

# EE-206

# Systemes de mesure

# Lesson Outline

- Digital oscilloscope
- Library installation
- Coding example

# Digital oscilloscope

A digital oscilloscope is an indispensable tool to solve most measurement challenges quickly and accurately.

The full denomination is digital storage oscilloscope (DSO) as it stores and analyses the signals digitally rather than using analog techniques, with advanced functionalities:

- save point-on-wave data;
- different trigger settings;
- channel-specific scales;
- processing routines (e.g. DFT).

# HDO4034a

Teledyne Lecroy HDO4034a (high definition) specs

- 4 input channels ( $\pm 10$  V)
- 350 MHz bandwidth
- 12-bit ADC resolution
- 10 GHz sample rate
- HD4096 12.1" monitor
- 12.5 Mpts per channel
- i3-6100 quad core 3.7 GHz
- 8 GB RAM, Windows 10



# HDO4034a

It is provided with several measurement and math tools...

Measurement Tools		Math Tools	
Measurement Functionality	Display up to 8 measurement parameters together with statistics, including mean, minimum, maximum, standard deviation, and total number. Each occurrence of each parameter is measured and added to the statistics table. Histograms provide a fast, dynamic view of parameters and waveshape characteristics. Parameter gates define the location for measurement on the source waveform.	Math Functionality	Display up to 2 math functions traces (F1-F2). The easy-to-use graphical interface simplifies setup of up to two operations on each function trace, and function traces can be chained together to perform math-on-math.
Measurement Parameters - Horizontal + Jitter	Delay (from trigger, 50%), Duty Cycle (50%, @level), Edges (@level), Fall Time (90-10, 20-80), Frequency (50%, @level), Period (50%, @level), $\Delta$ Period (@level), Phase (@level), Rise Time (10-90, 20-80), Skew, Time (@level), $\Delta$ Time (@level), Width+, Width-	Math Operators - Basic Math	Average (summed), Average (continuous), Difference (-), Envelope, Floor, Invert (negate), Product (x), Ratio (/), Reciprocal, Rescale (with units), Roof, Sum (+).
Measurement Parameters - Vertical	Amplitude, Base, Maximum, Mean, Minimum, Peak-to-Peak, RMS, Std. Deviation, Top.	Math Operators - Filters	Enhanced resolution (to 15 bits vertical)
Measurement Parameters - Pulse	Area, Base, Fall Time (90-10, 80-20), Overshoot (positive, negative), Rise Time (10-90, 80-20), Top, Width+, Width-	Math Operators - Frequency Analysis	FFT (power spectrum, magnitude), up to full record length. Select from Rectangular, VonHann, Hamming, FlatTop and Blackman Harris windows.
		Math Operators - Functions	Absolute value, Derivative, Integral, Invert (negate), Reciprocal, Rescale (with units), Square, Square root, Zoom (identity).

... that makes it not only a waveform display but an actual processor for measurements.

# HDO4034a

In terms of connectivity, the feasible options are:

Connectivity	
Ethernet Port	Supports 2 10/100/1000BaseT Ethernet interface (RJ45 ports)
USB Host Ports	4 side USB 3.1 Gen1 ports and 1 front USB 2.0 port support Windows compatible devices
USB Device Port	1 USBTMC port
GPIB Port (optional)	Supports IEEE - 488.2 (External)
External Monitor Port	HDMI 1.4 (Qty. 1) and DisplayPort 1.2 (Qty. 1) to support customer-supplied external monitor. Includes support for extended desktop operation with UHD 3840 x 2160 pixel resolution and split-grid capability on external monitor. Supports touch screen integration of external monitor (Note: external display can not use a Fujitsu touch-screen driver).
Remote Control	Via Windows Automation, or via LeCroy Remote Command Set

... and Labview is not contemplated, so we need to find a way to establish the connection.

# Drivers library

<https://teledynelecroy.com/support/softwaredownload/labview.aspx>

where we need to download:

- VICP Passport plug-in  
NB: Windows only
- NI X-Stream library  
NB: NI-VISA included in your Labview version

## ■ X-Stream DSOs


Type: LabVIEW™ driver

Follow this link to National Instrument's page for LabVIEW Plug and Play drivers: [NI X-Stream LabVIEW Drivers](#). NI has developed a "traditional" driver as well as a "project-style" driver for use in LabVIEW 8.0 and above.

Installation instructions can be found in an HTML readme file that is within the ZIP file containing the driver download. Read this first to avoid installation issues. Also contained in the readme file are instructions for finding Example programs.

**Designed for:**

- WaveMaster 8 Zi Oscilloscopes
- SDA 8 Zi Oscilloscopes
- DDA 8 Zi Oscilloscopes
- SDA Oscilloscopes
- SDA 7 Zi Oscilloscopes
- DDA Oscilloscopes
- DDA 7 Zi Oscilloscopes
- WaveMaster 8000(a) Oscilloscopes
- WavePro 7 Zi Oscilloscopes
- WavePro 7000(a) Oscilloscopes
- WaveRunner 6000(a) Oscilloscopes
- WaveRunner Xi/MXi(-A) Oscilloscopes
- HDO6000 Oscilloscopes
- HDO4000 Oscilloscopes
- WaveSurfer 3000
- WaveSurfer Xs/MXs(-A) Oscilloscopes
- WaveSurfer 400 Oscilloscopes



## Software requirements

- LabVIEW 7.0 or higher
- NI-VISA 3.0 or higher
- [Latest Teledyne LeCroy VICP Passport](#) (for VICP connections only; not required for GPIB or LXI)

# Drivers installation

The Teledyne LeCroy VICP Passport is a plug-in passport for National Instruments' VISA and is needed if we wish to communicate with the DSO via TCP/IP (ethernet).

VICP Passport: download → install → DONE!

For the Labview instrument drivers, we have to be careful!

They are plug & play drivers but they have to be stored in a specific folder in order to be recognized by Labview.



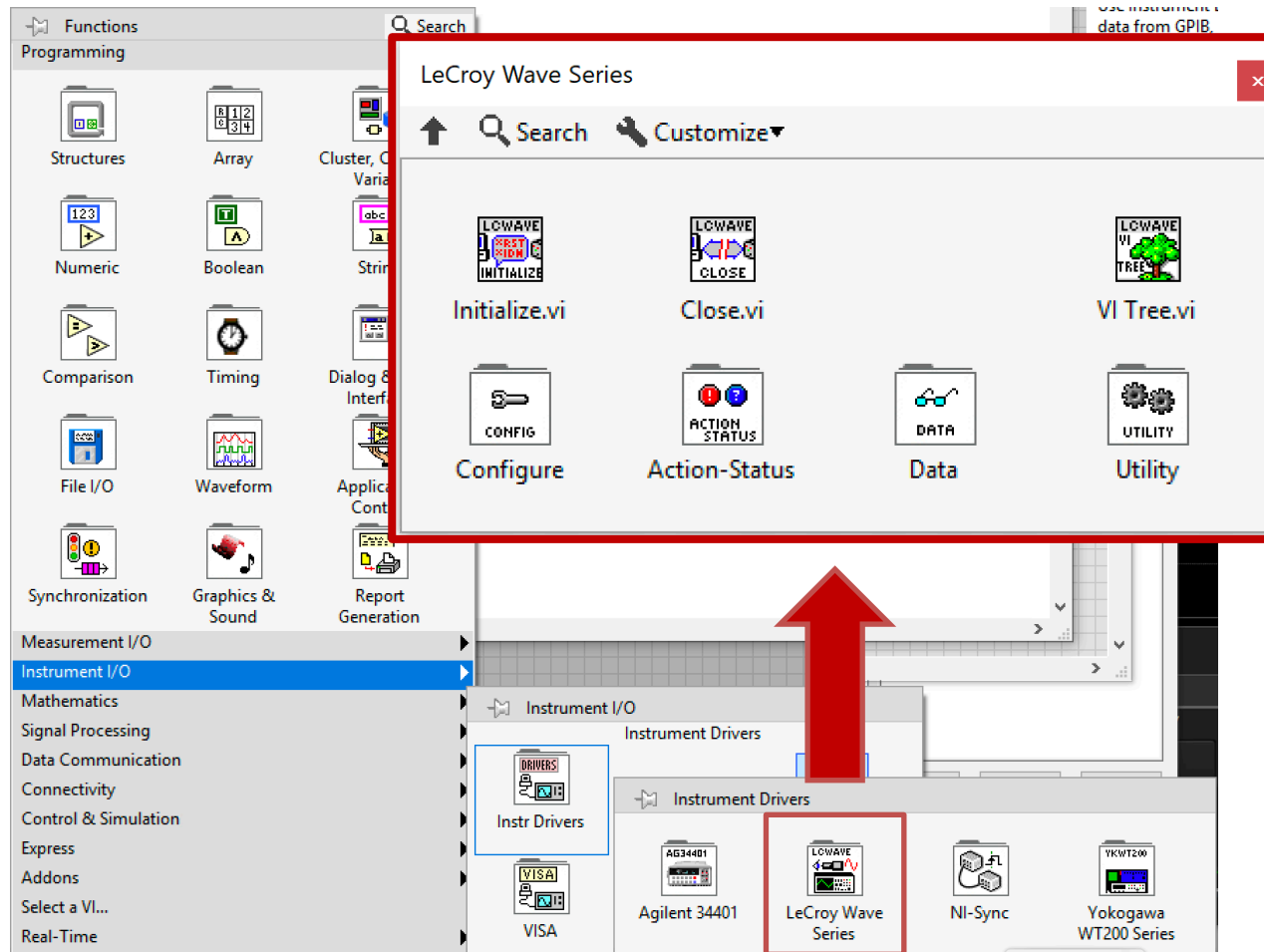
# Installation procedure

This procedure is valid for most third part drivers:

1. download the driver package (compressed folder)
2. uncompress the folder (typically, a .zip archive)
3. move the folder to <LabVIEW>\instr.lib directory
4. restart Labview and open a new blank VI

NI X-Stream: download → unzip → move to instr.lib

# New library



# Main functions



Initialize.vi

initialization, i.e. create task



Read Data.vi

read data, i.e. start task



Close.vi

close, i.e. end task

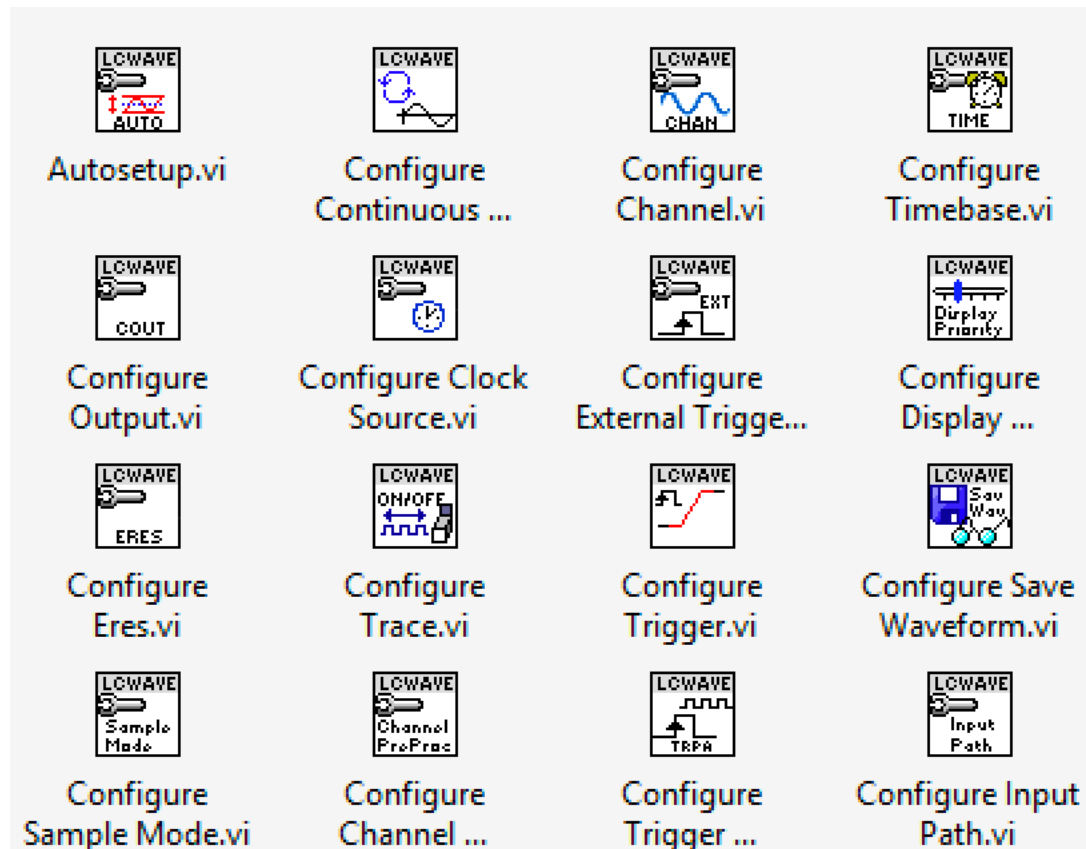


Config.vi

configure, i.e. configure task

# Configure menu

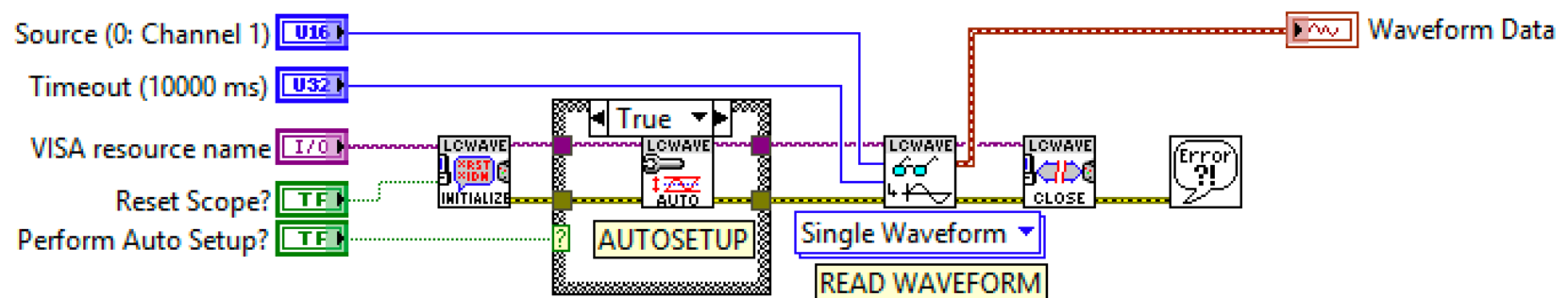
It is possible to configure almost every DSO parameter...



# Coding example

Sequence of operations:

- initialization
- configuration
- data acquisition
- task closing



# Recap: was everything clear?

- What is a digital oscilloscope, i.e. a DSO?
- Where has a driver library to be stored?
- What is the proper series of commands for the DSO?