北京迪阳科技有限责任公司是大陆代理商: TEL : 010-62156134 FAX:010-68400238

Email: sales@pc17.com.cn

Cleverscope Model CS328A Data Sheet

Summary

Cleverscope Model CS328A is a USB connected, PC hosted oscilloscope and spectrum analyser. It‘s 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.

Cleverscope hardware resources include:

- ñ Two 10 or 12 or 14 bit analog channels sampling simultaneously at 100 MSa/sec.
- ñ One external trigger.
- ñ Eight digital inputs sampling at 100 MSa/sec.
- ñ A rear panel I/O connector with a 100 Mbit/sec bi-directional LVDS/RS422 link, and three RS422 outputs.
- ñ Four or Eight Mega samples of storage per channel, providing two or more frames of signal of 20 or 40 ms of storage with 10 ns resolution. (Total storage is 64 Mbytes, distributed over the sample space).
- ñ Anti-alias filter for improved Spectrum Analysis performance
- ñ A dual triggered system allow triggers on edge, slope, period, count conditioned by digital values.
- ñ Triggered LED on the front panel
- ñ An optional plug-in signal generator, 0-10MHz, sine, square or triangle.

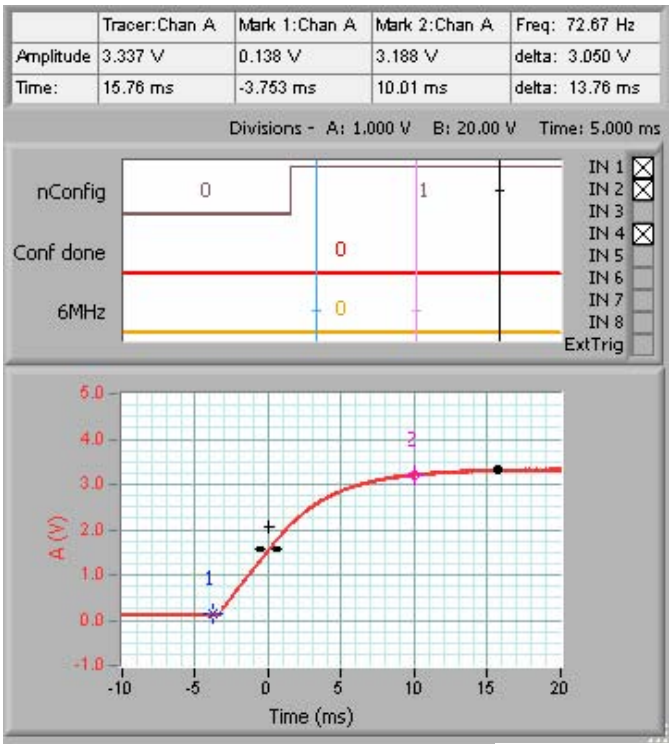
Cleverscope software resources include: ñSeparate, freely moveable, windows to display the signal, a zoomed signal view, and the frequency spectrum of the signal.

ñ Spectrum analysis with a variety of conditioning windows.

ñ Signal averaging and filtering.

ñF ull mathematical functions including + -/ * sqrt, transcendental functions, integral differential and filtering. Up to 8 user defined mathematical equations. ñLogging of derived values œ Frequency, RMS, p-p, period, DC, std dev and marker values. ñSignal measurement, including peak, RMS, DC, pulse width, period and frequency. ñCopy and Paste to other applications. ñSave and Open from disk, including autosave following trigger. ñUser chosen units and scaling. ñText annotation of each graph.

Here is a typical mixed signal window:



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Specification

Acquisition

Acquisition Outputs	Waveforms: Sampled, Peak Detected, Filtered, Averaged in PC, Averaged in Acquisition Unit, and Spectrum
Acquisition Modes	Single Shot, Triggered, Automatic, Repetitive (High Frequency), Multiple Frame
Acquisition Rate to PC, via USB	20 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 MWê2% in parallel with 20 pF ê3 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 10 MHz, 4V p-p signal.

Vertical

Digitizers	10, 12 or 14 bit resolution (depending on option module)

Full Scale Volts Range	20 mV to ê20V, 1X probe
Resolution	0.02 mV for 20 mV Full Scale.
Position Range	Full Scale Range as above moved anywhere in the range ê2.5V with 10mV resolution for full scale less than 5V, and anywhere in the range ê20V with 100mV resolution for full scale greater than 5V.
Analog Bandwidth	100 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	20 MHz 5th Order 0.5 dB passband ripple, 50 dB down at 100MHz.
Analog Bandwidth with Moving average filter on	1 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	ê1% for Sample or Averaged acquisition mode
DC Measurement accuracy	ê1% for Sample or Averaged acquisition mode +0.1 division.
Delta Volts measurement	Volts between any two points, ê1% for Sample or Averaged acquisition mode +0.02 division.

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Sample Rate Range	100 MSa/sec to 1500 samples/sec
Waveform interpolation	Sin(x)/x
Record Length	1024 œ 4 000 000 samples for each channel
Sec/Div Range	1 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	(ê1 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 œ 40 msec with 10ns resolution 40 msec œ 42.9 secs with 10ns -10 us resolution. (Lower sample rates are used for smaller capture buffer sizes)

Trigger

Number of triggers	2
Trigger sources	Each trigger can be independently set to source from Channel A, Channel B, Ext Trig, Link Input, and Digital Inputs 1-8 as a pattern.
Trigger Sensitivity, Edge Triggered	Analog Channels œ 0.2 Div from DC to 50 MHz External Trigger œ 50 mV from DC to 100 MHz Digital Inputs œ 100 mV from DC to 100 MHz
Trigger Modes	Edge, Pattern, Pulse Duration, Voltage slope, Voltage Window, Count
Trigger Filtering	Noise reject, HF reject, LF reject
Trigger Level Range	Internal: defined by scope graph. External: ê20V in 40 mV increments Digital: 0 œ 8V in 10 mV steps
Trigger Level Accuracy	Internal: ê1% External: ê3% + 50 mV Digital: ê3% + 100 mV
Trigger Delay Range	0 œ 21.47 secs with 10ns resolution.

Digital Inputs

Number	8
Input impedance	100kWê2% in parallel with 10 pF ê2 pF
Input voltage range	-16 to + 20V
Threshold range	0 œ 8V in 10 mV steps
Threshold sensitivity	100 mV
Sample Rate	100 MSa/sec

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Calibration method	Automatic self calibration
Calibration Voltage Source	Range ê2.5V Resolution 1 mV Drift 11 ppm/èC Accuracy ê1%
Temperature Compensation	Via Internal temperature sensor, ê1.5èC accuracy

Displays

Windows	Simultaneous Capture, Tracking, Spectrum, Information, Maths, XY 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. Custom colours
Tracking window functions	Displays zoomed section of captured signal. Resolution from 10ns to 5s/div. Full zoom and Pan in both axis. Annotations. Custom colours
Spectrum window functions	Display spectrum of signal captured in capture window. User definable resolution Full zoom and Pan in both axis. Annotations. Custom colours
Maths window function	Displays results of Maths equations. Maths equations are user entered expressions involving any of the inputs (analog and digital), previous maths equation line results, and an arbitrary number of function results (+ -* / sqrt, power, log, ln, all transcendental functions, equality functions).
XY window function	Displays XY graph from source (Capture, tracking, spectrum, or Maths
Information window functions	Displays automated measurements (see below) Used to log derived information values to disk, with a period of between 0.05 œ 86,400 secs per sample.

Control window functions	Provides Trigger settings œ analog and digital Provides Sample control œ single, triggered or automatic. Provides access to tools œ Pan, Zoom, Annotate Controls Frame store Controls Spectrum resolution, acquisition method and averaging

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Cursors	Voltage Difference between cursors Time difference between cursors Reciprocal of DT in Hertz (1/DT).
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 Freq and Amplitude for fundamental + second and third harmonics THD SINAD HD2+3
Custom units	6 characters
Custom signal names	20 characters
Custom scaling	Scale + offset by defining two (Vin,Vout) points
User definable colours	Signals, Background, Major Grid, Minor Grid

Mathematical Functions

Functions over the signal	Differentiation, Integration, Filtering
Functions on a data point	Addition, subtraction, multiplication, division, squaring, square root, (inverse) sine, cosine, tangent, tangent, log, sign etc. Equality operations.
Maximum number of sequential mathematical equations	8

Spectrum Analysis

Frequency Range	User definable, Range = 0-1/Scope Graph DT Frequency axis œ log or linear.
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.

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Standard Functions	Copy and Paste Save and Open native format (saves full setup) Save and Open tab delimited text file Save and Open binary file (start time, dt, data) Print with Date/Time, File Name and Description. Print Setup
Windows	Dynamically resized Can be placed anywhere on desktop
User settable units	6 characters
User settable signal names	20 characters
User settable scaling	Scale + offset by defining two (Vin,Vout) points
User definable colours	Signals, Background, Major Grid, Minor Grid

Probe Compensator Output

Output Voltage, typical	2V into >100kΩ load
Output Frequency	1 kHz

Power Source

Source voltage into unit	6-20V DC
Power Consumption	6W
Standard power adaptor voltage range	100 œ 240VAC 50-60 Hz

Environmental

Temperature	Operating: 0èC to +40èC Storage: -20èC to +60èC
Cooling Method	Convection
Humidity	0èC to +40èC <90% relative humidity >40èC <60% relative humidity
Altitude	Operating 3,000 m Non-operating 15,000m

Mechanical

Size	Height	35 mm
	Width	153 mm
	Depth	195 mm (including BNC)
Weight (approx)		Standard packaging: 1.6 kg

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Signal Generator Plug-in CS700A

Function	Generate Sine, Square or Triangle output signals
Generation Method	Direct Digital Synthesis
Output Sampling Rate	50 MSa/sec
Frequency Range	Sine, Square: 0.2 Hz œ 10 MHz Triangle: 0.2 œ 1 MHz
Resolution	0.003 (<750 kHz) or 0.2 (<10 Mhz) Hz

Accuracy	50 ppm in 1 year, 0-40 deg C
Output Voltage Range	100mV œ ê5V p-p including DC offset
Output Voltage Resolution	10 mV
Output Impedance	50 ohm
Output Voltage Offset Range	-4 to +4V
Output Voltage Offset Resolution	10 mV
Frequency Shift Range	Any two frequencies in range 0.2Hz œ 10 MHz
Signal to Noise Ratio	-60 dBc typical
Total Harmonic Distortion	0 œ 1 MHz : < -60 dBc > 1 MHz: < -45 dBc
Amplitude Flatness	± 0.2 dB
Amplitude Accuracy	± 2%
Square Wave Rise/Fall Times	< 12 ns
Protection	Short Circuit Protected ± 10V peak overdrive < 1 min

Sampling

Increase in sampling channels	Stack two units on top of each other. Uses two USB links, and Trigger link cable. Delivers 4 analog, and 16 digital channels.
Increase in sampling rate	Using 5ns delay line, and Maths ”Interleave‘ function, increases sample rate to 200 MSPS.