Power of Ten


10-bit ADC
10 Msample memory
10" touchscreen
ROHDE&SCHWARZ
RTB2004 · Digital Oscilloscope · 2.5 GSa/s
Undo
Save Setup
Load Setup
Meter
FFT
Demo
Annotation
Delete
Auto
192 MSa/s
Run
Sample
tr: 29.46 µs
tf: 29.88 µs
MeanCyc: 9.28 mV
Vp-: -311.04 mV
RMS-Cyc: 223.10 mV
T: 100.01 µs
f: 10.00 kHz
Vpp: 643.55 mV
Aux Out
Pattern Generator
Probe Comp.
Logic Channels
D15 ... D8
D7 ... D0
Ext. Trigger In
Ch1
Ch2
Ch3
Ch4

10-bit ADC, 10 Msample memory and 10.1" capacitive touchscreen – the new R&S®RTB2000 tops the entry segment with a perfect "10" in three important areas. And that at a starting price of EUR 1,250. The unexpectedly rich feature set qualifies the instruments for innumerable measurement tasks in industry and education.

The R&S®RTB2000 series oscilloscopes set new standards in the entry class. That they are much more than ordinary oscilloscopes is obvious from their impressive functions that include an optional logic and protocol analyzer, signal waveform and pattern generator and digital voltmeter. They also feature dedicated operating modes for spectrum analysis, mask tests and long data acquisitions. They make debugging of all types of electronic systems easy and effective. And all of this comes at an extremely attractive price.

Video

10.1" high-resolution touchscreen with gesture support

The high-resolution, capacitive 10.1" touchscreen makes working with the R&S®RTB2000 a visual experience. That is by no means an unnecessary luxury for users who spend a large amount of time in front of an oscilloscope reading the display. At more than twice the size offered by other oscilloscopes in this class and with a resolution of 1280 × 800 pixels, the screen provides a richly detailed waveform display. Users also want fast and easy operation. The R&S®RTB2000 offers touch gestures for easy scaling, zooming and moving waveforms – familiar features from smartphones. Now even customers with a limited budget can enjoy such convenience features.

The user interface is the result of extensive usability studies. Based on higher-class models, it eases the transition from third-party products. A toolbar provides fast access to frequently used functions and the R&S®SmartGrid function makes optimal use of the screen for waveform display. All axes are labeled for quick recognition of signal characteristics. An annotation tool allows users to make notes directly on the screen or to highlight areas of interest (Fig. 1).

10-bit vertical resolution for visibly more signal details

Oscilloscopes measure voltage over time. The analog-to-digital converter performs a key function in this process. Its characteristics determine how well an instrument can resolve the amplitude of measured signals. For decades, the standard has been an 8-bit ADC with 256 levels. The Rohde&Schwarz 10-bit ADC used in the R&S®RTB2000 offers 1024 levels – four times that of other oscilloscopes in this segment.

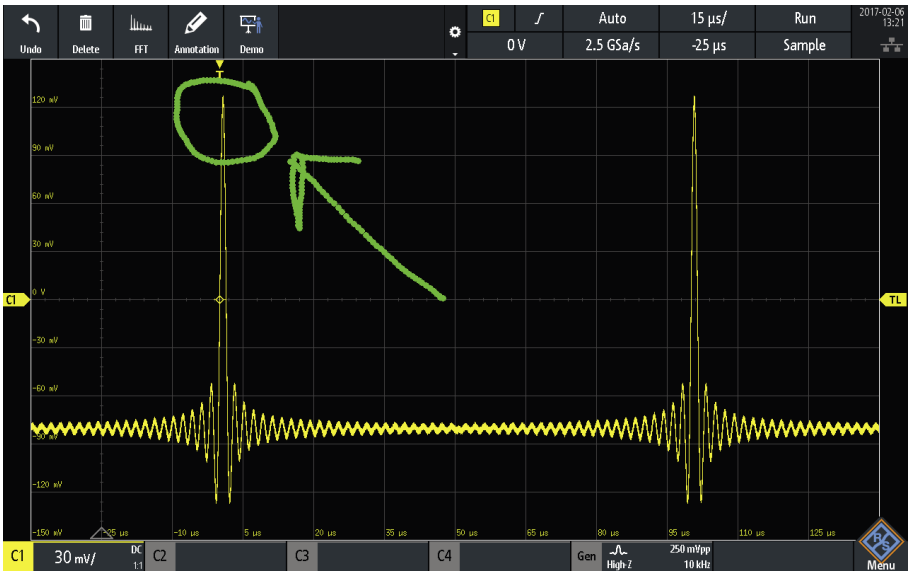


Fig. 1: The R&S®RTB2000 user interface with toolbar and R&S®SmartGrid axis labeling. The annotation tool allows users to draw directly on the screen – convenient for commenting and reports.

Video

The higher resolution permits more precise measurements and helps users detect very small among very large signals. Fig. 2 illustrates the advantage of the higher resolution at the end of an exponentially damped sine function. A large vertical scaling factor is required to fully display the initially high signal level of the sine waveform. The screenshot shows the portion of the time axis in which the amplitude has already dropped sharply. Shown underneath is the same waveform displayed while artificially limiting the ADC to 8 bit. The 10-bit resolution is much richer in details. The display on the R&S®RTB2000 can be improved even more by using averaging and special decimation with lowpass filtering. This significantly higher resolution can be the key to finding a problem within a circuit.

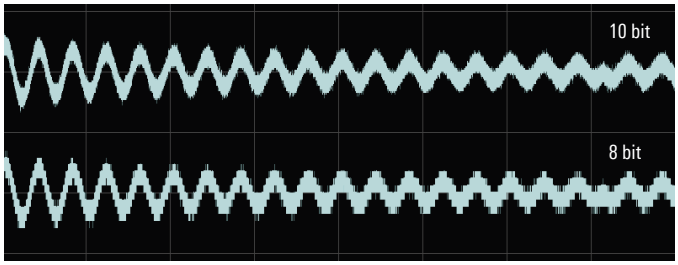


Fig. 2: Signal details of a decaying sine wave. Above is an R&S®RTB2000 oscilloscope with its standard 10-bit resolution. Below is the same signal with the ADC artificially limited to 8 bit.

Video

10 Msample standard memory allows longer acquisitions at full bandwidth

After the bandwidth and the sampling rate, the memory depth is the most important characteristic of an oscilloscope. It is the decisive factor in determining how well an instrument can be used for debugging. At 10 Msample per channel, the R&S®RTB2000 oscilloscope series has the largest acquisition memory in this class – ten times more than other instruments in this segment. In interleaved mode, the memory even increases to 20 Msample per channel. As a result, signal errors and important events are more reliably detected and the high sampling rate is retained even over long data acquisition times.

Long acquisition times are essential for analyzing serial protocols. The standard memory in the R&S®RTB2000 provides sufficient record length for the data telegrams of most buses (Fig. 3). The memory can be optionally expanded to a 160 Msample segmented memory. This mode records only the periods containing signals, such as protocol communications data or signal pulses. For example, protocol-based signals with communications gaps such as I²C or SPI can be captured over several seconds or minutes. Thanks to the variable segment size ranging from 10 ksample to 10 Msample, the 160 Msample memory can be optimally utilized; more than 13000 cohesive individual recordings are possible.

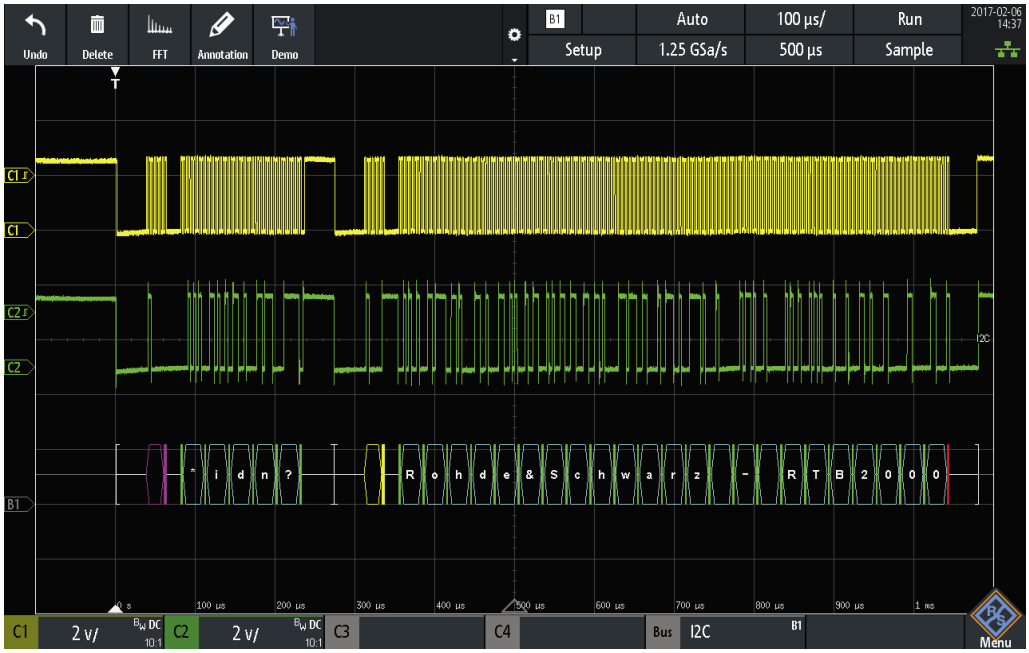


Fig. 3: The deep memory permits the acquisition of long signal sequences. This is especially useful when analyzing data telegrams and serial protocols.

Segmented memory in combination with the protocol trigger and decoding option turns the R&S®RTB2000 into a protocol analyzer capable of handling all the information in analog or digital signal sources.

Grows with your needs

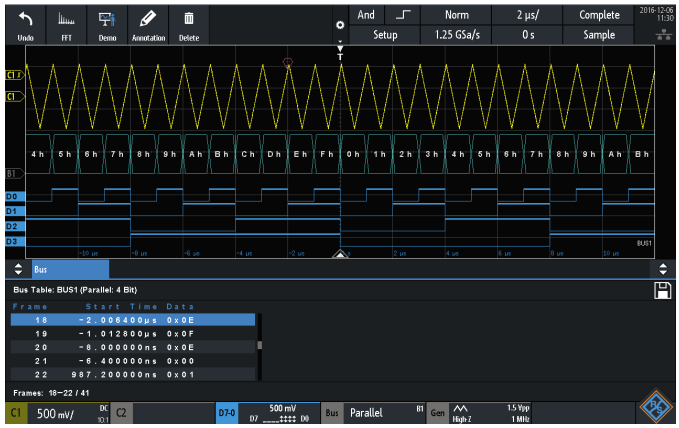
R&S®RTB2000 oscilloscopes can be purchased as 2-channel or 4-channel instruments with bandwidths of 70 MHz, 100 MHz, 200 MHz or 300 MHz. The price of the two-channel, 70 MHz bandwidth model starts at EUR 1,250. License keys are available to unlock upgrades up to 300 MHz bandwidth. The 4-bit pattern generator and the logic analyzer are also enabled using license keys. A secure investment with built-in upgradeability to meet future needs.

The three perfect 10s described here do not begin to cover all the oscilloscope highlights. Videos on our product webpage show what else users can look forward to. Here's a preview.

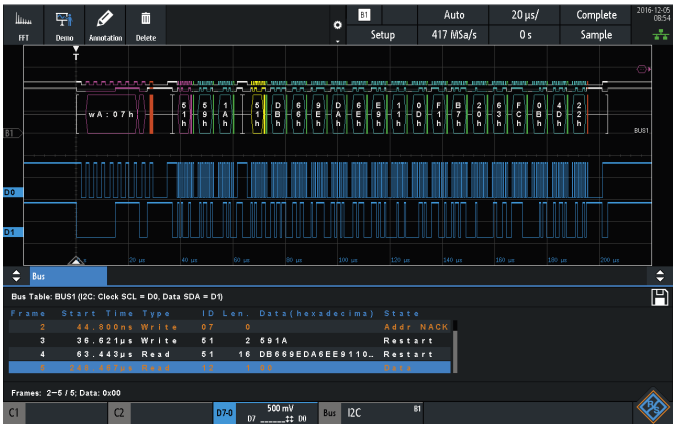
Dr. Philipp Weigell

Highlights at a glance

- 10-bit ADC
- 10.1" capacitive touchscreen
- 10 Msample standard memory, 20 Msample interleaved
- 160 Msample segmented memory for more than 13000 recordings
- Frequency range: 70/100/200/300 MHz
- 1 mV/div true vertical resolution
- History mode: analyze previous recordings
- 1.25 Gsample/s, 2.5 Gsample/s interleaved
- Logic and protocol analyzer, signal waveform and pattern generator, digital voltmeter, spectrum analyzer, mask tests
- Education mode to disable automated functionality
- Convenient reporting capabilities
- Localized GUI and online help
- Upgrade options via keycodes
- Web server functionality for instrument access
- Extensive range of probes and accessories

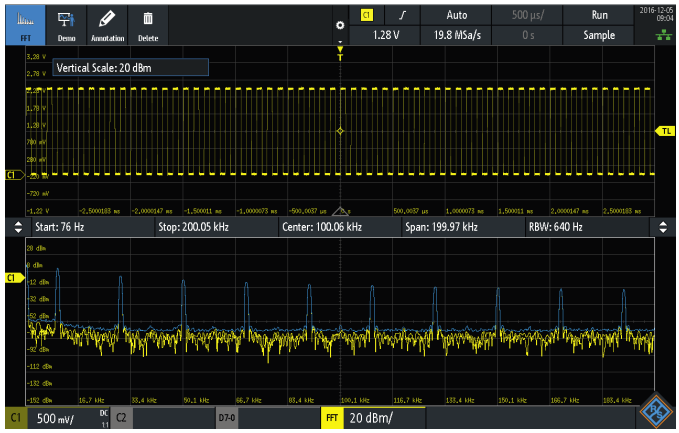


Logic analysis



Protocol analysis

Spectrum analysis



Mask test