distortion in line with EN 60268-3	
Frequency range	lower frequency (LF)	30 Hz to UF/8
	upper frequency (UF)	8 × LF to 45.6 % of sampling rate
Level ratio (LF:UF)		selectable from 10:1 to 1:1
Inherent distortion ¹⁰	level ratio LF:UF = 4:1	< -142 dB
Sweep parameters		upper frequency, level

DFD		
	for measuring the difference frequency distortion in line with EN 60268-3 or EN 60118	
Frequency range	difference frequency	80 Hz to 2 kHz
	mean frequency	200 Hz to 43.5 % of sampling rate
Inherent distortion ¹⁰	DFD d ₂	< -155 dB
	DFD d ₃	< -155 dB
Sweep parameters		mean frequency, level

Sine burst		
Burst time		1 sample up to 60 s, 1-sample resolution
Interval		single burst
Low level		0 to burst level, absolute or referenced to burst level
Sweep parameters		burst frequency, level

Arbitrary waveform		
Memory depth		max. 256 ksample
Clock rate		sampling rate of generator
File format		*.arb

Play WAV files		
File length		max. 16 Msample
Clock rate		sampling rate of generator
File format		*.wav
	with R&S [®] UPP-K41 option	*.ac3, *.ec3

Polarity test signal		
		asymmetrical two-tone signal (fundamental + 2nd harmonic)
Fundamental frequency		0.1 Hz to 8 kHz

DC voltage		
Level range		0 to ±1 FS
Sweep parameters		level

¹⁰ Total inherent distortion of analyzer and generator.

Universal multichannel signals		individually per channel: addition of one or more of the following signals
All channels dither	distribution	rectangular
	level	0 to 1 FS
All channels sinewave	frequency range	100 mHz to 45.6 % of sampling rate
	level	0 to 1 FS
	sweep parameters	frequency, voltage
Per channel sinewave	frequency range	100 mHz to 45.6 % of sampling rate
	level	0 to 1 FS
Per channel DC offset		-1 FS to 1 FS
Per channel arbitrary waveform	memory depth	max. 256 ksample
	clock rate	sampling rate of generator
	file format	*.arb
Frequency error	internal clock	±10 ppm
	relative to clock rate	±1 ppm
DC offset		0 to ±1 FS, adjustable
Limiter function	selectable	limits peak value of sum signal to 1 FS with respect to given level ratios

Multichannel analog audio generator (R&S® UPP-B8 option)

Outputs

25-pin D-Sub connector (female); wiring scheme compatible with TASCAM.

Voltage	unbalanced, RMS, sinewave, open circuit	0.1 mV to 7 V
Channels		3 to 10
Crosstalk attenuation	frequency < 20 kHz	> 115 dB, 130 dB (meas.)
Source impedance	between pins 2 and 3 pin 1 not connected	25 Ω
Load impedance		> 400 Ω

Signals

The following signals are multichannel signals, with individual settings for each channel.

Universal multichannel signals		individually per channel: addition of one or more of the following signals
All channels sinewave	frequency range (bandwidth 22 kHz/40 kHz/80 kHz)	0.1 Hz to 21.75 kHz/40 kHz/80 kHz
	level	0 V to 7 V
	sweep parameters	frequency, voltage
Per channel sinewave	frequency range (bandwidth 22 kHz/40 kHz/80 kHz)	0.1 Hz to 21.75 kHz/40 kHz/80 kHz
	level	0 V to 7 V
Per channel DC offset		0 V to ±5 V
Per channel arbitrary waveform	memory depth	max. 256 ksample
	clock rate	sampling rate of generator
	file format	*.arb
Frequency error	internal clock	±10 ppm
	relative to clock rate	±1 ppm
DC offset		0 V to ±5 V, adjustable
Limiter function	selectable	limits peak value of sum signal to 1 FS with respect to given level ratios

The following signals are mono signals and are routed simultaneously to all selected channels.

Sinewave		
Frequency range	bandwidth 22 kHz/40 kHz/80 kHz	0.1 Hz to 21.75 kHz/40 kHz/80 kHz
Frequency error		±10 ppm
Level error	at 1 kHz	±0.05 dB
Frequency response (referenced to 1 kHz)	20 Hz to 20 kHz	±0.1 dB, < ±0.05 (meas.)
	20 kHz to 80 kHz	±0.2 dB, < ±0.10 (meas.)

Inherent distortion (THD+N) ¹¹	20 Hz to 22 kHz	< -100 dB + 2.5 μ V
Sweep parameters		frequency, level

Mod Dist	for measuring the modulation distortion in line with EN 60268-3	
Frequency range	lower frequency (LF)	30 Hz to UF/8
	upper frequency (UF)	8 \times LF to 21.75 kHz/40 kHz/80 kHz
Level ratio (LF:UF)		selectable from 10:1 to 1:1
Level error		\pm 0.5 dB
Inherent distortion ¹¹	level ratio LF:UF = 4:1	< -90 dB, -95 dB (meas.)
Sweep parameters		upper frequency, level

DFD	for measuring the difference frequency distortion in line with EN 60268-3 or EN 60118	
Frequency range	difference frequency	80 Hz to 2 kHz, depending on mean frequency
	mean frequency	200 Hz to 20.75 kHz/39 kHz/79 kHz
Level error		\pm 0.5 dB
Inherent distortion ¹¹	DFD d ₂	< -110 dB, -115 dB (meas.)
	DFD d ₃	< -94 dB, -105 dB (meas.)
Sweep parameters		mean frequency, level

Sine burst		
Burst time		1 sample up to 60 s, 1-sample resolution
Interval		single burst
Low level		0 to burst level, absolute or relative to burst level
Frequency range	bandwidth 22 kHz/40 kHz/80 kHz	0.1 Hz to 21.75 kHz/40 kHz/80 kHz
Sweep parameters		burst frequency, level

Arbitrary waveform		
Memory depth		max. 256 ksample
Clock rate	bandwidth 22 kHz/40 kHz/80 kHz	48 kHz/96 kHz/192 kHz
File format		*.arb

Play WAV files		
File length		max. 16 Msample
Clock rate	bandwidth 22 kHz/40 kHz/80 kHz	44.1 kHz/48 kHz/96 kHz/192 kHz
File format		single-channel *.wav

Polarity test signal	asymmetrical two-tone signal (fundamental + 2nd harmonic)	
Fundamental frequency	bandwidth 22 kHz/40 kHz/80 kHz	0.1 Hz to 8 kHz/16 kHz/32 kHz

DC voltage		
Level range	unbalanced	0 V to \pm 5 V
Level error		\pm 2 %
Sweep parameters		level

DC offset		
Level range	unbalanced	0 V to \pm 5 V
Level error		\pm 2 %
Residual offset		\pm 1 % of RMS value of AC signal

¹¹ Total inherent distortion of analyzer and generator.

Multichannel digital audio generator (R&S® UPP-B8 option)

Digital audio outputs

Unbalanced output		9-pin D-Sub connector (female)
Impedance		75 Ω , short-circuit-proof
Level	V_{pp} into 75 Ω	0.5 V
Error limits		± 1 dB
Channels		3 to 10
Audio bits		8 to 24
Clock rate		30 kHz to 200 kHz
Format		professional format (AES3) and consumer format (IEC 60958)
Synchronization		internal clock

Signals

All signals 24 bit, full scale.

The following signals are multichannel signals, with individual settings for each channel.

Universal multichannel signals		individually per channel: addition of one or more of the following signals
All channels dither	distribution	rectangular
	level	0 to 1 FS
All channels sinewave	frequency range	100 mHz to 45.6 % of sampling rate
	level	0 to 1 FS
	sweep parameters	frequency, voltage
Per channel sinewave	frequency range	100 mHz to 45.6 % of sampling rate
	level	0 to 1 FS
Per channel DC offset		-1 FS to 1 FS
Per channel arbitrary waveform	memory depth	max. 256 ksample
	clock rate	sampling rate of generator
	file format	*.arb
Frequency error	internal clock	± 10 ppm
	relative to clock rate	± 1 ppm
DC offset		0 to ± 1 FS, adjustable
Limiter function	selectable	limits peak value of sum signal to 1 FS with respect to given level ratios

The following signals are mono signals and are routed simultaneously to all selected channels.

General characteristics		
Dither	for sinewave, stereo sinewave, DFD and Mod Dist	
	distribution	rectangular
	level	0.5 LSB to 1 FS
Frequency error	internal clock	± 10 ppm
	relative to clock rate	± 1 ppm
DC offset		0 to ± 1 FS, adjustable

Sinewave		
Frequency range		0.1 Hz to 49.9 % of sampling rate
Inherent distortion (THD) ¹²		< -155 dB
Sweep parameters		frequency, level

Mos Dist		
for measuring the modulation distortion in line with EN 60268-3		
Frequency range	lower frequency (LF)	30 Hz to UF/8
	upper frequency (UF)	8 \times LF to 49.9 % of sampling rate
Level ratio (LF:UF)		selectable from 10:1 to 1:1
Inherent distortion ¹²	level ratio LF:UF = 4:1	< -142 dB
Sweep parameters		upper frequency, level

¹² Total inherent distortion of analyzer and generator.

DFD		
Frequency range	for measuring the difference frequency distortion in line with EN 60268-3 or EN 60118	
	difference frequency	80 Hz to 2 kHz, depending on mean frequency
Inherent distortion ¹³	mean frequency	200 Hz to 49.9 % of sampling rate – 1 kHz
	DFD d ₂	< –155 dB
Sweep parameters	DFD d ₃	< –155 dB
		mean frequency, level

Sine burst		
Burst time		1 sample up to 60 s, 1-sample resolution
Interval		single burst
Low level		0 to burst level, absolute or referenced to burst level
Sweep parameters		burst frequency, level

Arbitrary waveform		
Memory depth		max. 256 ksample
Clock rate		sampling rate of generator
File format		*.arb

Play WAV files		
File length		max. 16 Msample
Clock rate		sampling rate of generator
File format		single-channel *.wav

Polarity test signal		
Fundamental frequency		asymmetrical two-tone signal (fundamental + 2nd harmonic) 0.1 Hz to 16.6 % of sampling rate

DC voltage		
Level range		0 to ±1 FS
Sweep parameters		level

¹³ Total inherent distortion of analyzer and generator.

FFT analyzer

Frequency range	digital	DC to 50 % of sampling rate
	analog bandwidth 22 kHz/40 kHz/80 kHz	DC to 22.5 kHz/43.5 kHz/87 kHz
FFT size		512, 1k, 2k, 4k, 8k, 16k, 32k, 64k, 128k, 256k points
Window functions		rectangular, Hann, Blackman-Harris, Rife-Vincent 1 to 3, Hamming, flat top

Filter

For all analog and digital analyzers and generators. All filters are digital filters.

Analyzer	prefilter	1 weighting or user-definable filter
	function filter	up to 2 weighting or user-definable filters
Generator		1 weighting or user-definable filter

Weighting filters		A weighted
		C weighted
		CCIR 1k weighted
		CCIR 2k weighted
		CCIR unweighted
		CCITT
		C message
		DC noise highpass
		deemphasis J.17, 50/15, 50, 75
		preemphasis 50/15, 50, 75
		IEC tuner
		jitter weighted
		rumble weighted
	rumble unweighted	

Highpass and lowpass filters		highpass 22 Hz
		highpass 400 Hz
		lowpass 22 kHz
		lowpass 30 kHz
		lowpass 80 kHz
		AES 17 lowpass

User-definable filters		
Design parameters		8th order elliptical, type C (for highpass and lowpass filters also 4th order), passband ripple +0 dB/-0.1 dB, stopband attenuation approx. 20 dB to 120 dB, selectable in steps of approx. 10 dB (highpass and lowpass filters: stopband attenuation 40 dB to 120 dB)
Highpass, lowpass filters		selectable passband (-0.1 dB), stopband indicated
Bandpass, bandstop filters		selectable passband (-0.1 dB), stopband indicated
Notch		selectable center frequency and width (-0.1 dB), stopband indicated
Third octave and octave filters		selectable center frequency, bandwidth (-0.1 dB) indicated
File-defined filters		any 8th order filter cascaded from 4 biquads, defined in z plane by poles/zeros or coefficients

Sweep

Generator sweep		
Parameters	sinewave, stereo sinewave, DC, Mod Dist, DFD	frequency, level, one or two-dimensional
Sweep		linear, logarithmic, single, continuous
Stepping		time steps or synchronized to analyzer

Sweep speed		
RMS measurement 20 Hz to 20 kHz, logarithmic 30-point generator sweep (frequency measurement switched off, 80 kHz bandwidth, DC coupling)		2 channels/8 channels
	gen track	0.3 s/0.4 s
	auto fast	0.4 s/0.5 s
	auto	0.8 s/0.9 s

Display of results (using external monitor)

Units		
Level (analog)		V, dBu, dBV, W, dBm, difference (Δ), deviation ($\Delta\%$) and ratio (without dimension, %, dBr) to reference value (entered or stored, current generator level)
Level (digital)		FS, %FS, dBFS, LSBs, deviation ($\Delta\%$) or ratio (dBr) to reference value (entered or stored, current generator level)
Distortion		% or dB, referenced to signal amplitude, THD and THD+N in all available level units (absolute or relative to selectable reference value)
Frequency		Hz, difference (Δ), deviation ($\Delta\%$) and ratio (as quotient f/f_{ref} , 1/3 octave, octave or decade) to reference value (entered or stored, current generator frequency)
Phase		$^\circ$, rad, difference (Δ) to reference value (entered or stored)

Graphical display of results, external DVI-D monitor with resolution up to 1280 × 1024 pixel (75 Hz)		
Display of results		numeric display
		combi display with numeric value, bargraph, min./max. and limits (for each numeric result)
		sweep trace
		spectrum
		waveform
		list of results
		bargraph for THD and intermodulation measurements
Display functions		autoscale
		x-axis and y-axis zoom
		two cursor lines, vertical or horizontal
		search function for max. values
		marker for harmonics (spectrum)
		change of unit and scale also possible for loaded traces

Test reports		
Functions		screen copy to printer, clipboard or file (BMP, variable size/colors/line type)
Printer types		all Windows XP supported printers
Printer interfaces		USB, LAN

Remote control

Interfaces		IEC 625-2 (IEEE 488), LAN or USB device; commands largely in line with SCPI
Protocols		IEEE 488, VXI-11, NI-Visa

Audio monitor

Unbalanced output		2 × BNC grounded, switchable to <ul style="list-style-type: none"> • input signal, unfiltered (any channel) • input signal, filtered (any channel) • DC ¹⁴
Output voltage	V_p	max. 5.0 V ¹⁵
Source impedance		< 2.5 Ω, short-circuit-proof ¹⁵
Output current	I_p	max. 50 mA

¹⁴ DC only available with serial numbers above 120099, 140099, 180099.

¹⁵ Impedance 600 Ω, max. 4.5 V with serial numbers below 120100, 140100, 180100.

General data

Environmental conditions		
Temperature	operating temperature range	+5 °C to +45 °C
	storage temperature range	-20 °C to +60 °C
Damp heat		+25°C/+40°C, 95 % rel. humidity, cyclic, in line with EN 60068-2-30

Mechanical resistance		
Vibration	sinusoidal	5 Hz to 55 Hz, 0.15 mm amplitude const., 55 Hz to 150 Hz, 0.5 g const., in line with EN 60068-2-6
	random	10 Hz to 300 Hz, acceleration 1.2 g RMS, in line with EN 60068-2-64
Shock		in line with MIL-STD-810E, method 516.4, procedure I, 40 g shock spectrum

Power rating		
Rated voltage		100 V to 240 V AC
Rated frequency		50 Hz to 60 Hz
Rated power		80 VA

Product conformity		
Electromagnetic compatibility	EU: complies with EMC Directive 2004/108/EC	applied harmonized standards: EN 61326-1 (industrial environment) EN 61326-2-1 EN 55011 (class B) ¹⁶ EN 61000-3-2 EN 61000-3-3
Electrical safety	EU: complies with Low Voltage Directive 2006/95/EC	applied harmonized standard: EN 61010-1
	USA	UL 61010-1
	Canada	CAN/CSA-C22.2 No. 61010-1
International safety approvals	VDE (Association for Electrical, Electronic and Information Technologies)	GS certificate no. 40028654
	CSA (Canadian Standard Association)	CSA _{US} certificate no. 2229570

Dimensions	W × H × D	465 mm × 106 mm × 495 mm (18.31 in × 4.17 in × 19.49 in)
Weight	fully equipped	6.7 kg (14.77 lb)

¹⁶ With installed R&S®UPP-B4 option, the instrument complies with EN 55011 class A.

Ordering information

Designation	Type	Order No.
Base unit		
Audio Analyzer, two channels	R&S®UPP200	1411.1003.02
Audio Analyzer, four channels	R&S®UPP400	1411.1003.04
Audio Analyzer, eight channels	R&S®UPP800	1411.1003.08
Accessories supplied		
Power cable, quick start guide, CD with operating and service manual		
Hardware options		
Digital Audio Interfaces	R&S®UPP-B2	1411.2300.02
HDMI and Digital Audio Interfaces	R&S®UPP-B4	1411.2500.02
Multichannel Analog/Digital Audio Generator	R&S®UPP-B8	1411.2700.02
Software options		
Cascading Software for R&S®UPP800	R&S®UPP-K800	1411.0759.02
1/n Octave Analysis	R&S®UPP-K601	1411.0765.02
Digital Audio Protocol for R&S®UPP-B2	R&S®UPP-K21	1411.0807.02
Dolby Data Stream Decoding for R&S®UPP-B4	R&S®UPP-K41	1411.0813.02
Extended Audio/Video Measurements for R&S®UPP-B4	R&S®UPP-K45	1411.0859.02
System components		
XLR/BNC Adapter Set, male	R&S®UP-Z1M	1411.3358.02
XLR/BNC Adapter Set, male/female	R&S®UP-Z1MF	1411.3306.02
AES/EBU Cable for R&S®UPP-B2	R&S®UP-Z2	1411.3406.02
I ² S Cable for R&S®UPP-B2/UPV-B41	R&S®UP-Z3	1411.3458.02
Eight-Channel I ² S Cable for R&S®UPP-B4	R&S®UP-Z4	1411.3258.02
19" Rack Adapter	R&S®ZZA-211	1096.3260.00
Operating and service manual		1411.1055.32
Audio Switcher (input, USB device)	R&S®UPZ	1120.8004.12
Audio Switcher (output, USB device)	R&S®UPZ	1120.8004.13

Service options		
Extended Warranty, one year	R&S®WE1	Please contact your local Rohde & Schwarz sales office.
Extended Warranty, two years	R&S®WE2	
Extended Warranty, three years	R&S®WE3	
Extended Warranty, four years	R&S®WE4	
Extended Warranty with Calibration Coverage, one year	R&S®CW1	
Extended Warranty with Calibration Coverage, two years	R&S®CW2	
Extended Warranty with Calibration Coverage, three years	R&S®CW3	
Extended Warranty with Calibration Coverage, four years	R&S®CW4	

Extended warranty with a term of one to four years (WE1 to WE4)

Repairs carried out during the contract term are free of charge ¹⁷. Necessary calibration and adjustments carried out during repairs are also covered. Simply contact the forwarding agent we name; your product will be picked up free of charge and returned to you in top condition a couple of days later.

Extended warranty with calibration (CW1 to CW4)

Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs ¹⁷ and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

For product brochure, see PD 5214.3846.12 and www.rohde-schwarz.com

¹⁷ Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

Service that adds value

- | Worldwide
- | Local and personalized
- | Customized and flexible
- | Uncompromising quality
- | Long-term dependability

About Rohde & Schwarz

Rohde & Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established more than 75 years ago, Rohde & Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

Environmental commitment

- | Energy-efficient products
- | Continuous improvement in environmental sustainability
- | ISO 14001-certified environmental management system

Certified Quality System
ISO 9001

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R&S®UPP Audio Analyzer

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