TiePie Engineering from Scientech

Speed up your Innovation with a WiFi Oscilloscope

WiFiScope Connection possibilities

WiFi connected

Using a computer based oscilloscope was never easier than with the WiFiScope WS5: simply switch it on and start the software on the computer:

- no power cables required as it is battery powered and can operate hours on a fully charged battery

- no interface cables required as it uses WiFi to connect to the computer

This allows you to to measure fully floating, fully isolated from your computer. The WiFiScope WS5 can be placed near any test subject that may be hard to reach, or on moving objects, where wired connections are not possible.

Because the WiFiScope WS5 is not connected to the computer, there is no risk of damaging the computer.

LAN connected

When measuring in remote locations where a wired network is available, the WiFiScope WS5 can also be used through its LAN port. Measurements can then be performed from any location via the network, without having the computer to be close to the test subject.

Using its 1 Gbit LAN connection, the WiFiScope WS5 can achieve higher streaming performance than via WiFi.

LAN Cable, CAT 5e or better, 10m max.

USB connected

When wireless measuring or LAN connected measuring is not required or not possible, the WiFiScope WS5 can also be connected via its USB3 port. This gives the benefit of even higher streaming performance. Additionally, when connected via USB, the WiFiScope WS5 can be combined with oscilloscopes via its CMI interface.

USB Cable, 5M max.

Hardware features

This powerful high speed WiFi oscilloscope combines fast sampling up to 500 MSa/s with high resolutions of 12, 14 and 16 bit, a large memory of 64 MSamples and an extremely accurate built-in 40 MHz 14 bit Constant Data Size (CDS) arbitrary waveform generator with 24 V peak to peak output, generating true form signals. The oscilloscope supports continuous streaming measurements up to 20 MSa/s and can be synchronized with other oscilloscopes using the CMI interface to form a multi channel combined instrument with synchronized time base. The CMI interface is available by default on the WiFiScope WS5. Ωptionally, the WiFiScope WS5 can be delivered with SureConnect connection test and resistance measurement on each channel.

The flexibility and quality that the WiFiScope WS5 offers is unparalleled by any other oscilloscope and function generator in its class.

Rugged industrial design

The WiFiScope WS5 features a rugged design. Its enclosure is fitted with rubber protectors at the front and the rear. These protect the WiFiScope WS5 against damage by mechanical shocks. The rubber helps absorbing shocks and protects the connectors at the front and the rear of the WiFiScope WS5, these fall within the protected zone.

Additionally, the rubber prevents your WiFiScope WS5 from sliding. The rubber protectors have special notches that simplify stacking instruments. Holes are included that allow to connect a strap to hang the instrument near the test subject.

SureConnect

The SureConnect connection test feature of the WiFiScope WS5 tells you immediately whether your test probe or clip actually makes electrical contact or not. No more doubt whether your probe doesn't make contact or there really is no signal.

Multi instrument synchronisation

The WiFiScope WS5 is equipped with a sophisticated CMI synchronization bus, allowing to connect multiple WiFiScope WS5s to each other by means of TP-C50H Coupling cable CMIs, to use them as a combined instrument. All instruments will measure at the same sample frequency (0 ppm deviation!). Apart from a synchronization bus, the CMI also contains a trigger bus and a detection bus. The maximum number of instruments is only limited by the number available USB ports.

High accuracy

The WiFiScope WS5 measures with high resolutions of 14 and 16 bit. A signal measured with the WiFiScope WS5 therefore has 256 times more resolution than most standalone oscilloscopes, which usually have a low resolution of 8 or 9 bit. The high resolution of the WiFiScope WS5 precision oscilloscope allows for measuring signals with more accuracy, because the quantization error is much lower.
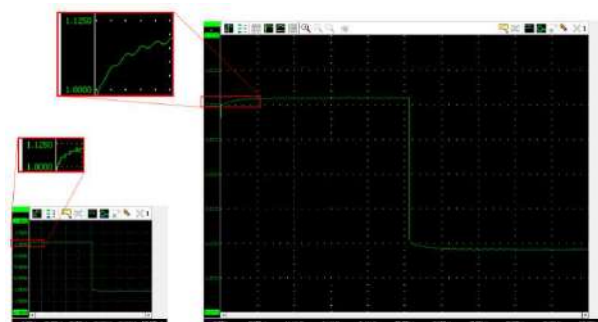
Large memory

When measuring at high sample rates, a long record length/large memory is necessary to be able to record a complete signal in the acquisition buffer. Where most oscilloscopes have 2.5 kSamples or 100 kSamples memory, the WiFiScope WS5 has 32 MSamples memory per channel. This gives the user 300 to 10000 times more memory. An advantage of a large memory is that once-only fast phenomena can be captured completely. For example complete serial communications, like CAN bus signals, can be measured all in one record to be reviewed and analyzed afterwards.
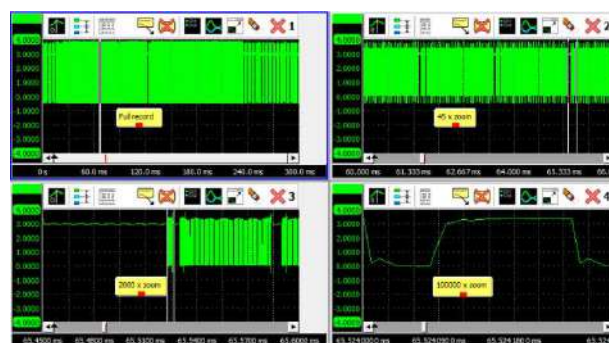
Low distortion Arbitrary Waveform Generator

The WiFiScope WS5 is the first High Resolution WiFi oscilloscope with built-in 30 MHz low distortion function generator. The built-in Arbitrary Waveform Generator uses CDS signal synthesis technology, developed by TiePie engineering, resulting in the best signal fidelity in its class, generating the true form of your signals. With spurious distortion as low as -85 dB at 100 kHz signal frequency, a very flat amplitude spectrum and a rise time of 8 ns, the low distortion function generator creates signals that approach perfection.

Oscilloscope and Generator synchronization

The High Resolution WiFi oscilloscope and the arbitrary waveform generator in the WiFiScope WS5 can be easily synchronized by setting the trigger source of the oscilloscope to one or more generator trigger events: start, stop and new period.

Software features
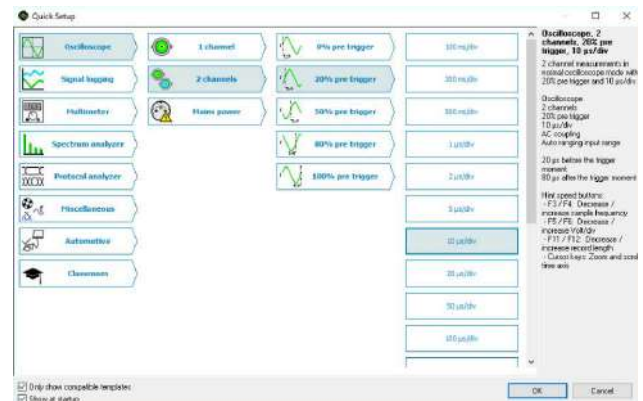
Versatile multi channel oscilloscope software

The WiFiScope WS5 is delivered with the versatile multi channel oscilloscope software, which transforms the WiFiScope WS5 into an oscilloscope, spectrum analyzer, data logger, multimeter and protocol analyzer.

Some of the powerful features of the multi channel oscilloscope software are indicated below, for a full description of the multi channel oscilloscope software, refer to the multi channel oscilloscope software pages.

Quick Setup

To simplify setting up the measurements, the multi channel oscilloscope software contains a large number of Quick Setups, for almost any application. A Quick Setup contains the basic settings for a specific measurement as well as additional information regarding the selected Quick Setup, like e.g. how your Handyscope and/or accessories need to be connected. Quick Setups can also contain reference signals. After loading the Quick Setup, that specific measurement can be performed and if needed, small adjustments to the setup can be made.

The Quick Setups are carefully organized in a tree structure, ordered by application. Just a few mouse clicks allow to perform a complex measurement.

Flexible signal displays

The multi channel oscilloscope software scope, spectrum analyzer and datalogger offer an ultimately flexible way to display all aspects of the measured signals. They can have one or more graphs, each displaying one or more signals, where each graph can display different parts of a signal. Graphs can display the signal(s) of your Handyscope in Yt mode, in XY mode or as frequency spectrum, with or without interpolation. Colors of all items in a graph can be set to any required value. Graph dimensions can be adjusted to any required size, graphs can be located in one single window or in separate windows, which can be located anywhere on the desktop.
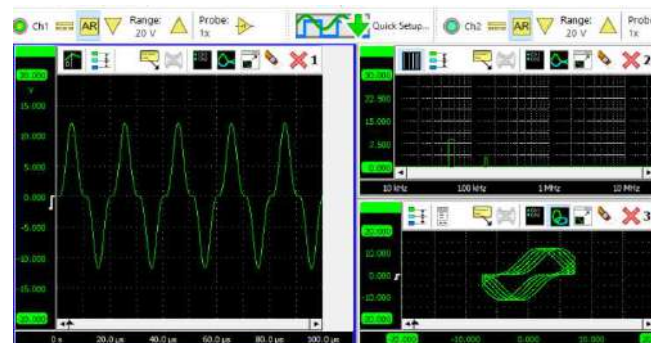
Comprehensive Arbitrary Waveform Generator

To generate your test signals, the multi channel oscilloscope software also includes a comprehensive Arbitrary Waveform Generator.

An arbitrary waveform generator is an instrument that can generate repetitive or single shot signals. The signals can have a predefined standard shape like a sine wave or a square wave as in a conventional function generator. However, the signals can also have an arbitrary shape, defined by the user. These signals can be created using the multi channel oscilloscope software or an external program or can be signals previously measured by the Handyscope and loaded in the generator.
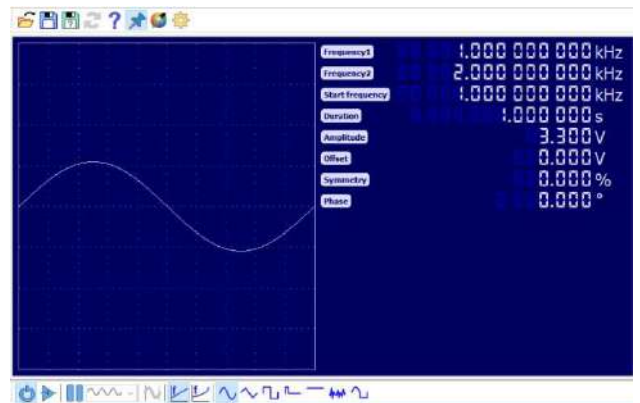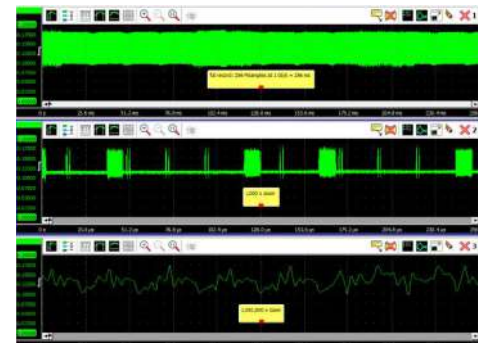
The multi channel oscilloscope software generator can be fully synchronized with the multi channel oscilloscope software oscilloscope, using the dedicated generator trigger signals, allowing the scope to trigger on the start of the generated signal, on each new period or on the end of the generated signal.

Unlimited zoom

When measuring at high sample rates, a long record length is a must, otherwise the acquisition buffer is full before the signal is measured. Therefore, our Handyscopes can have up to 256 MSamples record length per channel.

To view all that data conveniently and yet being able to see all details of the signals, the multi channel oscilloscope software scope, spectrum analyzer and data logger support sophisticated signal drawing routines with unlimited zooming capabilities. The full signal can be shown on any display size, without loss of information. Yet, you can zoom in to any required level, to see the finest details in the signals. Zooming factors of 1 million of even more are no problem, you can zoom in far beyond sample level.

High detail spectrum analyzer

The high detail multi channel oscilloscope software spectrum analyzer takes full benefit of the deep memory of the high resolution USB Handyscopes. Not only gives the deep memory an incredible low resolution bandwidth of just 7.45 Hz at a frequency span of 500 MHz, it also gives a vertical dynamic range of 140 dB. The fast and powerful FFT routines with many user selectable window functions allow you to see the smallest frequency components in your signals.
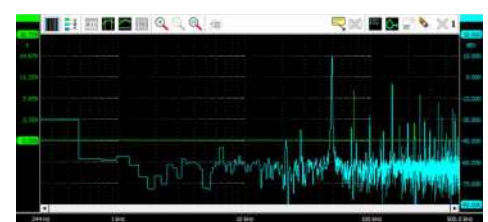
The multi display option of the multi channel oscilloscope software spectrum analyzer allows viewing multiple parts of the spectrum at the same time, giving a better understanding of the signals that are analyzed.

Technical Specification

Acquisition system

Number of input channels	:	2 analog
CH1, CH2	:	BNC

Type	:	Single ended		
Resolution	:	8, 12, 14, 16 bit user selectable		
DC Accuracy	:	0.25 % (0.1 % typical) of full scale ± 1 LSB		
Ranges (Full scale)	:	±200mV	±400m	±800mV
		±2V	±4V	±8V
		±20V	±40V	±80V
Coupling	:	AC/DC		
Impedance	:	1MΩ / 25 pF ± 1%		
Maximum voltage	:	200 V (DC + AC peak , 10 kHz)		
Maximum voltage 1:10 probe	:	600 V (DC + AC peak , 10 kHz)		
Bandwidth (-3dB)	:	at 75% of full scale input		
Ch1	:	250 MHz		
Ch2	:	100 MHz		
AC coupling cut off frequency (-3dB)	:	±1.5 Hz		
SureConnect	:	Ωptionally available (option S)		
Maximum voltage on connection	:	200 V (DC + AC peak < 10 kHz)		
Resistance measurement	:	Ωptionally available (option S)		
Ranges (Full scale)	:	100 kΩ	200 kΩ	500 kΩ
		1 kΩ	2 kΩ	5 kΩ
		10 kΩ	20 kΩ	50 kΩ
		100 kΩ	200 kΩ	500 kΩ
		1 MΩ	2 mΩ	
Accuracy	:	1 % of full scale		
Response time (to 95%)	:	< 10 µs		

Maximum sampling rate	:	WS5-540	WS5-530	WS5-220
8/12 bit, measuring one channel	:	500 MSa/s	500 MSa/s	200 MSa/s
8/12 bit, measuring two channels	:	200 MSa/s	200 MSa/s	100 MSa/s
14 bit	:	100 MSa/s	100 MSa/s	50 MSa/s
16 bit	:	6.25 MSa/s	6.25 MSa/s	3.125 MSa/s

Maximum streaming rate 1 2	:	WS5-540	WS5-530	WS5-220
8 bit, measuring one channel	:	40 MSa/s	40 MSa/s	20 MSa/s
8 bit, measuring two channels	:	20 MSa/s	20 MSa/s	10 MSa/s
12/14 bit, measuring one channel	:	20 MSa/s	20 MSa/s	10 MSa/s
12/14 bit, measuring two channels	:	10 MSa/s	10 MSa/s	5 MSa/s
16 bit	:	6.25 MSa/s	6.25 MSa/s	3.125 MSa/s

1. Ωn some computers, the highest streaming rates may not be available, due to computer restrictions.
2. When connected through WiFi, the maximum streaming rate is limited, and depends on the quality of the WiFi network.

Memory	:	Standard model	XM option
Measuring one channel	:	256 KSamples per channel	64 MSamples per channel
Measuring two channels	:	128 KSamples per channel	32 MSamples per channel

Sampling clock source

Internal	:	TCXΩ
Accuracy	:	± 0.0001 %
Stability	:	± 1 ppm over 0°C to 55°C
Time base aging	:	±1 ppm/year

External	:	LVDS, on auxiliary connectors
Input frequency	:	10 MHz ± 1 %
		16.369 MHz ± 1 %

Trigger

System	:	Digital, 2 levels
Source	:	CH1, CH2, ΩR, digital external, generator start, generator new period, generator stop
Trigger modes	:	Rising edge, falling edge, any edge, inside window, outside window, enter window, exit window, pulse width
Level adjustment	:	0 to 100 % of full scale
Hysteresis adjustment	:	0 to 100 % of full scale
Resolution	:	0.006 % (14, 16 bits) / 0.025% (12 bits)
Pre trigger	:	0 to selected record length, 1 sample resolution
Post trigger	:	0 to selected record length, 1 sample resolution
Trigger hold-off	:	0 to 63 MSamples, 1 sample resolution
Trigger delay	:	0 to 16 GSamples, 1 sample resolution
Segmented trigger	:	Available on models with extended memory option XM, available via LibTiePie SDK
Maximum number of segments	:	1024
Minimum segment length	:	1 sample
Maximum segment length	:	32 M / number of segments
		64 M / number of segments measuring one channel
Trigger rearm time	:	Sample frequency dependent, < 700 ns on highest sample frequency

Digital external trigger

Input	:	Extension connector pins 1, 2 and 3
Range	:	0 to 2.5 V (TTL)
Coupling	:	DC
Jitter	:	Depending on source and sample frequency
Source = channel	:	≤ 1 sample

Source = external or generator

Sample frequency = 500 MSa/s : ≤ 8 samples

Sample frequency < 500 MSa/s : ≤ 4 samples

Sample frequency ≤ 100 MSa/s : ≤ 1 sample

Arbitrary Waveform Generator (independent from acquisition system)

Waveforms

Standard	:	Sine, square, triangle, pulse, noise, DC

Signal characteristics

Sine	:	WS5-540	WS5-530	WS5-220
Frequency range	:	1 µHz to 40 MHZ	1 µHz to 30 MHZ	1 µHz to 20 MHz
Amplitude flatness	:	Relative to 1 kHz		
< 100 kHz	:	±0.1 dB		
< 5 MHZ	:	±0.15 dB		
< 20 MHZ	:	±0.3 dB (Amplitude ≤ 11 V (22 Vpp))		
< 30 MHZ	:	±0.4 dB (Amplitude ≤ 9 V (18 Vpp))		
< 40 MHZ	:	±1 dB (Amplitude ≤ 7.5 V (15 Vpp))		

Spurious (non harmonic)

< 100 kHz	:	-75 dBc
100 kHz to 1 MHZ	:	-70 dBc
1 MHz to 10 MHZ	:	-60 dBc
10 MHz to 15 MHZ	:	-55 dBc
15 MHz to 20 MHZ	:	-45 dBc
20 MHz to 30 MHZ	:	-35 dBc
30 MHz to 40 MHZ	:	-30 dBc

Square	:	WS5-540	WS5-530	WS5-220
Frequency range	:	1 µHz to 30 MHz	1 µHz to 30 MHz	1 µHz to 20 MHz
Rise/fall time	:	< 8 ns		
Ωvershoot	:	< 1 %		
Variable duty cycle	:	0.01 % to 99.99 %		
Asymmetry	:	0 % of period + 5 ns (@ 50 % Duty cycle)		
Jitter (RMS)	:	< 50 ps		

Triangle	:	WS5-540	WS5-530	WS5-220
Frequency range	:	1 µHz to 30 Mhz1	1 µHz to 30 MHz	1 µHz to 20 MHz
Nonlinearity (of peak output)	:	< 0.01 %		
Symmetry	:	0 % - 100 %, 0.1 % steps		

Pulse

Period	:	100 ns to 1000 s
Pulse width	:	15 ns to 1000 s
Variable edge time	:	8 ns to 1 s
Ωvershoot	:	< 1 %
Jitter (rms)	:	< 50 ps

Noise

  Bandwidth (typical)   : 30 MHz

Arbitrary	:	WS5-540	WS5-530	WS5-220
Frequency range	:	0.4 nHz to 30 MHZ	0.4 nHz to 30 MHz	0.4 nHz to 20 MHz
Maximum sample rate	:	240 MSa/s	240 MSa/s	200 MSa/s

  Length

    Standard model   : 1 to 256 KiSamples

    XM option   : 1 to 64 MiSamples

  Rise/Fall time   : < 8 ns

  Nonlinearity (of peak output) : < 0.01 %

  Settling time   : < 8 ns to 10 % final value

  Jitter (RMS)   : < 50 ps

Common characteristics

  Number of output channels : 1 analog, BNC

DAC resolution   : 14 bit

Ωutput range   : At open circuit

  frequency ≤ 10 MHz   : -12 to +12 V (24 Vpp)

  frequency ≤ 20 MHz   : -11 to +11 V (22 Vpp)

  frequency ≤ 30 MHz   : -9 to +9 V (18 Vpp)

  frequency ≤ 40 MHz   : -7.5 to +7.5 V (15 Vpp)

Amplitude

  Ranges (at open circuit) : 0.12 V (0.24 Vpp)

          : 1.2 V (2.4 Vpp)

          : 12 V (24 Vpp)

  Resolution   : 12 bit

  Accuracy   : 0.4 % of range

DC offset

  Range   : -12 to +12 V at open circuit

  Resolution   : 12 bit

  Accuracy   : 0.4 % of range

Noise level

  0.12 V range   : 900 µVRMS

  1.2 V range   : 1.3 mVRMS

  12 V range   : 1.5 mVRMS

CouplingDC

Impedance   : 50 Ω

Ωverload protection   : Ωutput turns off automatically when overload is applied. Instrument will tolerate a short circuit to ground indefinitely.

Burst

Waveforms	:	Sine, square, triangle, noise, arbitrary
Count	:	1 to 65535
Trigger	:	Software, external

Sweep : Available on models with extended memory option XM

Waveforms	:	Sine, square, triangle
Type	:	Linear, logarithmic
Direction	:	Up, down
Trigger	:	Software, external

System characteristics

System	:	Constant Data Size
Memory		
Standard model	:	256 KiSamples
Ωption XM	:	64 MiSamples
Ωperating modes	:	Continuous, triggered, gated

Maximum sample rate :

WS5-540	WS5-530	WS5-220
240 MSa/s	240 MSa/s	200 MSa/s

Sampling source	:	Internal TCXΩ
Accuracy	:	±0.0001 %
Stability	:	±1 ppm over 0°C to +55°C
Time base aging	:	±1 ppm/year

Multi-instrument synchronization

Combining instruments is only available when all instruments are connected via USB.

When instruments are connected via LAN or WiFi, combining is not available.

Maximum number of instruments	:	Limited by number of available USB ports
Synchronization accuracy	:	0 ppm
CMI interface	:	2x, CMI 1, CMI 2
Required coupling cable	:	TP-C50H Coupling cable CMI
Maximum coupling cable length	:	50 cm

Interface

Interface

USB	:	USB 2.0 High Speed (480 Mbit/s);
		(USB 1.1 Full Speed (12 Mbit/s) and USB 3.0 compatible)
Network	:	1 Gbps
WiFi	:	802.11

Power Requirements

Power	:	From USB, external input or built-in battery
Consumption	:	12 VDC 2 A max
External power	:	From power adapter
Internal battery	:	Li-ion
Capacity	:	7000 mAh, 3.7 V

Physical

Instrument

Height	:	44 mm (1,7 inch)
Length	:	187 mm (7.4 inch)
Width	:	215 mm (8.5 inch)
Weight	:	751 g (26.5 ounce)
USB cord length	:	1.5 m (59 inch)

I/O connectors

Channel 1, 2	:	BNC
AWG	:	BNC
USB	:	USB 3 type B Super Speed socket
LAN	:	RJ45 socket
Extension connector	:	D-sub 9 pins female
Power	:	3.5 mm power socket
CMI connectors	:	2 x HDMI type C socket

System requirements

PC I/Ω connection	:	USB 1.1, USB 2.0 or newer
		RJ45
		WiFi
Ωperating system	:	Windows 10, 32 and 64 bits
		Linux (via own developed software using the LibTiePie SDK)

Environmental conditions

Ωperating

Ambient temperature	:	15°C to 35°C within rated accuracy (10°C to 40°C without specifications)
Relative humidity	:	10 % to 90 %, non condensing

Charging

Ambient temperature	:	0°C to 35°C
Relative humidity	:	10 % to 90 %, non condensing

Storage

Ambient temperature	:	0°C to 35°C
Relative humidity	:	5 % to 95 %, non condensing

Certification and Compliances

CE mark compliance   :   Yes
RoHS   :   Yes

Package contents

The WifiScope WS5 is delivered with:

Carry case	:	Carry case BB452
Instrument	:	WiFiScope WS5
Probe	:	2x Ωscilloscope Probe 1:1-1:10 - HP-9250
Accessories	:	Handyscope / WiFiScope power supply
		USB3 cable, 1.5 m long
		network cable, 3 m long
Software	:	for Windows 10, via website
Drivers	:	for Windows 10, via website
Software Development Kit	:	for Windows 10 and Linux, via website
Manuals	:	instrument manual and software user's manuals
		color printed and digital, via website

Subject to Change