Functional comparison of R&S RTB2000, Siglent SDS2000X Plus and Keysight InfiniiVision 1000 X Oscilloscopes

Version 0.21. This is a document under construction.
Comments, corrections, additions etc. can be posted here.

LEGEND

Keyboard: feature not mentioned in manual but present on the instrument
Blue: significant advantage, not present in other instruments
RED: significant disadvantage
Orange: something to note but not a significant disadvantage
`Courier font`: the precise naming as used on the instrument
FW02.400: reference to the FW version that first introduced the feature.
`DISPLAY > Persistence. M85, S12.` Reference to where this can be found on the instrument. `SETUP` refers to a physical knob or rotary dial. Lower key refers to menu item or soft button (DSOCX). M refers to a page in User Manual[1], S refers to a page in Specification Sheet

INTRODUCTION

General

Series	R&S RTB2000	Siglent SDS2000X Plus	Keysight InfiniiVision 1000 X
Model/version reviewed	**RTB2K-COM4**	**SDS2104X Plus, 16LA, AWG**	**DSOX1204G**
Market introduction	March 2017	January 2020	March 2017 (4ch. version January 2019)
Market position	Low mid-range	Low mid-range	Low range
FW version reviewed	FW 2.4	FW 1.3.9R6	FW 2.12
FW updates	10 updates in 56 months	6 updates in 22 months	~ 5 + 3 updates in 56 months

Physical

		SIGLENT	KEYSIGHT TECHNOLOGIES
Physical design	Very solid	OK, but not top notch[2]	Very solid
Front panel color	Grey	Beige	Black

Power switch (front panel)	Hard (back panel)
	Soft (front panel)
	Auto power-on
		Soft (front panel)
		Auto power-on selectable
		`Utility > Menu > Power On Line. M29`
		Turn off, Reboot
		`Utility > Shutdown / Reboot`
			Hard (front panel)

Settings on power-on	From last session `M34`	From last session `(Not discussed in manual)`	From last session `(Not discussed in manual)`
Button/control layout	Very logical	Not always consistent[3]	Not always consistent
Rotary dials	6, all have clicks Shared V scale, V position H scale, H position Trigger Multifunction	6, two have clicks Shared V scale, V position H scale, H position Trigger Multifunction	9, three have clicks Shared V scale, V position M scale, M position (not very useful) H scale, H position Trigger Cursor Multifunction
Channel indicators for shared vertical controls	Active Ch: lighted button, screen Selected Ch.: matching colour LEDs in both vertical dials[4]	Active Ch.: screen only Selected Ch.: lighted button	Active Ch.: lighted button, screen Selected Ch.: matching colour LED[5] indicator next to vertical dials
Channel indicators for shared vertical controls	Matching colour LED in Trigger button	Screen only	Screen only
Painted front panel colour indicators for channels	None	Around BNC[6]	Around BNC
Start-up time	10 sec	44 sec	55 sec
Fan noise	Silent to very low	Very loud	Notable
Energy use (on, idle)[7]	45 Watt (measured) Manual: "max. 60 W" `M33`	55 Watt (measured) Manual "Up to 100 Watt" `M14`	31 Watt (measured) Manual: "50Wmax" `M22`
Weight	2.6 kg	3.5 kg	3.2 kg
Transport accessories	Plastic front cover, Soft case, Transit case	Soft Carry Bag	Soft carrying case

[1] RTB: Version 11 (for 2.4 FW); SDS version EN01C; DSOX Fourth edition, September 2021.
[2] Rotary dials wobble a bit. Rubber feet come off regularly. Overall, a more 'plastic' feel.
[3] Examples: "Start/Stop" is not in trigger or horizontal area, and away from "Single". "Measure" and "Cursor" in top, "Aquire and Display" in menu halfway device, and "Search", "Navigate", "Decode" and "Decode" all at the bottom. I don't see any logic.
[4] In some versions (recent years?) the colors around the rotary dials do not look constant.
[5] Sever color mismatch for Channel 1 (dark yellow on button, bright yellow on the screen).
[6] On pictures on the internet, all the SDS2000X Plus scopes I see also have colors printed around the channel selection buttons. But on my unit, these colors are gone. Perhaps when FR1.3.7R5 introduced the selectable color for analogue traces (and changed the LED colours in the buttons accordingly with the chosen user color), Siglent decided to remove the paint on the front panel. But why they remove it only for one of the two places ?!?
[7] Measured with GW-INSTEK GPM-8310 Power Meter.

I/O connectors

		SIGLENT	KEYSIGHT TECHNOLOGIES
BNC connectors	Goldplated (all)	Not goldplated automatic x10 probe sense for supported probes	Not goldplated
USB (Flash, Mouse, Keyboard, Power)	1x host (FMKP) 1x device	2x host (FMKP) 1x device	1x host (FPXI)[8] 1x device
Network	Ethernet (1Gbps)	Ethernet (100Mbps)	Ethernet
Trigger In	Front (dedicated) Sensitivity 300mV, level -5/5V, max. 300 V (RMS), max. 400 V (Vp)	Back (dedicated) Max. 1.5Vrms; max. 7.5Vrms with EXT/5 attenuator	Back (dedicated) Max 30 Vrms, 40 Vpk
Trigger out	Front (shared conn.) Polarity: positive or negative pulse Level: 4.8V (2.4@50Ω) Pulse width (250ns to 1s) and polarity (pos or neg pulse) can be set via remote command; default 250ns (measured)[9] Trigger > Action on Trigger. M77, 86, 461, 462; remote command 461, 462, 87.	Back (shared conn.) Polarity: negative pulse Level: 2.6Vpp (900mVpp @ 50Ω) (measured) Pulse width varies with horizontal scale (measured): 600ms @ 100ms/div 860 µs @ 100µs/div 90µs @ 100ns/div (but duty cycle at 99%)	Front (shared conn.) Polarity: positive pulse Level: 5.3Vpp (2.7Vpp @ 50Ω) (measured) Pulse width varies with horizontal scale (measured): 500ms @ 100ms/div 520 µs @ 100µs/div 20 µs @ 100ns/div (but duty cycle at 85%)
Mask test out	Pass, fail Front (shared conn.)	Pass, fail Back (shared conn.)	Fail (5V) Front (shared conn.)
Generator out	Front (shared conn.)	Front (dedicated)	Front (shared conn.)
10MHz reference in/out	–/+ (shared conn.)	–/–	–/–
Combined in multifunction out connector	Trigger Out, 10MHz ref, Mask, Function Generator (labelled Aux Out) Setup > Aux out. M27,177/178	Trigger Out, Mask (labelled Auxiliary Out) (Output is Trigger, except when Mask analysis is activated))	Trigger Out, Mask, Function Generator (labelled GEN OUT) UTILITY > Options > Auxilary. M242-243
Probe compensation	1kHz, 2.5V (measured)	1 kHz (meas.), 2.5Vpp (measured)	1 kHz (meas.), 2.5Vpp (measured)
Other IO	4 pin pattern generator		

Documentation

User manual	Well written and informative (609 pages) Updated with each new FW versions (nor 2.4) Also interactive online web version with very good search function[10]	Less informative, functions often poorly explained or missing altogether (352 pages)	Well written and informative (332 pages)
Programming guide (SCPI)	Part of User Manual Also interactive online web version (adapted to online environment)[11]	Separate (585 pages)	Separate (952 pages) Offers some information missing in the user manual[12] There is also a Windows HTML Help (*.chm) format file [13]
Service Guide			Verification, calibration etc. (57 pages)
Educator's Training Kit			For physics/EE students, quite informative and specifically highlights functions in this instrument (96 pages)
Other	Lots of white papers, application notes, etc.		Lots of white papers, application notes, etc.

[8] Manual does not mention keyboard but it works!
[9] A 50% duty cycle square with 260ns positive pulse has a period of 520ns and a frequency of 1 9MHz. So, with trigger actions above this frequency one will want to shorten the pulse width.
[10] https://www.rohde-schwarz.com/webhelp/RTB_HTML_UserManual_en/Content/welcome.htm
[11] https://www.rohde-schwarz.com/webhelp/RTB_HTML_UserManual_en/Content/welcome.htm
[12] Example: detailed description of all training signals on p.818 of Programming Guide.
[13] https://www.keysight.com/nl/en/assets/9018-17471/help-files/9018-17471.chm

User interface

Screen and graphical UI

Screen	10.1" (1280 × 800 pixel) 1.0 Mpixel Glossy[14]	10.1" (1024x600) 0.611 Mpixel Matte Backlight adjustable Display > Backlight. M303	7" (800x480) 0.32 Mpixel Matte
Touch screen	Touch/select, Swipe, Drag, Pinch, Two finger swipe[15]	Touch/select, Swipe, Drag, Pinch, Draw	
Languages	13 languages (FW1.203) Setup > Language. M198	10 languages Utility > Menu > System Setting > Language. M53,330	15 languages
Trigger indicator LEDs	Triggered	Ready, Triggered	
Screen/ control UI	++ (but some misses)	+ (but some misses)	No touch screen, a bit cumbersome menu structure
Toolbar	User-definable with 8 out of 24 icons selectable		
Undo, Redo	Undo: Reverses last actions step by step Redo: Recovers the undone steps in reverse order		
Menu History	Displays all menus used during the current session		
Other	QuickAccess: up to 10 parameters can be changed any moment in their own movable window (FW02.101)		
Help mode	Extensive context-based help Screen shortcut	Book style help pages Utility > Help	Extensive context-based help 3 second button push
UI responsiveness (buttons, controls and screen)	High. Responsiveness seems totally unrelated to system load.	Medium, somewhat sluggish. Under significant load, the instrument can become unresponsive to front panel controls[16]	High. Responsiveness seems totally unrelated to system load.
Experienced hangs/glitches	Extremely rare, none experienced since FW02.300	Infrequent hangs in UI when doing more advanced settings	None

Trace display

Temperature map waveform colour	Temperature, Fire, Rainbow, Individual per channel For A, R, M Vertical > Channel. M62	Rainbow Only global Display > Color Grade. M306	*"Signal detail is displayed using 256 levels of intensity."*
Trace intensity	{0-100%} INTENSITY Display > Intensities. M194	{0-100%} Default for front-panel dial UNIVERSAL Display > Intensity. M303	{0-100%} PUSH TO SELECT
Inverse Brightness	Supported Display. M194		
Persistence	Fully variable {50 ms to 12.8 s, ∞} Display. M193	{1, 5, 10, 30s, ∞} Display > Persistence. M306	Fully variable {100 ms to 60s, ∞} DISPLAY > Persistence. M86
Display types	{Vectors, dots} Display. M194	{Vectors, dots} Display > Type. M304	
Custom trace colour (Analog, Math, Ref)	R, M (not A) Individual colour per channel, also for math (FW02.300) and ref Individual colour per math channel Ref. M106,62	A (1.3.7R5), R, M Individual colour per channel, also for math and ref For A, LED buttons change colour accordingly Display > Color setting. M306	

[14] Those that do not like a glossy display, can consider adding a matte screen protector (the other way round is not possible).
[15] In history segments.
[16] Confirmed by others, see here.

Labels and annotations

		SIGLENT	KEYSIGHT TECHNOLOGIES
Analogue channel labels	Full text (8char) 39 presets[17] Vertical > Label. M63-64	Full text (20char) No presets	Full text (10 char) 75 presents
Digital channel labels	Full text (8char) 38 presets ("Clock", "MOSI", etc.) Logic > Label. M275	Full text (8char) (input is truncated[18]) Preset "ADR[0-15]" Preset "DATA[0-15]"	
Reference channel labels	Full text (8char) 7 presets Ref > Label. M106	Full text (20char) No presets	Full text (10 char) 75 presents
Math channel labels (scales)	Library of 75 scales (V, A, Ω, etc.) Math > Label	21 scales that adapt to input channels (e.g.: V·A=W)	9 scales that adapt to input channels (e.g.: V·A=W)
Serial bus labels	Full text (8char) 15 presents (specific for busses) Decode > Label. M217		Fixed label (according to chosen serial protocol)
Parallel busses labels	Full text (8char) 15 presents (specific for busses) Decode > Label. M217		Full text (10 char) 75 presents "AnalogBus"
Keyboard options for label entry	Onscreen USB keyboard	Onscreen USB keyboard	Rotary dial USB Keyboard
Label readability	Labels small but well readable	Analogue labels poorly readable Digital labels almost unreadable (no shadow)	
Screen annotation	Text (50+ characters), pencil drawings, colours Screen shortcut.M182		Text, 10 lines of 30 characters each, 10 colours, inverted

[17] Preset set for analogue channels is different from that for digital channels.
[18] The input field does not have a character limit. But after hitting enter, it becomes clear that all character beyond position 8 are discarded.

Grid customizability

		SIGLENT	KEYSIGHT TECHNOLOGIES
Grid divisions shown	12 horizontal, 10 vertical	10 horizontal, 8 vertical	10 horizontal, 8 vertical

Grid area occupied by menus	Pop-up icon bar takes 5% (½ div horizontal) of screen surface
	
	Pop-up settings menu takes 22% (2.5 div. horizontal) of screen surface
	
	Menu auto-hide: 8 seconds (for multi-option menus)
		Pop-up settings menu takes 14% (2.5 div. horizontal) of screen surface. With `Embedded` mode activated, the waveform screen is compressed and no div are lost. (1 3.7R5)
		`Display > Menu Style. M303`
		
		Menu auto-hide - Variable {Off, 3, 5, 10, 30, 60s)
		`Display > Hide Menu. M303`
			16% of the screen is always occupied by the menus. Does not cost horizontal divisions but makes the waveform area small on the already small screen.
			
			There is a Menu auto-hide (0-60s) but that brings the default menu in view so still taking space
			`Utility > Options > Menu Timeout`

Grid display	Grid types:
	• `Lines`: full line grid; H&V centre lines have tick marks
	• `Recticle`: grid crosshairs plus H&V centre lines with tick marks
	• `Off`
	`Display > Grid. M195`
	
	Grid intensity (0-100%)
	`Display > Intensities > Grid. M194`
		Grid types:
		• `Full`: dashed line grid; H&V centre lines with tick marks; 25% and 75% dashed horizontal lines
		• `Light`: H&V centre lines with tick marks; 25% and 75% dashed horizontal lines (no horizontal divisions visible)
		• `No grid`
		`Display > Grid. M303`
		
		Grid Intensity (0-100%)
		`Display > Graticule. M42`
			Grid intensity (0-100%)
			`DISPLAY > Grid > Intensity. M87`
			
			Fixed grid type: full line grid; H&V centre lines have tick marks
			
			Specific grid type for analogue video (Institute of Radio Engineers)
			`DISPLAY > Grid > Intensity. M86`

Grid track	When activated, grid moves horizontally and vertically with waveform repositioning `Display > Grid > Track grid. M195`		

Grid axis values	Horizontal and vertical values on the grid axis {On, Off}
	
	Values and units ("e.g., 40mV" or "–400 µs") switch automatically with selected channel.
	`Display > Grid > Annotation. M195`
		Horizontal and vertical values on the grid axis {On, Off} (FW 1.3.9R4)
		
		Values and units ("e.g., 40mV" or "–400 µs") switch automatically with selected channel. With four digits after the period this is not so readable
		
		Modes {moving, fixed}
		`Display > Axis label settings`
		`(missing in manual)`
			No axis values shown

Other customizability

Device name	Can be changed (for screen prints and device information fields) (FW02.400)		

LED lights/buttons brightness	Brighness (0-100%)
	`Front panel button INTENSITY`
	`Display > Intensities. M194`
		Brightness (0-100%)
		`Display > LEDlight. M303`	

Screen saver		Screen goes black after set time (Off, 1, 5, 10, 30, 60 min.) `Utility > System Setting > Screen saver. M00`	

Date/time	Supported. Time display on screen can be disabled (FW02.300)
	`Screen shortcut`
	`Setup. M00`
		Supported
		`Screen shortcut`
		`Utility > Menu > System Setting > Date/Time. M00`
			Supported
			UTILITY > Options > Clock.

Sound	Can be set at trigger event
	`Trigger. M86`
	Can be set at violation of mask
	`Mask > Actions. M154`
	General control events, e.g. changing the measurement type in the "Measure" menu.
	`Via SCPI command. M465`
		Can be set at violation of mask
		`Analyze > Mask test. M257`
		General buzzer sound {On, Off}
		`Utility > Menu > System Setting > Sound. M330`	

Acquisition system & memory

		SIGLENT	KEYSIGHT TECHNOLOGIES
Analogue channel sample resolution (ADC)	10-bit ADC (16-bit high-res decimation "mode") S.4	8-bit ADC[19] 10 bit "mode" up 10 to MHz using oversampling[20] Acquisition > Menu. M82. ENOB enhancement at lower bandwidth (see ERES at Math section) M222	8-bit ADC
Analogue channel sample rate (ADC)	2.5GSa/s (interleaved 2ch mode) 1.25 GSa/s (normal)	2 GSa/s (interleaved 2ch mode) 1 GSa/s (normal)	2 GSa/s interleaved 2ch mode) 1 GSa/s (normal)
Digital channel sample rate	1.25 GSa/s every channel	Up to 500 MSa/s	
Analogue channel memory depth (per channel)	10 Msample 20 Msample (interleaved 2ch mode)	100 Msample 200 Msample (interleaved 2ch mode) (Both half for 10 bit mode)	1 Msample 2 Msample (interleaved 2ch mode)
Digital channel memory depth (per channel)	10 MSa every channel	"Up to" 50 MSa every channel	
Segmented memory depth	160Msample	Not specified ?!?	Not specified ?!?
Waveform update rate	Up to 300,000 wfm/s in fast segmentated memory mode[21] Up to 50,000 wfm/s S.5	Up to 500,000 wfm/s in Sequence mode S.1 Up to 120,000 wfm/s S.4 Reduce waveform update rate {Fast, Slow} Acquire > Menu. M82.	Up to 200,000 wfm/s[22] S.12

Channels

Analogue channels

		SIGLENT	KEYSIGHT TECHNOLOGIES
Input impedance	1 MΩ	1 MΩ, 50 Ω	1 MΩ
Max voltage at channel input (Vpp)	400Vpp	400Vpp	200 Vpk
Channel overload warning	Yes (positive, negative)		
Probe Attenuation	4 presents; Fully variable (100µ to 10M) (equals 10^{-4} ~ 10^{7}) (V02.3) Front-key button [1] [2] [3] [4] Vertical > Channel > Probe Channel shortcut menu. M65	3 presents; Fully variable (0.000001 to 1000000) (equals 10^{-6}~10^{6}) automatic x10 probe sense for supported probes Channel shortcut menu. M67	16 presets (0.1X to 10,000X) (100m to 10M) in 1-2-5 sequence (equals 10^{-1}~10^{7})
Channel BW limit modes	20 MHz (also any value via math LPF) Front-key button [1] [2] [3] [4] Vertical > Channel Channel shortcut menu. M60	20 MHz, 200 MHz Front-key button [1] [2] [3] [4]	20 MHz (also any value via math LPF)
Coupling	DC, AC, GND Channel shortcut menu. M60	DC, AC, GND Front-key button [1] [2] [3] [4]	DC, AC
Vertical scale / Sensitivity (@ 1MΩ)	1 mV/div to 5 V/div Front-key button [1] [2] [3] [4] Front-panel dial [VERTICAL SCALE] Vertical > Channel. M61	500 µV/div – 10 V/div Front-panel dial [Vertical V-mV] Screen channel shortcut	1 mV/div to 10 V/div (500 µV/div mode is digital zoom[23])
Auto scale	Per channel: Autoscale (V02.101) Channel shortcut menu. M58 For all channels: Autoset [AUTOSET] Deeper check	For all channels: Auto Setup AUTO SETUP Acquire > Auto Setup	For all channels: Autoscale [AUTO SCALE]. M24
Vertical position	Front-panel dial [VERTICAL ▼▲] Front-key button [1] [2] [3] [4] Vertical > Channel. M61	Front-panel dial [Vertical s-nS] Screen channel shortcut	Front-panel dial [VERTICAL ▼▲]
Vertical position setting[24]	Position and Offset are simultaneously available in as menu items.	{Position, Offset}	Offset (in Volt)

[19] See https://www.eevblog.com/forum/testgear/high-resolution-adc-converters-in-oscilloscopes-(8-bit-10-bit-12-bit-14-bit).
[20] Https://www.eevblog.com/forum/testgear/siglent-sds2000x-plus-coming/
[21] Specification, p. 17: "continuous recording of waveforms in acquisition memory without interruption due to visualization; blind time between consecutive acquisitions less than 2.5 µs".
(up to 300 000 waveforms/s)
[22] Specifications are inconsistent. "≥ 200,000 waveforms/sec" (p.12), "Up to 200,000 waveforms/sec update rate" (p. 5)
[23] Instrument has 500 µV/div mode but the specifications (p.12) mention "500 µV/div is a 2X digital magnification of 1 mV/div setting."
[24] For 'Position' (in div) the entire wave goes up or down on the screen. For 'Offset' (in Volt): When AC wave is superimposed on, say, 8V DC, then this allows to put 8V at centre line and zoom in or out while the wave stays in position.

	The vertical rotary dial can be switched between the above modes (FW02.202) Vertical[25] > Channel. M57	Utility > Menu > Reference position. M337	
(De)skew (time compensation)	-500 to 500ns Front-key button Vertical > Channel Channel shortcut menu. M61-62	-100 to 100ns Front-key button	-100 to 100ns
Invert	Yes Front-key button Vertical > Channel. M61	Yes Front-key button	Yes
Channel hide	No (but inactive channel can be used for trigger, math, etc.)	Yes (hidden channel can trigger but inactive channel cannot trigger) (FW1.3.5R5) Screen channel shortcut Front-key button	No (but inactive channel can be used for trigger, math, etc.)
Copy settings to another channel		Yes ('Fast apply to") Screen channel shortcut	
Vertical scale units displayed on screen	V, A (attenuation adjusts) Front-key button Vertical > Channel > Probe. M66	V, A (attenuation adjusts) Front-key button	V, A (attenuation adjusts)
Turning analogue channel into digital (for Boolean logic)	Yes Threshold, hysteresis Front-key button Vertical > Channel > Threshold. M64		
Zero adjust (compensate for different ground levels of DUT)	Yes Front-key button Vertical > Channel. M61-62		

Digital channels

		SIGLENT	KEYSIGHT TECHNOLOGIES
Digital channels	16 channels	16 channels	
Predefined logic levels	TTL , CMOS 5.0 V, CMOS 3.3 V, CMOS 2.5 V, ECL, Custom Logic. M274	TTL, CMOS, LVCMOS3.3, LVCMOS2.5, Custom Screen (digital) channel shortcut	
Custom level	−2 V to +8 V in 10 mV steps Logic. M274	−10V to +10V in 1mV steps	
Hysteresis	{Low, Medium, High} Logic. M275, 80		
Display modes digital channels	Individual per channel, show 8 ch. as small block or large block, move as block	Fixed block; position and height of block can be set via menu (not vertical position rotary!)	

Reference waveforms

		SIGLENT	KEYSIGHT TECHNOLOGIES
	Front-key button REF References	Front-key button REF	
Number	4	4	2
Copy source (Analog, Digital, Math)	4A, 5M (specs: also D, R, spectrum)	4A, 16D, 2M	4A, 1M
Disk load/save	Load, Save From internal or external (See section Save and Recall below for details)	Save, Recall Only to external (See section Save and Recall below for details)	Save, Recall Only to external (See section Save and Recall below for details)

[25] Is in the top-level vertical menu (so tap the 'vertical' icon at right hand size of screen).

Math channels (excl. FFT)

		SIGLENT	KEYSIGHT TECHNOLOGIES
	MATH Math > Menu	MATH Math > Menu	
Math channels	5 channels (FW02.202)	2 channels	1 channel
Source (Analog, Math) (Zoom)	4A, (5-1M), constant No D	4A, (2-1)M (Zoom) No D (constant possible via formula editor)	4A
Total functions (excl. FFT)	19 (see below)	18 (see below)	5 (see below)
Filters	LPF (0-300MHz) (FW02.300) HPF (0-300MHz) (FW02.300)	No	LPF (0-70MHz)
Tracking	Period, Freq, PW, Duty cycle (FW02.400)	No	No
Formulae editor	No	Yes	No
Labels / scales of result	Library of 75 scales (V, A, Ω, etc.)	21 scales that adapt to input channels (e.g.: V.A=W)	9 scales that adapt to input channels (e.g.: VxA=W)
Other functions	11 trace colours Save & load math sets with up to 5 formularies (See section Save and Recall below for details);	Gate, Full text label (20char) check seems inconcistent with above.	

Overview of all Math Functions

Series	Symbol	Function inputs		SIGLENT	KEYSIGHT TECHNOLOGIES
Addition	+	2	Y	Y	Y
Subtraction	−	2	Y	Y	Y
Multiplication	X	2	Y	Y	Y
Division	/	2	Y (special treatment to prevent infinity)	Y	Y (divide by zero shown as zero result)
Identity *("Y" "Output of the trace itself")*	y			Y	
Absolute value	|y|		Y	Y	
Inverse	-y		Y	Y (Negation)	
Sign				Y (1.3.5R3)	
Reciprocal	1/x		Y (special treatment of second input is small to prevent infinity)		
Square	y^2		Y		
Square root	√		Y	Y	
Common Log.	lg or Log(10)		Y	Y	
Natural Log.	ln or Log(e)		Y	Y	
Exponential	e^x			Y	
Exponential10	10^x			Y	
Derivate (differential)	f' or d/dx		Y (const.) (FW02.202)	Y (Differential Interval Dx)	
Integral	∫dt		Y (time range via V-marker cursor) (FW02.202)	Y (DC Offset, time range via Gate values)	
Low Pass	LPF		BW: 0Hz to 300 MHz 2nd order infinite impulse response filter (IIR)		BW: 0Hz to 70 MHz 4th order Bessel-Thompson filter
Hight Pass	HPF		BW: 0Hz to 300 MHz 1st order infinite impulse response filter (IIR)		
Track Period			Upper Level (UL); Hyst, Edge (FW02.400)		
Track Frequency					
Track Pulse Width					
Track Duty Cycle					
Average *("Averages multiple traces [in time] and displays the resulting trace")*		2		Y (#, count, reset)	
ERES *("Average adjacent data into a point and rebuilds the trace") (removes HF noise)*				Y (enhanced bits 0.5 to 3)	

Interpolate *("Produce more points in the trace using sin(x)/x algorithm")*				**Y (Upsample Coef.)** (1.3.7R5)	
Total functions (excl. FFT)			**19**	**18**	**5**

Horizontal system & trigger

Horizontal modes

		SIGLENT	KEYSIGHT TECHNOLOGIES
Acquire mode * decimation mode: sample rate > ADC rate ** arithmetic mode: consecutive acquisitions	Sample, Peak Detect * High Resolution * Average (2-100k) ** Envelope ** Envelope+ Peak Detect Nx (samples per acq) selectable 1-13k Screen shortcut Acquisition. M55	Sample ("normal") Peak Acquire, Menu. M83 (Average available as math channel)	Sample ("normal") Peak Detect High Resolution Average (2-64k)
Horizontal Time scale X(t) (time base range)	1ns /div to 500s/div Front-panel dial HORIZONTAL SCALE Screen shortcut Horizontal > Time Scale. M68	1 ns/div – 1000 s/div[26]	5 ns/div to 50 s/div
XY	Two Y channels (simultaneous) Input: 4A Shows also time domain (YT) Trigger and time base intact App > XY	Single Y channel Input hardwired C1-Ch2 Acquire, XY Mode	Single Y channel Input hardwired C1-Ch2 Z-axis (blanking) via ext. trigger input ACQUIRE > Time Mode > XY. M43
Roll	Roll (default 500ms/div, selectable 50ms/div to 500s/div) (FW02.000) Start position left Math available (except HPF, LPF and tracking) Acquisition. M69	Roll (50 ms/div and slower) Start position right Math disabled Acquire, Roll	Roll (50 ms/div and slower) Start position right Math disabled
Interpolation modes	Sin(x)/x, Linear, S&H Acquisition. M70	Sin(x)/x (Sinc), Linear (X) Acquire > Menu. M82	Not specified
Offset positions	Check PS. Activate grid axis to see what you are doing!	Offset mode selectable in Utility > Menu > Reference position. M337 PS. Activate grid axis (default off) to see what you are doing!	
Reference point position	Left (10%), Centre (50%), Right (90%) Horizontal. M54		

Zoom

		SIGLENT	KEYSIGHT TECHNOLOGIES
Type of zoom	Horizontal, Vertical (FW02.202) ZOOM Screen shortcut	Horizontal, Vertical ZOOM Front-panel dial Zoom (click) Acquire, Zoom. M92	Horizontal — magnification glass —
Select horizontal zoom area	Draw zoom area Pinch zoom trace Timebase dial (position & scale) Menu with numerical values	Pinch zoom trace Timebase dial (position & scale) Menu with numerical values	Timebase dial (position & scale)
Select vertical zoom area	Draw zoom area Pinch zoom trace Vertical dial (position & scale) Menu with numerical value	Pinch zoom trace Vertical dial (position & scale) Menu with numerical values	
Split screen	Selectable windows size	Fixed windows (⅓ and ⅔)	Fixed windows (about ½ and ½)

[26] 0.5 ns/div – 1000 s/div when 500 MHz bandwidth option is installed

Trigger system

		SIGLENT	KEYSIGHT TECHNOLOGIES
Source	4A, 16D, Ext., AC Line, 2 Serial Dedicated source button with colour code	4A, 16D, Ext., AC Line, 2 serial	4A, Ext., AC Line, Wavegen, Wavegen Modulation
Channel selection	Always (on, off)[27]	When active or hidden (not off)	Always (on, off)[28]
Trigger mode	Auto, Normal AUTO/NORM Trigger > Trigger type. M76	Auto, Normal AUTO , NORM Trigger > Auto Trigger > Normal	Auto, Normal
Trigger start and stop	Run, Stop, Single Force trigger RUN/STOP (R/G LED) SINGLE (white LED) FORCE TRIGGER Screen shortcut	Run, Stop, Single RUN/STOP (R/G LED) SINGLE (G LED) Trigger > Single	Run, Stop, Single RUN/STOP (R/G LED) SINGLE (Orange LED)
Trigger types	6 (see below)	10 (see below)	7 (see below)
Type: Edge	{Rise, fall, alternate} Trigger > Trigger type. M76	{Rise, fall, alternate} Trigger > Menu. M101	{Rise, fall, alternate, either} M101
Type: Pulse width	Polarity {> < = ≠ inside outside} Delta Δ Threshold Hysteresis Trigger > Trigger type. M78	Polarity {> < inside outside} Trigger > Menu. M105	Polarity {> < inside}
Type: Video	Polarity, 5SD 3HD video standards, 3 interlace modes, line select Trigger > Trigger type. M80	Polarity, 4SD 4HD video standards, custom standard, 2 interlace modes, line select Trigger > Menu. M106	Polarity, 4 SD video standards, 3 interlace modes, line select
Type: Pattern	Up to 20 bits (4A 16D) {AND, OR} State: {H, L, don't care} {True, False, Goes True, Goes False} Analogue channels thresholds Time limitation {> < = ≠ inside outside} with Δ Trigger > Trigger type. M82	{AND, OR, NAND, NOR} State: {H, L, don't care} Goes Tru for OR and NAND, To False for AND and NOR Time limit range (AND and NOR only) Check in practice	"State"
Type: Serial	Supported Trigger > Trigger type. M342	Supported Trigger > Menu.	Supported
Type: Timeout	Supported (FW1.203) Trigger > Trigger type. M85		
Type: Edge within vertical window		"Window" Trigger > Menu. M111	
Type: Runt		Polarity, {> < inside outside}, upper time value Trigger > Menu. M116	
Type: Interval		Supported Trigger > Menu. M114	
Type: Dropout		Supported Trigger > Menu. M114	
Type: Setup and hold			Supported
Type: Slope (Rise/fall time)		Supported Trigger > Menu. M102	Supported
Trigger Zone		Trigger zone Trigger > Zone. M124-130	
Hold-off	For all trigger types (FW02.000) Time. Trigger > Trigger type. M76	For all trigger types except video and serial. Time or # of events Trigger > Menu. M120-121	Time
Trigger coupling	AC, DC Trigger > Coupling. M77	DC, AC (AC: 20Hz HPF, Ext. trig: 8 Hz HPF) Trigger > Menu. M122	AC, DC (AC: 10Hz HPF) (DC ext. trigger: 50Hz) TRIGGER > Coupling. M124
LF Reject	15kHz HPF[29] Trigger > Coupling. M77	1.2MHz HPF (EXT trig: 33kHz HPF) Trigger > Menu (part of Coupling menu)). M122, S11	50kHz HPF (ext. 50Hz) TRIGGER > Coupling > M124
HF Reject	5kHz LPF[30]	600Hz LPF (EXT trig: 967kHz LPF)	50kHz LPF

[27] Digital channels available while logic probe connected
[28] Digital channels available while logic probe connected
[29] Inconsistent with Specifications (p.5): "LF reject (attenuates < 50 kHz (meas.)"
[30] Inconsistent with Specifications (p.5): "HF reject (attenuates > 50 kHz (meas.)"

	Trigger. M77	Trigger > Menu (part of Coupling menu)). M122, S11	TRIGGER > Coupling > Reject. M124
Noise reject	Yes (extends the hysteresis to avoid unwanted trigger events)[31] Trigger. M77, 334	Yes (increases the trigger hysteresis) Trigger > Menu. M122	Yes (adds additional hysteresis to the trigger circuitry) TRIGGER > Coupling > Reject. M124
BNC pulse out (For pulse amplitude and with see IO/connections, above)	BNC pulse out ("AUX", front side) Shared connector, settings via: Trigger. M86	BNC pulse out ("Auxiliary Out", front side) (Output of Auxiliary Out connector is Trigger, except when Mask analysis is activated)	BNC pulse out ("GEN OUT"), front side) Shared connector, settings via: UTILITY > Options > Auxilary. M242-243
Actions on mask (other than BNC Pulse out)	Sound Screenshot Save waveform Save all channels to references Trigger. M86 (FW02.300)	BNC pulse out ("Auxiliary Out") see (Output of Auxiliary Out connector is Trigger, except when Mask analysis is activated)	

Tools

Cursor

Location on instrument	All settings in Cursor CURSOR	All settings in Cursor > Menu CURSOR	All settings CURSOR
Mode	• Manual (H, V, H+V) • Track (H+V) ("V-Marker"[32])	• Manual (H, V, H+V) • Track (H+V) • Measure (linked to a selected position in measure mode) (FW 1.3.9R4)	• Manual (H+V) • Track (H+V) • Binary[33] • Hex[34]
Source (Analog, Digital, Math, Ref) (Zoom)	4A, 16D, 5M, 4R	4A, 16D, 2M, 4R	4A, M, FFT, 2R
Different source for X1 and X2	Yes (FW02.400)	Yes	Yes
Cursor control rotary dial	Multifunctional dial	Multifunctional dial	Dedicated dial
Track scaling (when time base or vertical scale is changed)	Selectable ("Track Scaling")	Selectable separately for X and Y ("CursorX Ref", ("CursorY Ref)	
Coupling of cursor lines	Via "Coupling" {Off, On}	Via "X2-X1" or "Y2-Y1"	Via "X1-X2 Linked" or "Y1-Y2" Linked"
Measurement results in cursor mode	7 measurements: t1, t2, Δt, V1, V2, ΔV and ΔY/ΔX (in kV/s) (FW02.000)	7 measurements: t1, t2, Δt, V1, V2, ΔV and 1/ΔX (in MHz)	6 measurements: t1, t2, Δt, V1, V2, ΔV
Position of measurement results	Overlay of waveform	Overlay of waveform or movable table	Table (bottom)
Unit definition			X units {Sec., Hz., Phase[35], Ratio[36]} Y units {Base, Ratio[37]}

Measure

Location on instrument			
	All settings in Measure MEASURE	All settings in Measure > Menu MEASURE	All settings MEASURE
Measure positions	6 (FW02.400)	5	4
Source (Analog, Digital, Math, Ref) (Zoom)	4A, 16D, 5M, 4R	4A, 16D, 2M, 4R, 4Z, 4ZA, 16ZD	4A, M, (FFT: 6 only)
Measurement types	40 (incl. 2 in-between channel delays) M123	63 (inc. 10 in-between channel delays)	30
Functions		Trend, gates.	

[31] Manual page 334 also mentions additional 100 MHz LPF.
[32] V-Marker is in Type menu.
[33] Logic levels of displayed waveforms at the current X1 and X2 cursor positions are displayed in binary. The display is color coded to match the color of the related channel's waveform. Meaning: 1 is higher than trigger level, 0 is lower than trigger level.
[34] Logic levels of displayed waveforms at the current X1 and X2 cursor positions are displayed in hexadecimal. Meaning: 0x8 is higher than trigger level, 0X0 is lower than trigger level.
[35] With phase, X cursor = 360°.
[36] With ratio, X cursor is 100%.
[37] With ratio, Y cursor is 100%.

		Track (FW 1.3.9R4) TBA	
Quick measurement	9 measurement overlay with live trace ("Quick Meas") QUICK MEASURE	Table with 12 measurements Menu > Simple	Table with 26 measurements ("Snapshot All")
Histogram		Small histogram for each measurement position, one histogram can be zoomed	
Link measurements to trace display		In Cursor Measure Mode, H and V cursors show relevant measure points (gate positions, selected edges, rise time, duty cycle., etc.)	H and V cursors show relevant measure points (gate positions, selected edges, rise time, duty cycle., etc.)
Threshold settings for relevant measurements	Lower, Middle and /or Upper Level can be set manually (e.g., 10%, 50% 90%).	Lower, Middle and /or Upper Level can be set manually (e.g., 10%, 50%, 90%), or in voltages. (1.3.7R5)	Lower, Middle and /or Upper Level can be set manually (e.g., 10%, 50%, 90%), or in voltages.
Statistics	5 (Value, Min, Max, Mean, SD) + count (from FW02.400)	6 (Value, Min, Max, Mean, PP, SD) + count	5 (Value, Min, Max, Mean, SD) + count (from FW02.12)
Statistics – Count limit	check	1-1024, ∞	1-2000, ∞
Save measurementws and statisctics	Save measurements and statistics set to file (CSV)		
Statistics - Other			Option to show standard deviation/mean ("Relative σ") which is a dimensionless value Select FS/zoom

Overview of all measurement types

				SIGLENT	KEYSIGHT TECHNOLOGIES
	Measurement types	Dimen-sion	40 (inc. 2 in-between channel delays) NEW 33	63 (inc. 10 in-between channel delays) NEW 58	30 NEW 33
orizontal (time)	Frequency	Hz	Frequency	Freq	Frequency (Freq)
	Period	S	Period	Period	Period
	Duty Cycle +	%	Duty Cycle +	+Duty	+ Duty Cycle (+ Duty)
	Duty Cycle –	%	Duty Cycle –	–Duty	– Duty Cycle (– Duty)
	Pulse Width +	S	Pulse Width +	+Width	+ Width
	Pulse Width –	S	Pulse Width –	–Width	–Width
	Burst Width	S	Burst Width		
	Rise Time	S	Rise Time	Rise Time; 10-90%Rise[38]	Rise Time (Rise)
	Fall Time	S	Fall Time	Fall Time; 90-10%Fall	Fall Time (Fall)
	Slew rate+	MV/s	Slew rate+ (FW02.000)	PSlope (FW 1.3.9R4)	
	Slew rate-	MV/s	Slew rate- + (FW02.000)	NSlope (FW 1.3.9R4)	
	Delay to Trigger	S	Delay to Trigger (FW02.400)	Delay (same?)	
	Time from trigger to each rising edge[39]	S		T@M	
	Time of max value	S		Time@max	
	Time of min value	S		Time@min	
	Difference between two consecutive periods	S		CCJ	
	X at Min Y	S			X at Min Y (X@Min)
	X at Max Y	S			X at Max Y (X@Max)
Horizontal delay between two channels	Delay	S	"Delay" Settings on either channel: {Rising, Falling} (**) (4 combinations)[40]	"FRFR", "FRFF", etc. Settings on either channel: {Rising, Falling} {First, Last } (8 combinations)	"Delay" Settings on either channel: {Rising, Falling} (4 combinations) (did not get falling edges working)
	Phase	°deg	Phase (**)	Phase	Phase (degrees)
	Skew	S		Skew	
Vertical (amplitude)	Peak to Peak	V	Peak Peak	Pk-Pk	Peak-Peak (Pk-Pk)
	Peak +	V	Peak +	Max	Maximum (Max)
	Peak –	V	Peak –	Min	Minimum (Min)
	Amplitude (top to base)	V	Amplitude	Amplitude	Amplitude (Ampl)
	Top Level	V	Top Level	Top	Top
	Base Level	V	Base Level	Base	Base
	Mean Value	V	Mean Value	Mean	Average Full Screen (Avg-FS)
	Mean Value First Cycle	V	Mean Cycle	Cycle Mean	Average – Cyc (Avg-Cyc) (N cycles)
	Median (50% above 50% below)	V		Median	
	Median First Cycle	V		Cycle Median	

[38] The first variant measures between low threshold and high threshold (which can be manually set, like the other scopes, see above). The second variant is between 10% and 90%, which overlaps with the first variant.
[39] Creates multiple values in a single trace. So, if there are three edges after the trigger on the screen, the values may be 1µS, 2µS and 3µS. The histogram function can show these clearly. The shown "Value" is the last one (3µS) and the average would be 1.5 µS.
[40] Older FW02.300 had 36 combinations.

	RMS Value	V	RMS Value	RMS	DC RMS Full Screen (DC RMS – FS)
	RMS Value First Cycle	V	RMS Cycle	Cycle RMS	DC RMS – N Cycles (DC RMS – Cyc) (N cycles)
	RMS Cycle (AC only)	V			AC RMS Full Screen (Std. Deviation) (AC RMS – FS)
	RMS Cycle (AC only) First Cycle	V			AC RMS – N Cycles (AC RMS – Cyc) (N cycles)
	σ-Std. Deviation	V	σ-Std. Deviation	Stdef	
	σ-Std. Deviation First Cycle	V	σ-Std. Dev. Cycle	Cycle Stdef	
	Crest Factor	ratio	Crest Factor		
	Level at trigger	V		L@T	
	Pos. Overshoot	%	Pos. Overshoot	ROV	Overshoot (Over)[41]
	Neg. Overshoot	%	Neg. Overshoot	FOV	
	Overshoot before a falling edge	%		Preshoot(FPRE)	Preshoot (Pre)[42]
	Overshoot before a rising edge	%		Preshoot(RPRE)	
Counting	# of positive pulses on display	Cnt.	Positive Pulse	Ppulses	Positive Pulse Count (+ Pulse Count)
	# of negative pulses on display	Cnt.	Negative Pulse	Npulses	Negative Pulse Count (– Pulse Count)
	# of rising edges on display	Cnt.	Positive Slope	Rising Edges	Rising Edge Count (Rise Edge)
	# of falling edges on display	Cnt.	Negative Slope	Falling Edges	Falling Edges Count (Fall Edge)
	# of edges in a waveform	Cnt.		Edges	
	# of cycles in a periodic waveform	Cnt.		Cycles	
	Bit Rate	Mbps			Bit Rate
	Counter trigger level crossings during gate time	Hz			Counter
Area	.. waveform above zero	Wb[43]		+Area@DC	
	.. waveform below zero	Wb		–Area@DC	
	.. waveform	Wb		Area@DC	
	Absolute area of the waveform	Wb		AbsArea@DC	
	.. waveform above average	Wb		+Area@AC (1 3.7R5)	
	.. waveform below average	Wb		–Area@AC (1 3.7R5)	
	.. above average minus area of the waveform below average	Wb		Area@AC (1 3.7R5)	
	.. above average add area of the waveform below average	Wb		AbsArea@AC (1 3.7R5)	

DSOX xheck Counter check in manual

Digital Voltmeter (DVM)

Location on instrument		SIGLENT	KEYSIGHT TECHNOLOGIES
	App > Meter Quick Toolbar > Meter M165; S7		ANALYZE > Feature > DMM M196; S7,717
Positions (shown simultaneous)	4 positions		2 (one selected voltage plus frequency)
	3 digits		3 digits
Scale	Via analogue channel settings		• Via analogue channel settings[44] • Auto range mode for inactive channels (channel must not be selected for trigger)
Source (Analog)	4A, active or inactive		4A, active or inactive
Measurements	DC, AC, ACrms, DC+ACrms (DC only when channel set to DC, no warning)		DC, DCrms, ACrms (DC only when channel set to DC, otherwise automatic switch to AC) (Frequency shown simultaneously)
Other			Also works for disabled channels
Bandwidth (voltage measurements)	BW=1MHz		20 Hz to 100 kHz (for RMS) (warning when outside range)
Display	Display colour adapts to channel. Show in overlay window than can be moved.		Large readout seven-segment readout style. Display colour adapts to channel. • While in analysis mode: Results shown in overlay window (transparency selectable).[45]

[41] The edge that is closest to the trigger is measured (which can be seen by the shown X cursor). To switch between positive and negative overshoot, change the trigger.
[42] The edge that is closest to the trigger is measured (which can be seen by the shown X cursor). To switch between rising edge and falling edge, change the trigger.
[43] See discussion at https://electronics.stackexchange.com/questions/562058/siglent-sds1104x-e-integrate-function-units-of-measure
[44] But asynchronous from oscilloscope's acquisition system.
[45] When switching from Analysis to Measurement menu, there is weird interference with measurement window.

			Small analogue scale showing measurement extrema over last 3 seconds. • While not in analysis mode: results shown left bottom.

Frequency counter

		SIGLENT	KEYSIGHT TECHNOLOGIES
Location on instrument	App > Counter. M167, S7	Analysis > Counter. M264, S14	ANALYZE > Feature > DVM. M195, S7,17
Implementation	Separate from DMM (Separate freq. counter in Measurements) (Separate freq. track in Math)	(Trigger frequency is shown on the screen independent of the counter) (Separate freq. counter in Measurements)	Part of DMM (results shown simultaneously with voltage) (Separate freq. counter in Measurements) (Separate event counter with gate in Measurements)
Modes	Frequency, Period (shown simultaneous)	Freq, Period, Totalizer	Frequency
Inputs	4A, trigger, ext. trigger (Independent of DMM) (Independent of channel selected for trigger[46])	4A (Independent of channel selected for trigger but only works if trigger (level) for that channel is properly set[47]) Also works for serial trigger (1.3.7R5)	4A (Same channel as DMM) (Only works when channel is also selected for trigger[48], but independent of proper trigger level)
Digits	6 digits	7 digits	5 digits
Measurement rate	[Not specified]	100 times/second	[Not specified]
Totalizer gate / trigger modes		Totalizer can count rising or falling edges Gate mode: Voltage level, Polarity Trigger "After Edge" mode: Rising or falling edges (on gate channel); Level	
Statistics		Statistics (for Freq. and Period) (Value, Mean, Min, Max, Stdef, Count[49])	
Range	Up to scope bandwidth (350MHz), (limited if trigger filter is set)	Not specified	check (In Measurement Module, counter is up to scope bandwidth; 70MHz)

Bus decode

Serial bus decod

		SIGLENT	KEYSIGHT TECHNOLOGIES
Location on instrument	All settings in Protocol PROTOCOL	All settings in Analysis > Decode DECODE	
Bundle protocols	SPI, I2C, UART, CAN, LIN	SPI, I2C, UART, CAN, LIN	SPI, I2C, UART, CAN, LIN
Optional		FlexRay, MIL-STD-1553B, I2S, CAN FD Manchester[50], SENT (1.3.7R5)	
Source	4A, 16D (not M or R!!)	4A, 16D (not M or R!!)	4A
Simultaneous buses	2 (1 for 2-way protocols)	2	1

[46] In the FW02.400 manual (p. 167) it is called the "Trigger Counter" and the screenshot also shows this at the icon, suggesting its use is limited for the channel serving as trigger. But on the instrument, the text at the icon is different (just 'counter') and when used, it can just measure the frequency of any channel, whether selected for trigger or not.
[47] Alternatively, a "Level" setting van be used in the counter menu which is linked to the trigger level setting for that channel (if moved, trigger level moves, if trigger level moved, this level moves).
[48] If user selects other channel for trigger, the frequency counter automatically changes to voltmeter for the selected channel.
[49] Here, count represents is how many frequency data points have been gathered for the statistical analysis.
[50] Implemented without serial trigger function.

Settings	Extensive (threshold, timing)	Standard	Standard
Base display format	{Bin, Hex, Dec, Oct, ASCII}	{Bin, Hex, Dec, Oct, ASCII}	UART: {Hex, Bin, ASCII} Others: only {Hex}
Number of lines shown simultaneous in table/lister	20 lines shown (scroll option to see more)	7 lines shown (scroll option to see more)	9 lines shown (scroll option to see more)
Relation to trigger module	Both bus protocols automatically available in trigger module	Protocol settings copy to and from trigger	Both bus protocols automatically available in trigger module
Other	Compact display of bits above protocol decode (also when channels off)		
Label Lists	Label list (Protocol Translation Table) for I2C, CAN and LIN can be loaded from file. Examples provided. (FW1.203)		

Parallel bus decode

		SIGLENT	KEYSIGHT TECHNOLOGIES
Location on instrument	All settings in Protocol PROTOCOL	All settings: select digital channels, then Bus	Analysis > Features > Analog Bus ('ABUS') *Uses the analog channels with individual threshold*
Busses, word size	2 bus, 1-16 bit	2 bus, 1-16 bit	1 bus, 1-4 bit
Base display format	{Bin, Dec, Oct, Hex, ASCII}	{Bin, Dec, Unsigned Dec, Hex}	{Hex, Bin}
Screen position	Flex position & height	Flex position	Fixed
Other	Clocked and unclocked Assign custom bus label Bus table with timing		

Analyses

Mask (TBA)

		SIGLENT	KEYSIGHT TECHNOLOGIES
Location on instrument	All settings in APP > Mask App > Mask	All settings in Analysis > Mask	TBA
Mask	See page8 secs	Yes (80,000 Pass / Fail decisions each second.) on BNC	TBA
BNC pulse out (For pulse amplitude and with see IO/connections, above)	BNC pulse out ("AUX", front side) Pulse on check Mask > Actions. M154 Output settings AUX connector: Setup > Aux out. M27,177/178 Mask > Actions. M 154	BNC pulse out ("Auxiliary Out") Pulse on {Pass, Pail} see above (Output of Auxiliary Out connector is Trigger, except when Mask analysis is activated)	TBA
Actions on mask (other than BNC Pulse out)	Sound Stop acquisition Screenshot Save waveform Mask > Actions. M154		TBA

Bode (TBA)

		SIGLENT	KEYSIGHT TECHNOLOGIES
Location on instrument	All settings in APP > Bode App > Bode	All settings in Analysis > Mask	TBA
	Available (FW02.202)		TBA
Bode	A & ϕ Dual I think	3 DUT outputs, X and Y cursors, measure, table	TBA
	10 Hz to 25 MHz	10 Hz to 120 MHz	
	Amplitude zones, waveform view	5 measure modes	waveform view
		Singe sweep (FW 1.3.9R4)	

FFT (TBA)

Location on instrument	All settings in APP > FFT App > FFT	All settings in Analysis > Mask	
	Yes	Yes up to 2 Mpts	Yes
		Markers, auto peak	

Power Analysis (TBA)

Location on instrument		All settings in Analysis > Power Analysis	

Signal generators

Function generator

Location on instrument	All settings in Gen GEN	All settings in Utility > Awg Menu AWG	WAVE GEN
Basic waveforms	Sine SinC Rectangle (=square) Pulse (Duty Cycle, Edge Time) Triangle (Symmetry (FW02.400)) Ramp (Polarity) ARB (see below) Exponential (Polarity) [Noise as DC+Noise] DC	Sine Square (Duty Cycle) Ramp (Symmetry) Pulse (Pulse Width) Noise (StDev, Mean) ARB (see below)	Sine Square (Duty Cycle) Ramp (Symmetry) Pulse (Pulse width) Noise DC No ARB
DC offset	For all waveforms	For all waveforms except noise	For all waveforms
Invert	For all waveforms except DC		For all waveforms except DC
Add noise	For DC		Add noise {0-66%) for all waveforms except DC and Noise)
ARB waveforms: upload	TRF files (such as saved as a reference waveform) CSV files (such as saved as a regular waveform)	Yes (USBflash drive or EasyWave PC software)[51]	
ARB waveforms: presets	-	45 and 2 custom	
ARB waveforms: copy from trace	Supported, can copy any active analogue, math or reference channel. Graphic 'cut waveform' editor (FW02.202).		
Modulation	For all waveforms Mod. type {AM, FM, ASK, FSK} Mod. Function {Sine, Rectangle, Triangle, Ramp} Mod. Frequency Mod. Deviation		For Sine, Ramp Modulation type {AM, FM, FSK) Mod. Function {Sine, Square, Ramp} Mod. Frequency (for AM, FM) Mod. Deviation (for AM, FM) Hop Freq (for FSK) FSK Rate (for FSK)
Burst	Check for which waveforms (FW02.202) Yes (# cycles, idle time, start phase, trigger {Const./Manual})		
Sweep	Check for which waveforms Start Freq.,		

[51] In the device menu, there is 'USB' and 'Channel'. The latter is probably to retrieve stored waveforms but I get the error 'File does not exist". Probably one must first create a waveform using the EasyWave PC software and then 'store' them on the device using this software.
See also manual p. 313.

	Stop Freq., Sweep Time, Sweep {Linear, Log, Triangle}		
Max frequency sine/square/ARB	25/10/10 MHz	50/10/5 MHz	20/10/- MHz
Max amplitude (PP) 1MHz sine into open circuit	5Vpp	6Vpp [52]	12Vpp[53]
Logic level settings			Logic presets for all waveforms {TTL, CMOS 5.0, CMOS 3.3, CMOS 2.5, ECL)
Output definition (for showing correct amplitude and offset)	High-Z, 50Ω	High-Z, 50Ω	High-Z, 50Ω
Resolution, sample rate, waveform memory	14 bit, 250 MSa/s, 16 kpts	14 bit, 125 MSa/s, 16 kpts	check
Other		Over voltage protection {On, Off} when output higher than 4V)	
Other		Zero Adjust automatic calibration	

Pattern generator

		SIGLENT	KEYSIGHT TECHNOLOGIES
Location on instrument	All settings in Patt. Gen.		HELP, Training Signals
Number of output pins	4 pins (bits)		1 pin
Square wave	1 pin; Frequency (up to 500kHz) (or Period), Polarity, Duty Cycle		
Digital counter	4 pin counter (0000 0001 0010 etc.) Frequency (up to 50MHz) Direction (Up, Down)		
Arbitrary pattern	4 bits Bit time, Period Burst function (# bursts, idle time between) Pattern length up to 2048 symbols Build-in graphical draw tool Trigger (1 shot or repeat) Load/safe patterns in SCP format (remote commands format; command for pattern is on p.555 of manual). User utility allows Excel creation[54] User utility allows Excel creation[55]		
Burst	[part of arbitrary pattern, see above]		• Burst of digital pulses that occur every 50 µs • Burst of 6 digital pulses (plus infrequent glitch) that occurs once every 80 µs
Manual	Manual setting of the 4 pins		
UART	2 pins (Rx, Tx) 9600 Bit/s, 115.2 kBit/s, 1 MBit/s		
SPI	4 pins (Clk, Mosi, Miso, CS) 100, 250 kBit/s, 1 MBit/s		
I2C	2 pints (SCL, SDA) 100, 400, 1000, 3400 kBit/s		
CAN	2 pin (CAN-H, CAN-L) 50, 100 kBit/s, 1 MBit/s		1 pin (CAN-L) 125 kbp
LIN	2 pin (High, Low) 9.6, 10.417, 19.2 kBit/s		1 pin 19.2 kbs

[52] Yet, in Bode plot, the aplitude is apparently up to 24Vpp. See https://siglentna.com/wp-content/uploads/dlm_uploads/2021/10/SDS2000X-Plus-Firmware-Revision-Record-And-Upgrade-Instructions.pdf

[53] The manual states 5Vpp but on the device one can select up to 20Vpp

[54] See https://www.eevblog.com/forum/testgear/rohde-schwarz-rtb2002-rtb2004-question-importing-cvs-in-pattern-generator/

[55] See https://www.eevblog.com/forum/testgear/rohde-schwarz-rtb2002-rtb2004-question-importing-cvs-in-pattern-generator/

Training signals, demo modes

Location on instrument	APP > App > Demo		HELP, Training Signals HELP, Demo
Training signals	Serial protocols (8), using up to 4 wires (see Pattern Generator)		14 (glitches, bursts, distortion) 2 serial busses (CAN, LIN)
DEMO modes	Basic (3) Advanced (9) Serial protocol (6) Track (2) (FW02.400)		Triggering (2) Math (2) Advanced features (4) Serial buses (2: CAN, LIN)

Memory, history, search

Memory, segmented memory and history (TBA)

Location on instrument	@@	@@	@@
Memory	Total 40MSa	Total 4MSa	Total 200 MSa (data sheet says 200Mptd/ch)
History	13,107 segments	Up to 90,000 frames Analyse > Menu > History All settings in Analysis > History HISTORY	
Segments		Acquire > Sequence, M89	
	@@ In Acquisition memory at Sample etc the Nx Singlwe can set the number of samples into the memory. Acquisition, M69		
	@@ check record length in acquisition memory Acquisition, M67	Acquisition>Menu>	
Record memory depth	Setup > Language, M198	20k, 200k, 2M, 20M, 200M (half for four channel operation) Acquisition > Menu, M80-81	
Navigate		All settings in Analysis > Navigate NAVIGATE	

Search (events) (TBA)

Location on instrument	All settings in Search SEARCH	All settings in Analysis > Search SEARCH	

Computer access and automatization

Web-based remote access

		SIGLENT	KEYSIGHT TECHNOLOGIES
Remote Front Panel	Remote Front Panel (full panel with screen & buttons) {fixed res, autoscale} Works well with iPads.	Remote Front Panel (screen only) Remote Front Panel does not work properly with Apple iPad (tested regular 10.5" as well as the 10.2" Pro and 12.9" Pro). All have truncation and/or compression problems.	Remote Front Panel (full panel with screen & buttons) Works well with iPads. Remote instrument control requires separate firmware install Slow screen update rate.
Live screen	Live screen {fixed res, autoscale}		Live screen fixed res
Screenprint	Resolution 1280×824 Auto refresh (6 time settings) {PNG, BMP} {Color, Greyscale} {Non-inverted, Inverted}	Resolution 1024×600 (Screenshots part of remote panel)	Via `Get Image:` PNG 800×503 Option for inverted (=printer friendly colours) Via `Save` menu also {PNG (24 bit), BMP (8 or 24 bit} {Color, Greyscale} {Non-inverted, Inverted}
Save waveform from instrument to PC *(See also section Save and Recall for saving to USB).*	Selectable: 4 analogue channels 2 digital sets (D0-D7; D8-D15) 4 Reference waves 5 Math waves File formats {TXT, CVS, BIN-MDB, BIN-LSB, FLT[56]-MSB, FLT-LSB} Type {Display Data, Acq. Mem} Possibility to save to instrument memory itself (instead of to a PC)	Waveform data is saved as *.BIN file. For Windows PC users, a "Convert_bin_to_csv" tool is provided, along with a Python source file and an unreadable read.me file (!). (1.3.5R3) Not clear which waveform is saved (regardless of wave activation, the file is 20MB in size).	File formats: • CSV data (*.csv) • ASCII XY data (*.csv) • Reference Waveform data (*.h5)[57] {Ch1, Ch2, Ref} (No Ch.3, Ch.4, Math, Ref) • Multi Channel Waveform data (*.h5)[58] • Binary data (*.bin) (See @@ for details) Separate text file contains relevant instrument settings for saved data. For all the above formats, length is selectable.
Save other type of files from instrument to PC *(See also section Save and Recall for saving to USB).*	Setup Self-alignment Report		Setup Lister data (=serial decode table) Mask Frequency Response Analysis Data
Upload from PC to instrument *(See also section Save and Recall recalling from USB).*	Setup Waveform to Reference 1-4.		Any file type
SCPI Device Control (direct command entry screen)	SCPI Device Control	SCPI Device Control	SCPI Device Control (Includes extensive HMTL Quick Reference Guide)
Device I/O settings information	Extensive	Basic	Very extensive
LAN configuration	See & edit `Setup > Ethernet. M201`	See & edit `Utility > I/O setting > System Setting > LAN conf. M37`	See & edit . `UTILITY > I/O > Configure LAN. M234`
Password for Web Server		Can be set. `Utility > I/O setting > System Setting > Web Server. M334`	

[56] FLT is a Floating Point format.
[57] A format that can be recalled to one of the oscilloscope's reference waveform locations, or opened by the N8900A Infiniium Offline oscilloscope analysis software.waveform locations or read by the N8900A Infiniium Offline oscilloscope analysis software..
[58] A format that can be opened by the N8900A Infiniium Offline oscilloscope analysis software.

Computer software, automation interfaces

		SIGLENT	KEYSIGHT TECHNOLOGIES
Microsoft Windows application software	R&S InstrumentView. Download and analyze waveforms on the computer. Very extensive. No license needed.	None (Siglent EasyWave software can be used to make ARB patterns)	BenchVue. Connect, record results and visualize measurements across multiple instruments simultaneously. License included with instrument. Very extensive.
Instrument drivers	Drivers for IVI, LabVIEW, LabWindows, VXI, various computer platforms	IVI Driver	Drivers for IVI and MATLAB
USB device modes (USB-B connector on back side)	• USB TMC (Test & Measurement Class.). For SCPI via VISA library. • USB VCP (Virtual Com Port). Supports any any terminal program to send SCPI commands • USB MTP (Media Transfer Protocol) Screen shortcut Setup > USB. M204	Not specified Utility > I/O setting > System Setting > USB ID (shows ID).	Communication to Keysight IO Libraries [I assume NI VISA] USB (USBTMC/488)
LAN	• For access to web server • For SCPI via VISA library. VXI-11 Port can be set in instrument (default 1024). The assigned VISA address is shown. Screen shortcut Setup > Ethernet. M201	• [For access to web server] • SCPI commands via NI-VISA, Telnet, or Socket. VNC number can be set (necessary when accessing more than two Siglent instruments through the web browser) Screen shortcut Utility > I/O setting > System Setting > LAN conf. M37	Communication to Keysight IO Libraries [I assume NI VISA] • HiSLIP LAN protocol • VXI-11 LAN protocol • GPIB over LAN protocol • TCP/IP SOCKET protocol • TCP/IP TELNET protocol
Emulation modes		Tektronics emulation mode Not documented in manual[59] I Utility > Menu	
Web storage		Supports web storage. (FW1.3.9R4) Not documented in manual Utility > Menu > System Settings > I/O > Net storage.	
			Remote Command Logging UTILITY > Options > Remote Log. M244

[59] Might be similar to the Tek mode in the Siglent SDS5000X, see here.

System

Save and recall

		SIGLENT	KEYSIGHT TECHNOLOGIES
Device setup	Save, Load To and from internal or external File format: SET (instrument-specific[60]), based on SCPI commands Precise content of setup not specified[61] Setup files have small screenshot embedded for easy identification. These are visible in file manager in instrument when loading a file. SAVE/LOAD File > Setup. M177	Save, Load To and from internal (10 positions max) or external File format: XML (instrument-specific[62]), in XML style format Precise content of setup not specified[63] (I cannot reproduce the steps in Manual p.32 on the instrument…) Current setting can be saved as default set-up. SAVE/RECALL Utility > Save/Recall. M317, 319	Save, Load To and from internal (10 positions max) or external File format: SCP (instrument-specific[64]), in XML style format Saves the horizontal timebase, vertical sensitivity, trigger mode, trigger level, measurements, cursors, and math function settings SAVE/RECALL. P219
Waveform data (save)	Save To internal or external File formats {TXT, CSV[65], BIN-MDB, BIN-LSB, FLT[66]-MSB, FLT-LSB}. Source: • Selected waveform (4A, 16D) • All visible waveforms Choice of • Displayed waveform(s) • Acquisition Memory (for stopped acquisitions) • History Data (waveform plus CSV file with information about segments) Waveform data formats are discussed in detail, including examples, on p.180-182 of the manual; History & Segment files on p. 114-115 Possible to save FFT results SAVE/LOAD File > Setup. M180 114 Waveforms can also be saved as a "Trigger Action" or a "Mask Action".	Save (3 formats) Only to external File formats: CSV, MAT (Matlab format), BIN Source (only for CSV and MAT): • Selected waveform (4A, 2M (1.3.7R5)). Not FFT • All visible waveforms (1.3.7R5) For BIN, I guess all data are saved ?!? For CVS, option to include the scope configuration parameter information (horizontal time base, vertical scale, etc.) `ParaSwitch` For BIN, a Windows-PC Bin2CSV Tool is available. This way, the file from instrument to PC can be smaller. SAVE/RECALL Utility > Save/Recall. M318	Save Only to external File formats: CSV, ASCII XY, BIN, H5 (single waveform/reference waveform[67]), H5 (Multi Channel Waveform data[68]) Detailed information on waveform formats is in manual on pages 266, 273, 274. Number of data points to be saved (`Length`); detailed explanation M221 If segmented memory is active {Selected segment only, All segments} `Setup Info` option saves additional setup information in a separate TXT file ((vertical, horizontal, trigger, acquisition, math, and display settings). SAVE/RECALL. P220
Reference waveforms	Save, Load To and from internal or external File formats: CSV (load only), TRF (instrument-specific[69])	Save, Load Only to external[70] File format: REF (instrument-specific[71])	Save, Load Only to external File format: H5[73]

[60] This is a device specific format and files are not intended for analysis outside the instrument.
[61] But the file can be opened in a standard text editor and shows some 1400 comment lines of setup data.
[62] This is a device specific format and files are not intended for analysis outside the instrument.
[63] But the file can be opened in a standard text editor – there are roughly 3000 lines of XML language, a bit harder to understand by humans but might still be investigated.
[64] This is a device specific format and files are not intended for analysis outside the instrument. Yet, it is in an XML type of language so can be investigated.
[65] Files stored as *.CSV can be later loaded in the instrument again as reference waveforms.
[66] FLT is a Floating Point format.
[67] A format that can be recalled to one of the oscilloscope's reference waveform locations, or opened by the N8900A Infiniium Offline oscilloscope analysis software.waveform locations or read by the N8900A Infiniium Offline oscilloscope analysis software.
[68] A format that can be opened by the N8900A Infiniium Offline oscilloscope analysis software.
[69] This is a device specific format and files are not intended for analysis outside the instrument.
[70] Manual, p.320: *"*Save/Recall only supports saving Reference to external memory. However, the reference waveform itself can be saved to internal memory. See the chapter "Reference" for details."*
[71] This is a device specific format and files are not intended for analysis outside the instrument.
[73] A format that can be recalled to one of the oscilloscope's reference waveform locations, or opened by the N8900A Infiniium Offline oscilloscope analysis software.waveform locations or read by the N8900A Infiniium Offline oscilloscope analysis software.

	Waveform files saved as CSV format can also be loaded as reference and are converted into TRF by the instrument Reference files have small screenshot embedded for easy identification. These are visible in file manager in instrument when loading a file. REF Reference. M187	Bit confusing and possible mismatch between instrument and manual. On the instrument it seems you can: - save a source (4A, 2M) into *.REF. - recall (load) a *REF file into REFA to REFD position But this is at odds with the manual.[72] SAVE/RECALL Utility > Save/Recall. M317	SAVE/RECALL. P222
Math sets (equation sets; formularies)	Load, Save To and from internal or external File format: FML (instrument-specific[74]) FML files are instrument-specific[75] To/from internal or external (sets with up to 5 formularies) MATH Math. M187, 101		
Statistics	Save To internal or external File format: CSV; content described on page 134 of manual. Save icon overlaps with other icon[76] Save button shown right of statistics table. M133		
Decoded busses (results table)	Save To internal or external File format: CSV Possible for any parallel or serial bus Protocol. 187, 216		Save Only to external File format: CSV SAVE/RECALL. M222
Search results	Save (CSV file) SEARCH Search. M117		
Screenshots	Save (PNG, BMP) To internal (FW02.300) or external File formats: PNG, BMP Resolution 1280×824 {Color, Greyscale} {Non-inverted, Inverted} Option to disable device logo in screenshot (FW02.300) Option to close all menu's before screenshot (so they do not mask the results) CAMERA[77] SAVE/LOAD File > Screenshots. M187	Save Only to external File formats: PNG, BMP, JPG Resolution 1024×600 {Normal, Inverted} Print Area {Grid, Full} (FW 1.3.9R4) PRINT Utility > Print SAVE/RECALL Utility > Save/Recall. M318	Save Only to external File formats: PNG (24 bit), BMP (8 or 24 bit) Resolution 800x503 {Color, Greyscale} {Normal, Inverted} (Invert Grat) Setup Info option saves additional setup information in a separate TXT file ((vertical, horizontal, trigger, acquisition, math, and display settings). SAVE/RECALL. M19
Patterns (for pattern generator)	Load, Save To/from internal or external File format: SCP (remote commands format; command for pattern is on p.555 of manual). User utility allows Excel creation[78] Patt. Gen.		
Arbitrary waveforms (for signal generator	Load From internal or external File formats:		

[72] Manual (p 317) *states "The reference waveform data are saved to external memory with the *.ref file extension."* Bit I did not manage to do so.
[74] This is a device specific format and files are not intended for analysis outside the instrument.
[75] This is a device specific format and files are not intended for analysis outside the instrument.
[76] The SAVE icon overlaps with the R&S Menu logo on the right bottom. While one can still select either, one must take care.
[77] If only 'screen shot' is selected in OneTouch, a simple screenshot is saved. If other file types are also selected, a ZIP is created with all files including the screenshot.
[78] See https://www.eevblog.com/forum/testgear/rohde-schwarz-rtb2002-rtb2004-question-importing-cvs-in-pattern-generator/

	- TRF files (such as saved as a reference waveform) - CSV files (such as saved as a regular waveform)		
Mask	Load, Save (MSK) To/from internal only[79] File format: MSK (instrument specific)[80] APP > Mask App > Mask. M147		Save, Load (MSK) To and from internal (4 positions max) or external File format: MSK (instrument specific)[81] SAVE/RECALL. P223
Bode plot results	Save To internal or external File format: CSV file Save button shown in bode plot control menu. M171		Save To external only Format: CSV File with Frequency Response Analysis results In the saved file, there are three data columns: frequency (Hz), gain (dB), and phase (degrees). SAVE/RECALL. P219
File Manager or similar functions	Copy between internal memory and USB drive Supported File > Setup[82] M187 For reference waveforms, the file can also be converted between file formats. PS if no USB flash drive inserted, the menu stays grey File > Refences. M187	Windows-like file manager available in the Save/Recall menu Icons and explanation somewhat unclear SAVE/RECALL Utility > Save/Recall. M323	
Saving multiple type of files at once	"OneTouch" allows to save any combination of the below at the same time when touching the "photo" button on the front panel: Setup, Waveform[83], Reference Waveforms, Search Results, Decoded Bus Data, Statistical Results. They are saved as up to 7 files in one ZIP container. File > Onetouch. M187		
Secure erase	Deletes all configuration and user data. Setup > Secure Erase. M187	Not discussed in the User Manual. Is in a weird spot in the menu structure. SAVE/RECALL Utility > Save/Recall > Recall	Performs a secure erase of all non-volatile memory in compliance with National Industrial Security Program Operation Manual (NISPOM) Chapter 8 requirements. SAVE/RECALL > Default/Erase / Secure Erase
Documentation on saved file formats.	Extensive information provided	Minimal or no information, often inconsistent with instrument	Extensive information provided
Free user memory (for local storage)	Approx. 370MB Setup > Memory Usage. M178	Approx. 73MB (but user can only save setup files internally, not even screenshots…) Can be seen in File Manager menu while loading/saving	
Other			File name entry is via rotary dial (keyboard is no option for saving to external memory as the USB slot is occupied)

[79] But can be copied with file manager to external storage.
[80] This is a device specific format and files are not intended for analysis outside the instrument.
[81] This is a device specific format and files are not intended for analysis outside the instrument.
[82] Even though this is in the 'Setup' [file] menu, this function works for any type of file.
[83] Waveform is saved according settings possible in Waveform Save menu. These settings are shown in the OneTouch menu.

Other system features (TBA)

Are file formats open or proprietary? Properly defined and explained?			
Self alignment	Self alignment TBA Setup > Self alignment. M86, 461, 462	Yes TBA Utility > Do Self Cal. M343	TBA
User calibration			• "To perform user calibration" on page 245 "To display the user calibration status" on page 247
		Screen test LED test Keyboard/button test Utility > Do Self-Test > Screen Test Utility > Do Self-Test > LED Test Utility > Do Self- Test > Keyboard Test M340-342	hardware self test" on page 246 • "To perform front panel self test" on page 246 "To export crash log files" on page 246 UTILITY > Service
Probe compensation	Visually aided procedure Setup > Probe Adjust Vertical > Channel > Probe. M86, 461, 462	Yes TBA	Yes TBA
Default setting		Default can be set as either: • Factory set-up • A saved user set-up DEFAULT Acquire > Default Saving user setup: SAVE/RECALL Utility > Save/Recall. M317	Returns device to a default setup but 'leaving some user settings (not specified). Also described as bringing the "oscilloscope in a known operating condition" DEFAULT SETUP. M24 SAVE/RECALL > Default/Erase / Default Setup It is also possible to restore the device to factory setting via de SAVE/RECALL > Default/Erase / Factory Defaults. M225
Autoset	Per channel: Autoscale (V02.101) Channel shortcut menu. M58 For all channels: Autoset AUTOSET Deeper check	For all channels: Auto Setup AUTO SETUP Acquire > Auto Setup	For all channels: Autoscale AUTO SCALE. M24
Print to external printer			Supported USB or network printer Vasious other options SAVE/RECALL > Print. M229-232

Not yet in any of the above categories

		CLEAR SWEEP Acquire > Clear sweep	