

## CS320: 2 Channel 100MS/s USB Portable Oscilloscope CS328: 2 Channel 100MS/s USB Portable Oscilloscope, 10MHz Waveform Generator & 8 Digital Inputs



### General

The CS320 & CS328 are a USB connected, PC hosted oscilloscope and spectrum analyzer. It is easy to use Windows program integrates with standard office applications.

Graphs and data can be copied and pasted to other applications, saved or loaded from disk, and printed.

CS320 offer excellent performance, 10 bit resolution at 100MS/s and 8M samples of storage. CS328 is equivalent to the CS320 with also available a waveform Generator 10MHz & 8 Digital Inputs

### Features

- Two 10 bit analog channels sampling simultaneously at 100MS/sec.
- One external trigger.
- Eight digital inputs sampling at 100MS/sec. (CS328)
- A rear panel I/O connector with a 100Mbit/sec bi-directional LVDS/RS422 link, and three RS422 outputs.
- Four Mega samples of storage, providing 40 ms of storage with 10 ns resolution.
- Anti-alias filter for improved Spectrum Analysis performance
- Triggered LED on the front panel
- 4 channels version with two units link together via trigger line, 16 I/O available

### Software

- Separate, freely moveable, windows to display the signal, a zoomed signal view, and the frequency spectrum of the signal.
- Spectrum analysis with a variety of conditioning windows.
- Signal averaging and filtering.
- Signal measurement, including peak, RMS, DC, pulse width, period and frequency.
- Copy and Paste to other applications.
- Save and Open from disk, including AutoSave following trigger.
- User chosen units and scaling.
- Text annotation of each graph.
- Web server for remote viewing of LAN connected unit.



## Specifications

### Acquisition

Acquisition Outputs	Waveforms: Sampled, Peak Detected, Filtered, Averaged and Spectrum
Acquisition Modes	Single Shot, Triggered, Automatic, Multiple Frame, Repetitive (High Frequency)
Acquisition Rate to PC, via USB	10 Frames per second
Acquisition Rate, multiple frame	Continuous capture until buffer is full (4000 frames of 1024 samples)

### Analog Inputs

Number	2
Input Coupling	DC, AC, GND
Input Impedance, DC coupled, all channels	1 M $\Omega$ $\pm$ 2% in parallel with 20 pF $\pm$ 3 pF
Probe Attenuation	1X, 10X
Maximum Voltage between Signal and Common at input BNC	300 Vrms (420V peak, duty cycle <50%, pulse width <100 msec) For steady state sinusoidal waveforms, derate at 20 dB/decade above 100 kHz to 10 Vpk at 3MHz and above.
Time delay between channels, typical	200 ps
Channel to Channel Crosstalk, typical	-70 dB at 20 MHz, signal at 0.5 Full Scale

### Vertical

Digitizers	10 bit resolution
Full Scale Volts Range	50 mV to 20V, 1X probe
Resolution	0.05 mV, 50 mV Full Scale.
Position Range	Full Scale Range as above moved anywhere in the range $\pm$ 12.5V with 10mV resolution.
Analog Bandwidth	120 MHz, -3dB
Instantaneous Capture Bandwidth	25 Mhz, with sin(x)/x interpolation
Repetitive Sampling Bandwidth	100 MHz, -3 dB
Analog Bandwidth in Peak Detect Mode	50 MHz
Analog Bandwidth with Anti-Aliasing filter on	25 MHz 5th Order 0.5 dB passband ripple, 50 dB down at 100MHz.
Analog Bandwidth with Moving avg filter on	2 MHz
Lower Frequency limit, AC coupled	10 Hz, 1x probe, 1Hz, 10x probe
Rise time at the BNC, typical	<3 ns
Peak detect response	Captures all pulses >10 ns in duration.
DC Gain accuracy	$\pm$ 3% for Sample or Averaged acquisition mode
DC Measurement accuracy	$\pm$ 3% for Sample or Averaged acquisition mode +0.1 division.
Delta Volts measurement	Volts between any two points, $\pm$ 3% for Sample or Averaged acquisition mode +0.02 division.

### Horizontal

Sample Rate Range	100 MS/sec to 1500 samples/sec
Waveform interpolation	Sin(x)/x
Record Length	1024 . 4 000 000 samples for each channel Up to 8 000 000 samples with option CS3XM
Sec/Div Range	10 ns/div to 5 s/div in 1,2,5 sequence
Sample Rate and Delay time Accuracy	+/-50 ppm over any >1 ms interval
Sample Clock jitter, typical	1 ps rms
Delta Time Measurement Accuracy	( $\pm$ 1 sample interval + 50 ppm +0.4 ns).
Position Range	+/- 21.47 secs of the trigger point, with 10 ns resolution.
Captured Sample window duration	1 usec . 40 msec with 10ns resolution 40 msec . 42.9 secs with 10ns - 10 us res (Lower sample rates are available for smaller capture buffer sizes)

## Specifications

### **Trigger**

Trigger Sensitivity, Edge Triggered

Analog Channels . 0.02 Div from DC to 50 MHz  
Analog Hardware Trigger . 0.5 div from DC to 100 MHz

External Trigger . 50 mV from DC to 100 MHz

Digital Inputs . 100 mV from DC to 100 MHz

Rear Input . 2.5V fixed

Trigger Modes

Edge, Window, Pattern, Pulse Duration

Trigger Filtering

Noise reject, HF reject, LF reject

Trigger Level Range

Internal:  $\pm 10$  divisions from center of screen

External:  $\pm 6.25V$  in 12 mV increments

Digital: 0 . 10V in 10 mV steps

Trigger Level Accuracy

Internal:  $\pm 3\%$

External:  $\pm 3\% + 50$  mV

Digital:  $\pm 3\% + 100$  mV

Holdoff Range

0 . 42.9 secs with 10ns resolution

Trigger Delay Range

0 . 21.47 secs with 10ns resolution.

### **Digital Inputs (CS328)**

Number

8

Input impedance

100k $\Omega$   $\pm 2\%$  in parallel with 10 pF  $\pm 2$  pF

Input voltage range -

16 to + 20V

Threshold range

0 . 10V in 10 mV steps

Threshold sensitivity

100 mV

Sample Rate

100 MS/sec

### **Calibration**

Calibration method

Automatic self calibration

Calibration Voltage Source

Range  $\pm 2.5V$

Resolution 1 mV

Drift 11 ppm/ $^{\circ}C$

Accuracy  $\pm 1\%$

Calibrated Temperature Range

0-40  $^{\circ}C$  in 1  $^{\circ}C$  steps

Temperature Compensation

Via Internal temperature sensor,  
 $\pm 1.5^{\circ}C$  accuracy

### **Displays**

Windows

Simultaneous Capture, Tracking, Spectrum,  
Information and Control windows

Capture window functions

Defines capture specification for signal acquisition unit, defining amount of time before trigger, amount of time after the trigger, lower amplitude limit, upper amplitude limit.

Defines Tracking graph time position, when tracking graph is linked.

Defines trigger level and direction

Full zoom and Pan in both axis.

Annotations.

Tracking window functions

Displays zoomed section of captured signal.

Resolution from 10ns to 5s/div.

Full zoom and Pan in both axis.

Annotations.

Spectrum window functions

Display spectrum of signal in capture window.

User definable bandwidth

User definable resolution

Full zoom and Pan in both axis.

Annotations.

Information window functions

Displays automated measurements (see below)

User chooses which measurements to show.

Control window functions

Provides graphical control horizontal and vertical settings.

Provides Sample control . single, triggered or automatic.

Provides access to tools . Pan, Zoom, Annotate, and Trigger setting.

Provides Autoscale control.

## Specifications

### **Measurements**

Cursors	Voltage Difference between cursors Time difference between cursors Reciprocal of $\Delta T$ in Hertz ( $1/\Delta T$ ).
Automated measurements	DC component RMS value Maximum voltage Minimum Voltage Peak-Peak Standard deviation Period Fundamental Signal Frequency Fundamental Signal Amplitude Pulse width Duty Cycle RT60
Custom units	6 characters
Custom signal names	20 characters
Custom scaling	Scale + offset by defining two ( $V_{in}, V_{out}$ ) points
User definable colours	Signals, Background, Major Grid, Minor Grid

### **Mathematical Functions**

Functions on one signal	Inversion, Differentiation, Integration
Functions between two signals	Addition, subtraction, multiplication, division, squaring, square root, (inverse) sine, cosine, tangent
Maximum number of mathematical operations	5

### **Spectrum Analysis**

Frequency Range	User definable, Range = $0 - F_{sample}/2$
Analysis Output	RMS Amplitude, Power, Power Density, Gain/Phase
Output type	Volts, Power, Gain/Phase in linear, dB, degree or radian values. Custom units can be applied.
Window types	None, Hanning, Hamming, Blackman-Harris, Flat top, Low Sidelobe
Averaging	Moving average, block average, peak hold.
Averaging method	Vector averaging in time domain if triggered. RMS averaging in frequency domain if not triggered.

### **Windows facilities**

Standard Functions	Copy and Paste Save and Open native format (saves full setup) Save and Open .csv text file Print with Date/Time, File Name and Description. Print Setup
Windows	Dynamically resized Can be placed anywhere on desktop Can be made to stay in front
User settable units	6 characters
User settable signal names	20 characters
User settable scaling	Scale + offset by defining two ( $V_{in}, V_{out}$ ) points
User definable colours	Signals, Background, Major Grid, Minor Grid