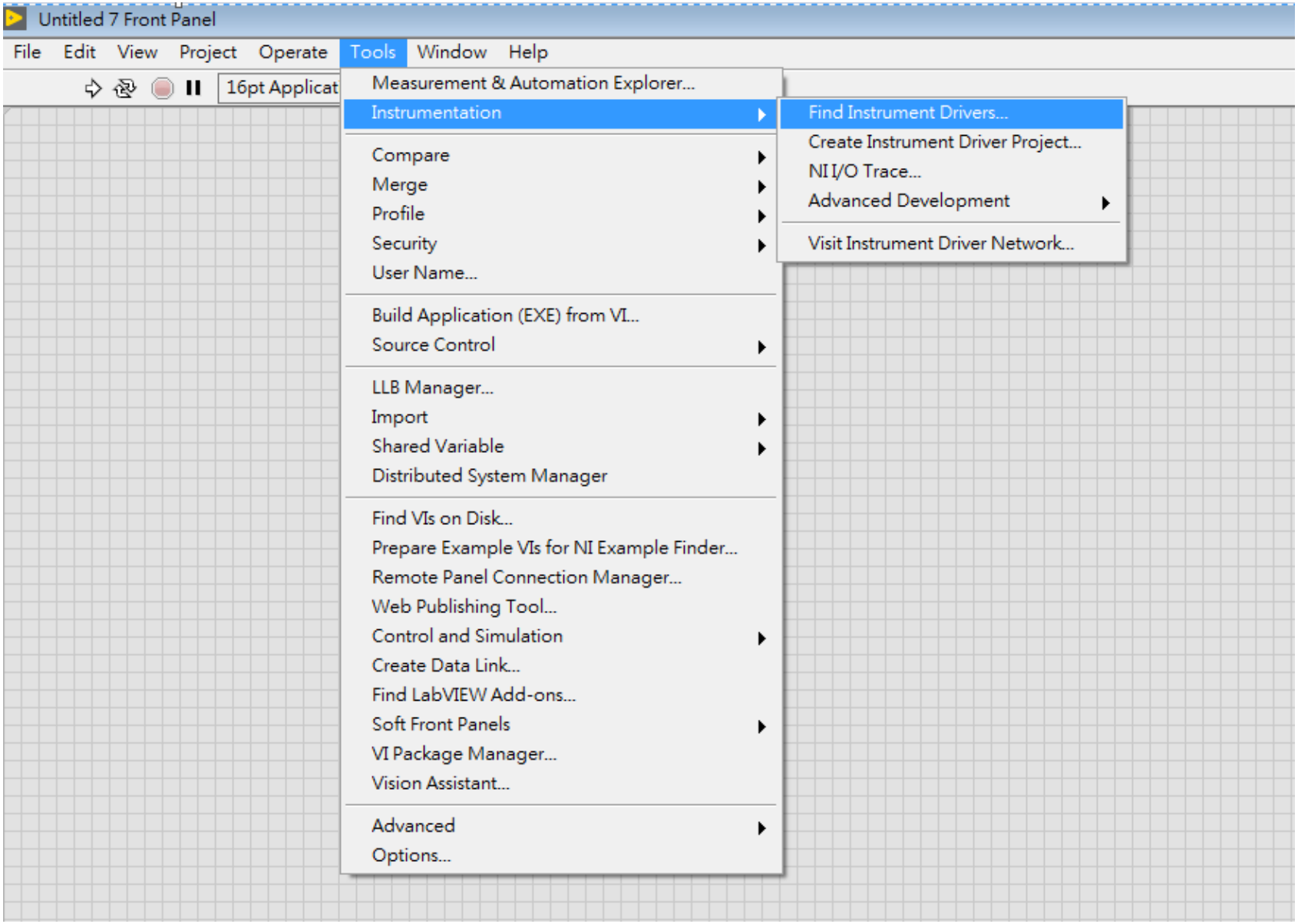
Lacroy HD4034 控制

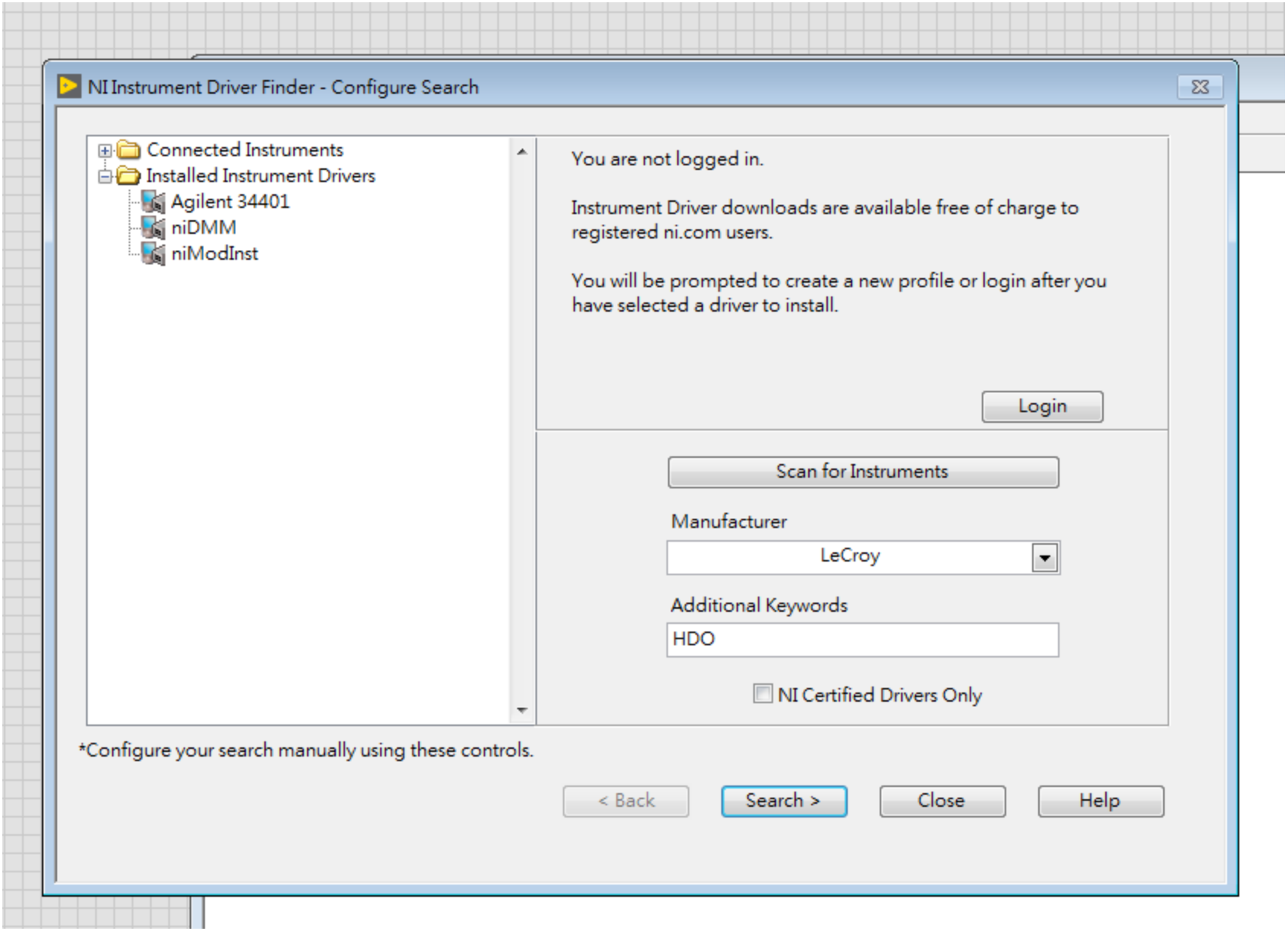
一般而言示波器與電腦推薦連接方式:

1. Ethernet
2. 真 USB
3. GPIB
4. 偽 USB, RS232 serial (Tek 牌常見)

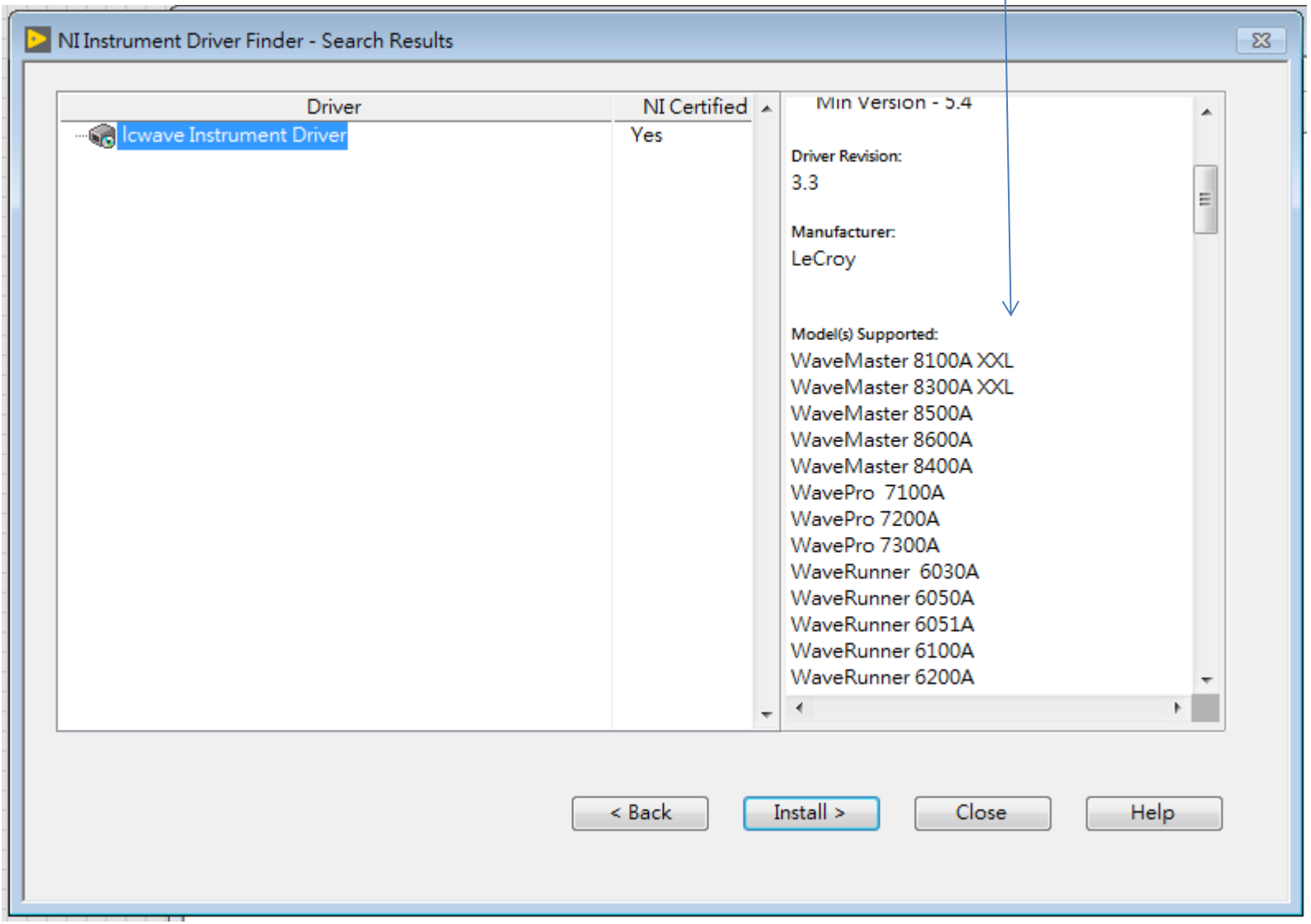
Lecroy HDO: Utilities->Utilities Setup -> Remote
可以看到 VISA address
Ex. USB0::0x05ff::0x1023::3511N17479::INSTR

先透過 NI Tool 找看看有沒有現成的 VI 可以用

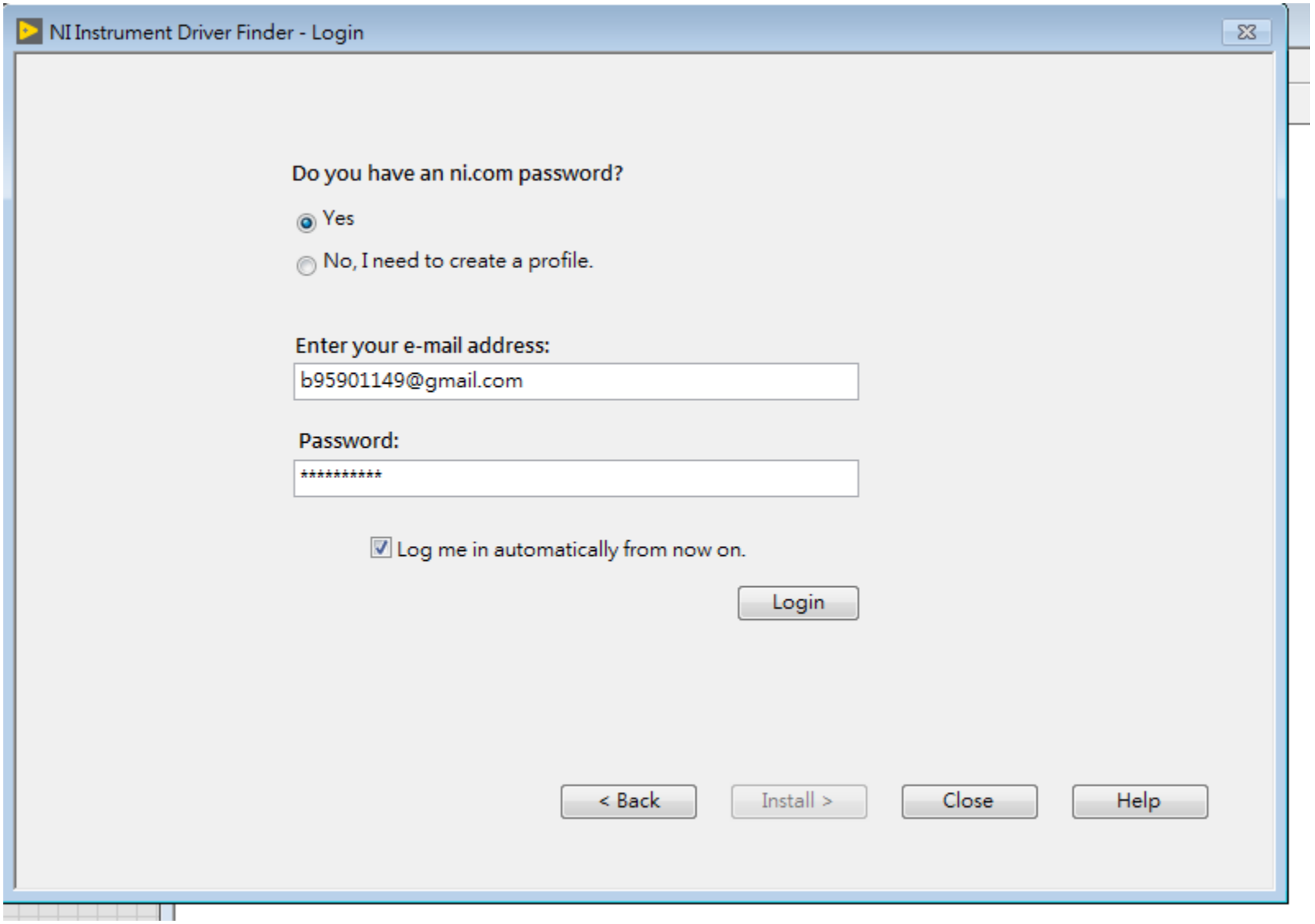



NI Instrument Driver Finder - Configure Search
Connected Instruments
Installed Instrument Drivers
Agilent 34401
niDMM
niModInst
You are not logged in.
Instrument Driver downloads are available free of charge to registered ni.com users.
You will be prompted to create a new profile or login after you have selected a driver to install.
Login
Scan for Instruments
Manufacturer
LeCroy
Additional Keywords
HDO
NI Certified Drivers Only
*Configure your search manually using these controls.
< Back
Search >
Close
Help

檢查看看自己的儀器有沒有出現在列表



輸入 NI 帳號(免費申請) 可以下載



http://www.ni.com/downloads/instrument-drivers/zht/

也可以透過網頁直接搜尋儀器 driver

Instrument Driver Network

LeCroy HDO4034

Model Specifications

Manufacturer(s):	LeCroy
Instrument Model:	HDO4034
Description:	High Definition Oscilloscopes
Instrument Type(s):	Oscilloscope
Application Area(s):	Test and Measurement

Drivers Available For This Instrument Model

ADE	Driver Type	Interface(s)	Options	NI Certified	Rating	
LabVIEW	Plug and Play (project-style)	IEEE 488.2 (GPIB) , Ethernet	None	Yes	3.86	Go To Driver Page

Where's my Application Development Environment (ADE)?

If you cannot find an instrument driver that supports your Application Development Environment (ADE), use an instrument driver converter:

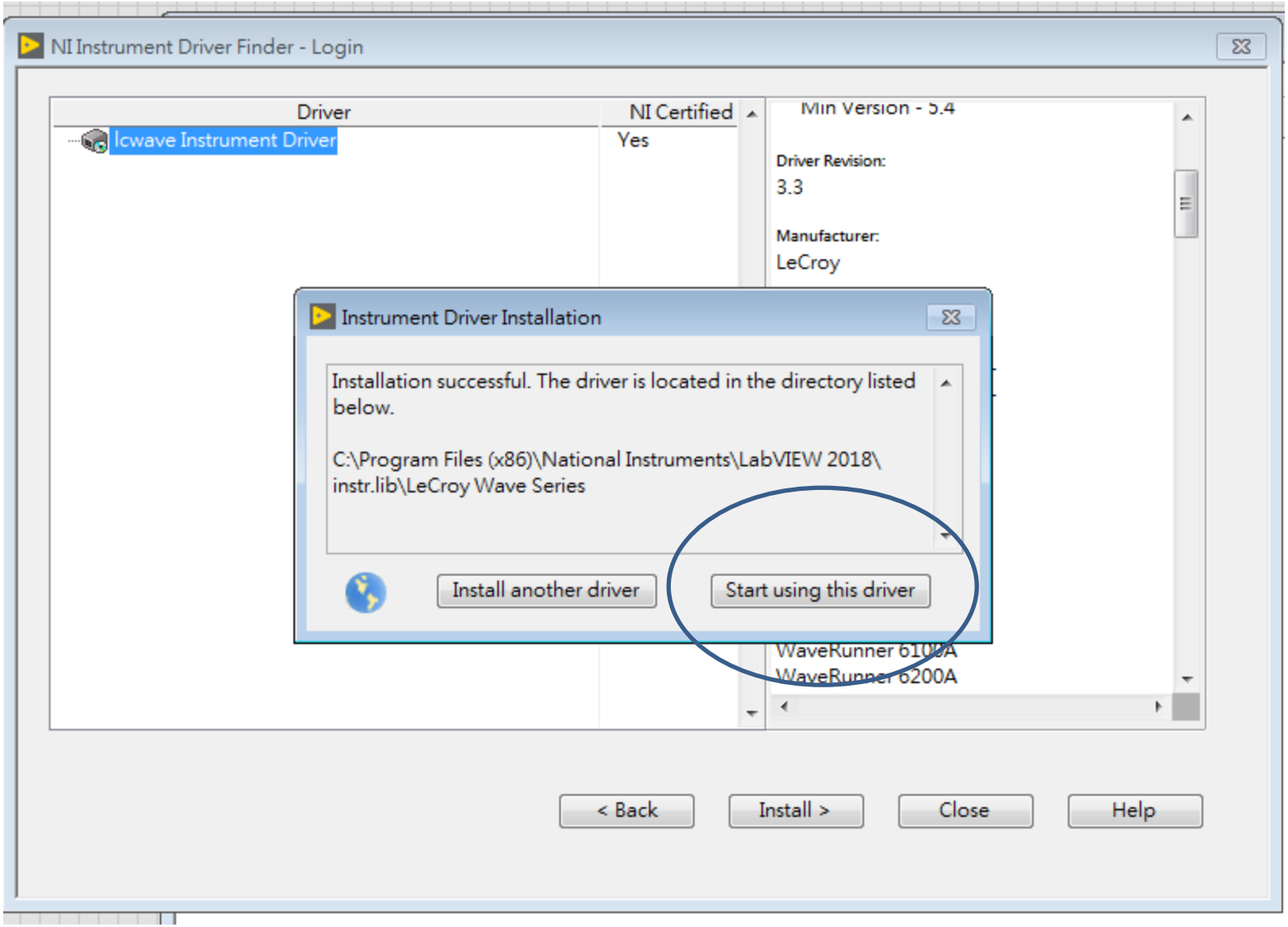
- The LabVIEW Instrument Driver Import Wizard allows you to convert an instrument driver from LabWindows/CVI (C source) to a LabVIEW wrapper (DLL).

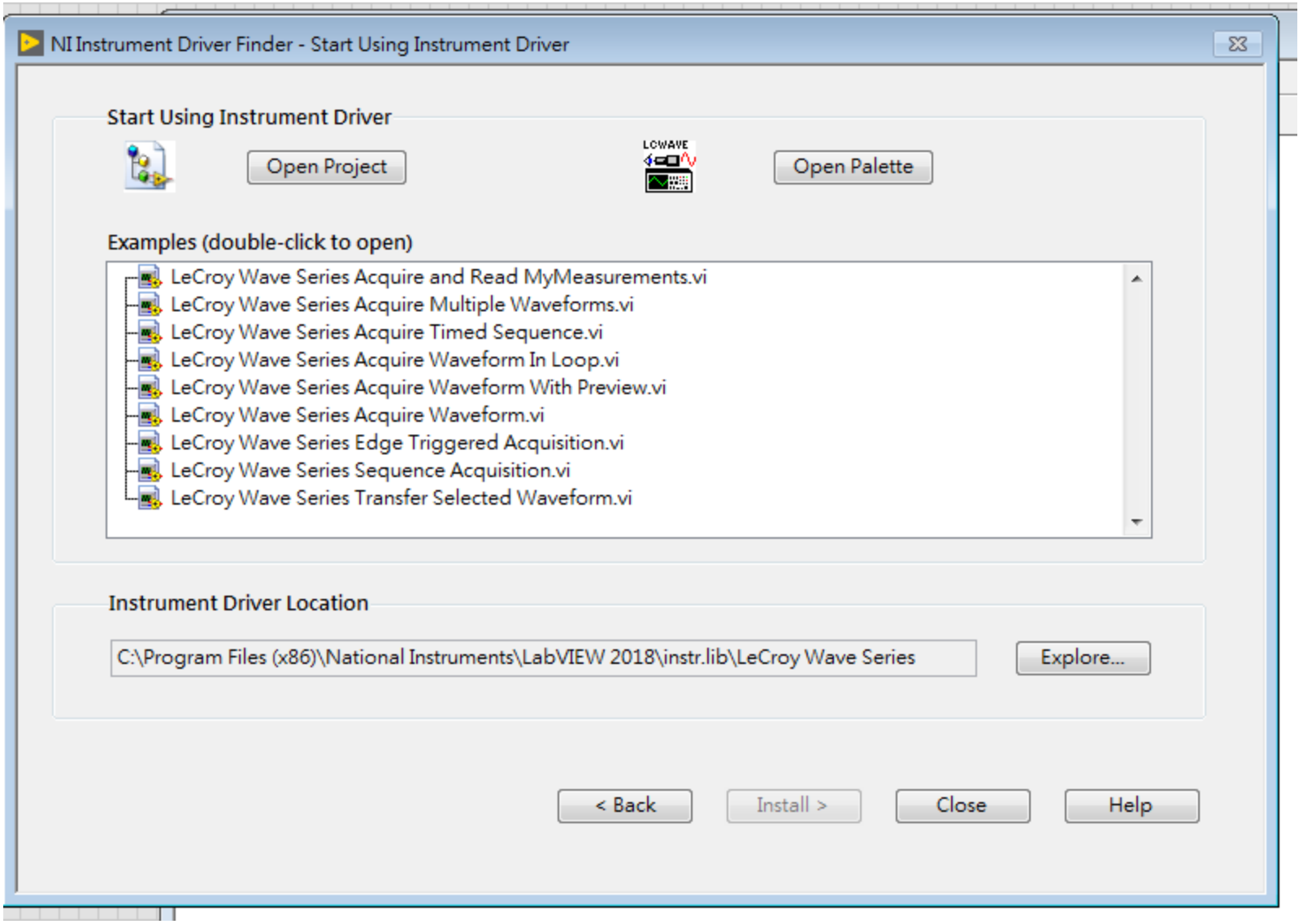
Next Steps

Browse All Drivers
Submit New Driver
Request New Driver
Request Support

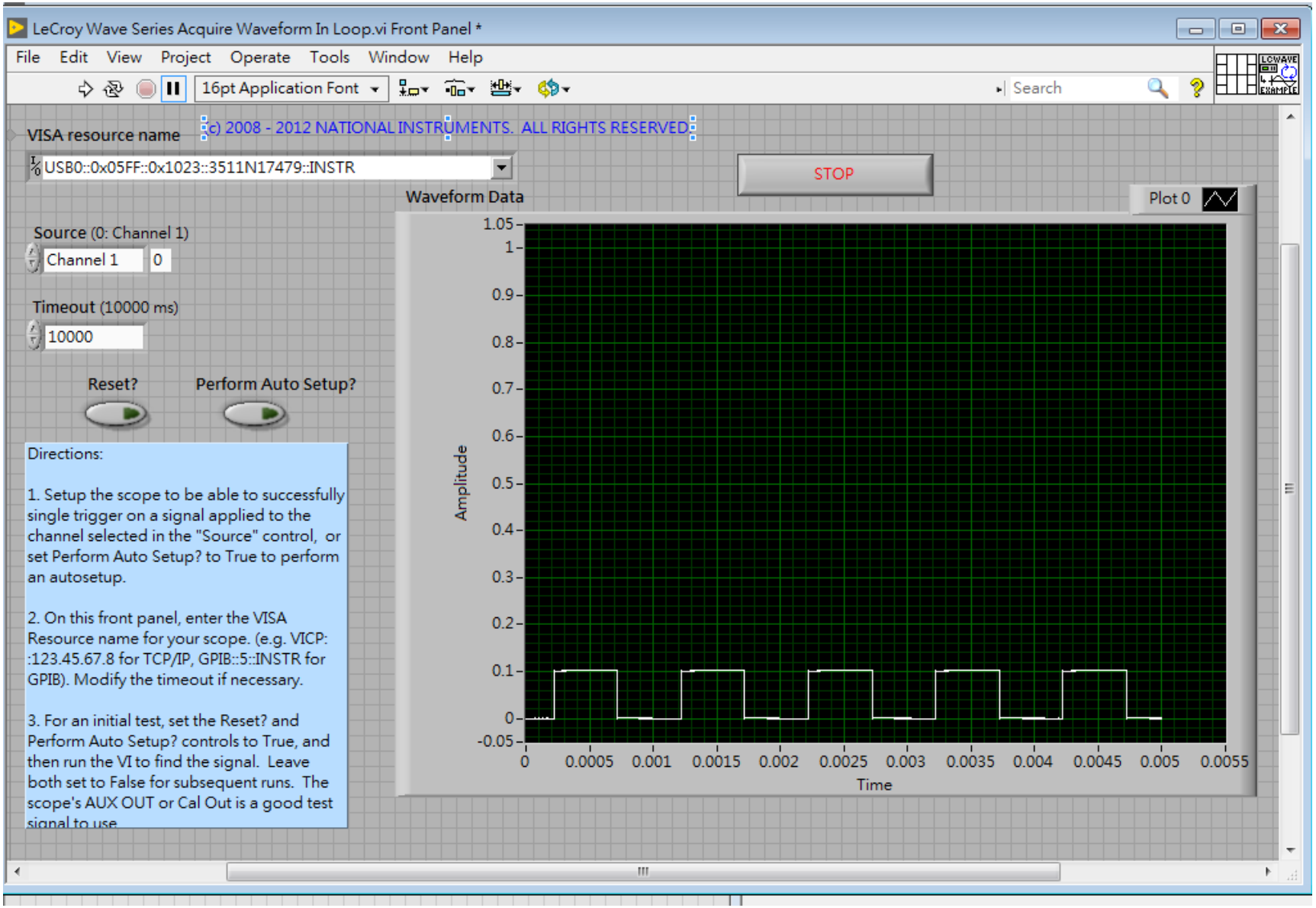
Learn More

Learn about instrument drivers
Development Resources
Instrument Control Tutorials
Instrument Control Discussion Forum
IDNet License Agreement

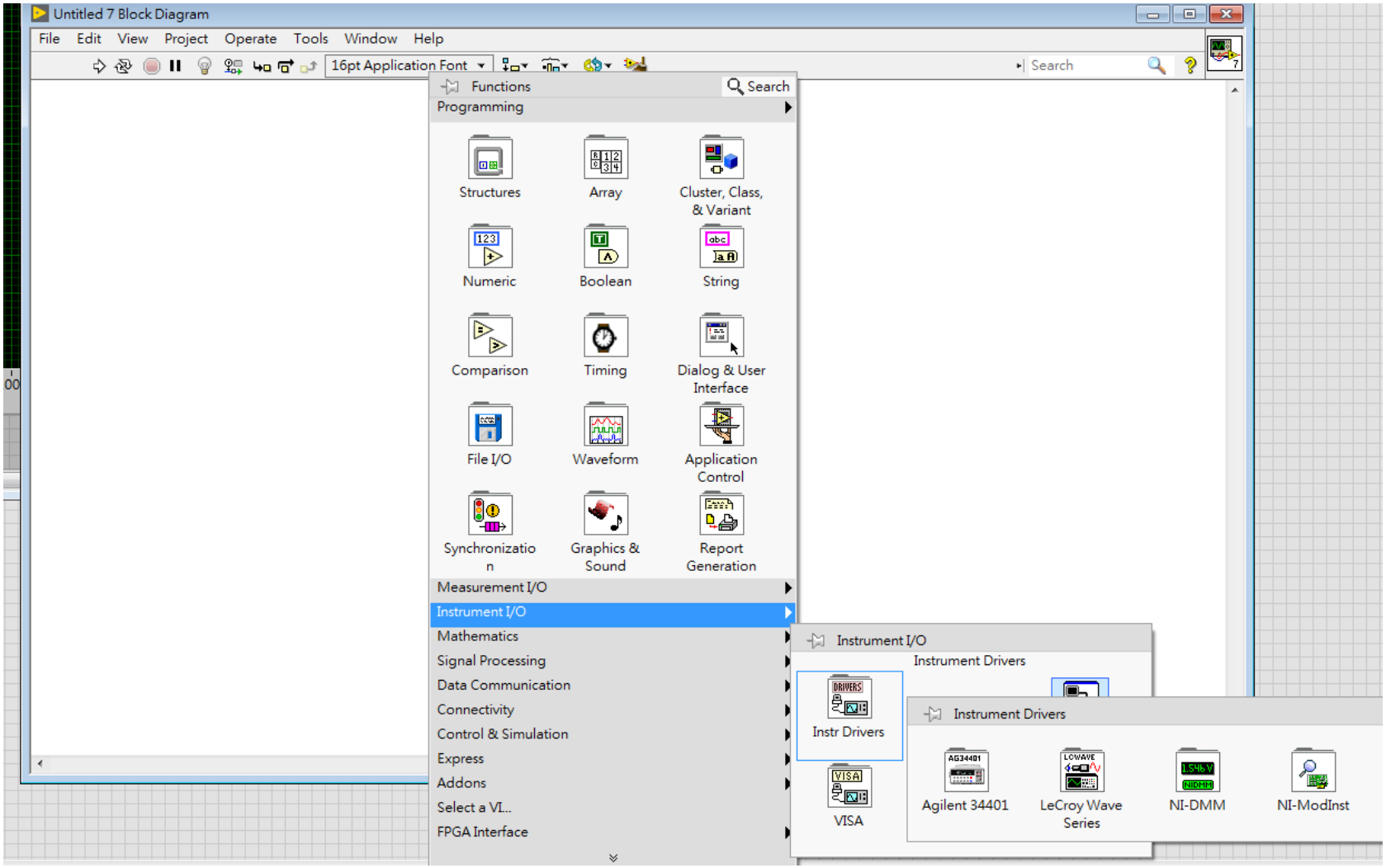

NI Instrument Driver Finder - Login
Driver
NI Certified
lcwave Instrument Driver
Yes
Min Version - 5.4
Driver Revision:
3.3
Manufacturer:
LeCroy
Instrument Driver Installation
Installation successful. The driver is located in the directory listed below.
C:\Program Files (x86)\National Instruments\LabVIEW 2018\instr.lib\LeCroy Wave Series
Install another driver
Start using this driver
WaveRunner 6200A
< Back
Install >
Close
Help

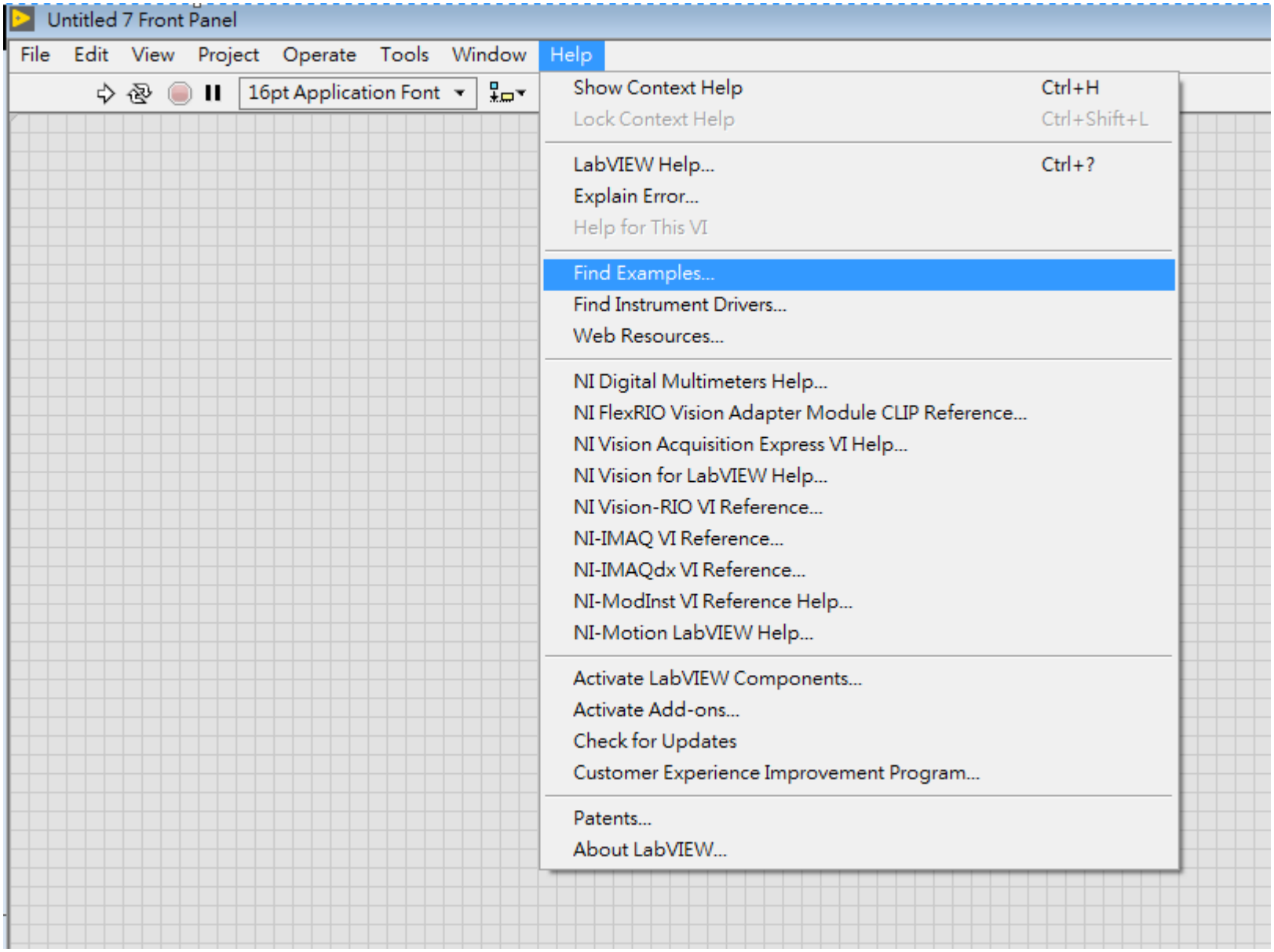

NI Instrument Driver Finder - Start Using Instrument Driver
Start Using Instrument Driver
Open Project
LCWAVE
Open Palette
Examples (double-click to open)
LeCroy Wave Series Acquire and Read MyMeasurements.vi
LeCroy Wave Series Acquire Multiple Waveforms.vi
LeCroy Wave Series Acquire Timed Sequence.vi
LeCroy Wave Series Acquire Waveform In Loop.vi
LeCroy Wave Series Acquire Waveform With Preview.vi
LeCroy Wave Series Acquire Waveform.vi
LeCroy Wave Series Edge Triggered Acquisition.vi
LeCroy Wave Series Sequence Acquisition.vi
LeCroy Wave Series Transfer Selected Waveform.vi
Instrument Driver Location
C:\Program Files (x86)\National Instruments\LabVIEW 2018\instr.lib\LeCroy Wave Series
Explore...
< Back
Install >
Close
Help

隨便點開一個範例程式
VISA resource name 填入在示波器上看到的 VISA address

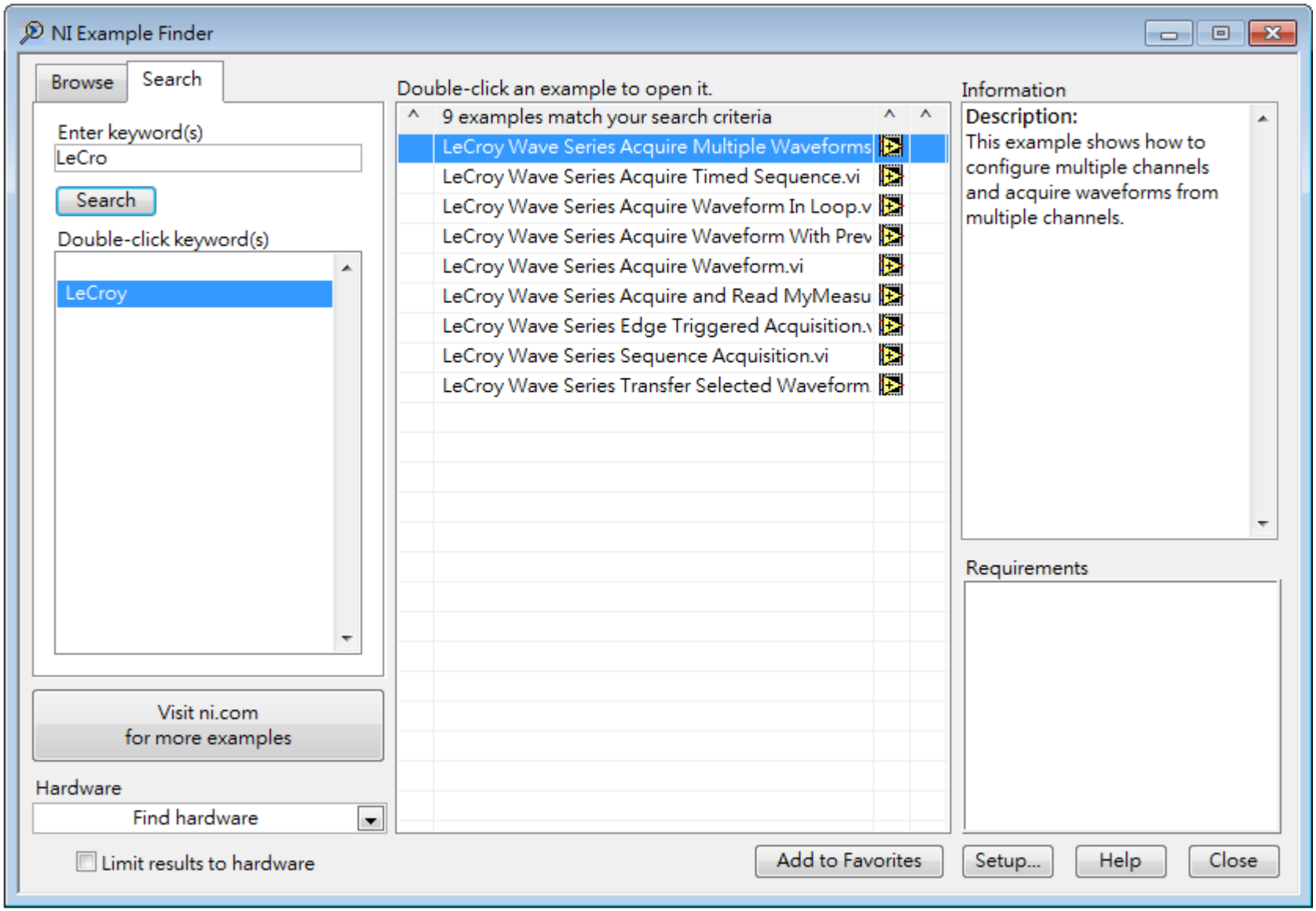


儀器 function 通常會被裝在 Instr. IO/Instr Drivers

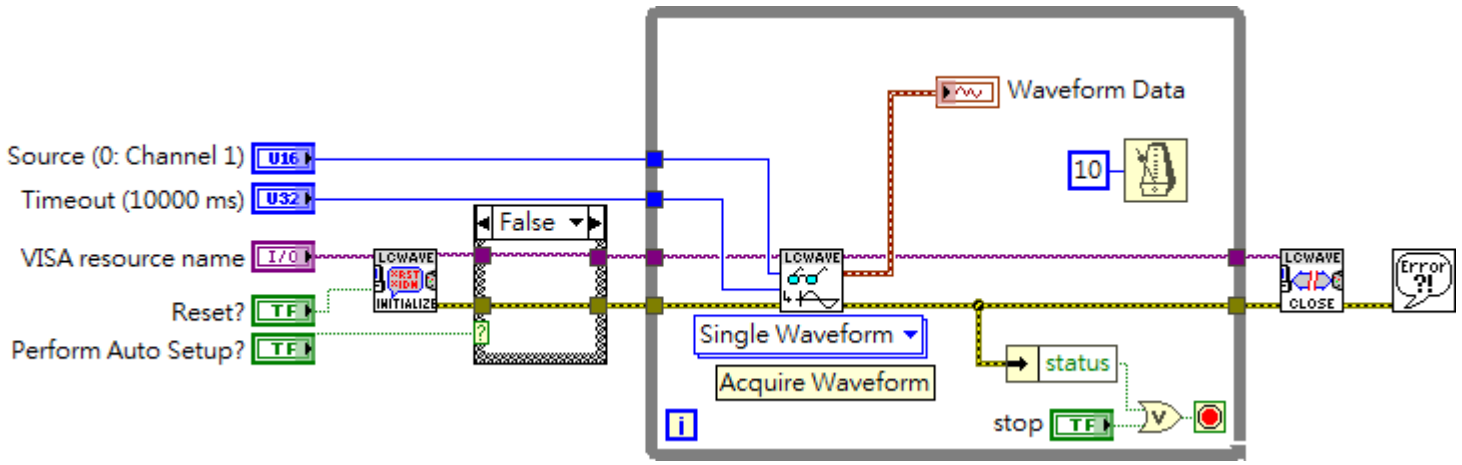



Untitled 7 Front Panel
File
Edit
View
Project
Operate
Tools
Window
Help
16pt Application Font
Show Context Help Ctrl+H
Lock Context Help Ctrl+Shift+L
LabVIEW Help... Ctrl+?
Explain Error...
Help for This VI
Find Examples...
Find Instrument Drivers...
Web Resources...
NI Digital Multimeters Help...
NI FlexRIO Vision Adapter Module CLIP Reference...
NI Vision Acquisition Express VI Help...
NI Vision for LabVIEW Help...
NI Vision-RIO VI Reference...
NI-IMAQ VI Reference...
NI-IMAQdx VI Reference...
NI-ModInst VI Reference Help...
NI-Motion LabVIEW Help...
Activate LabVIEW Components...
Activate Add-ons...
Check for Updates
Customer Experience Improvement Program...
Patents...
About LabVIEW...

範例一樣會被裝在 NI example 中



Acquire Waveform in Loop

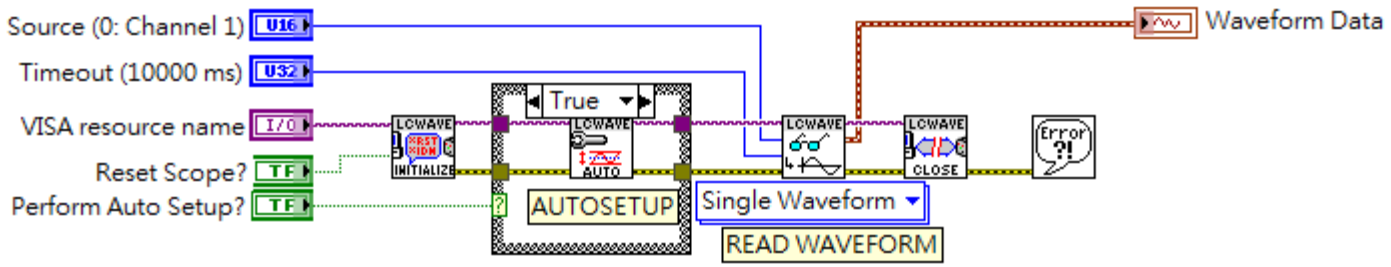


最普通的使用方式, 把示波器上的正在擷取的資料 buffer 傳到螢幕上

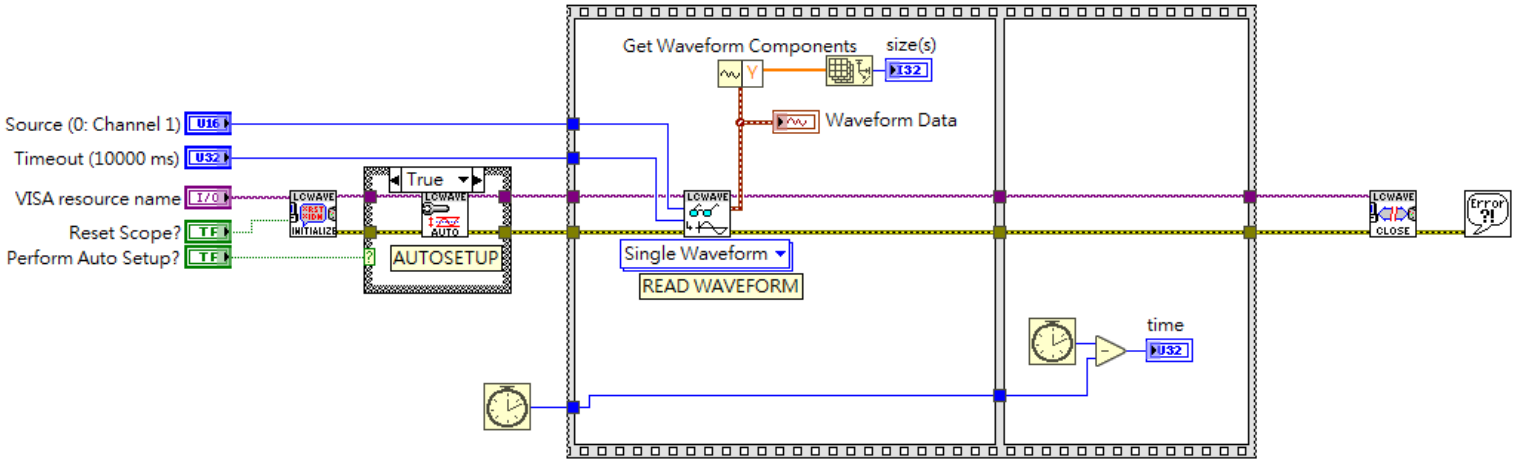
九成九的 DAQ 裝置資料擷取格式都如同上圖

初始化 -> 設定 trigger/clock -> 迴圈下讀取指令 ->關閉 VISA 通道

Acquire Waveform



Timebase 設定 5M points, 計算得知約需 1.1~1.2 sec
取樣時間大概2ms, 但是傳遞資料時間需要超過 1秒
HD4034的 USB 介面算是真 USB, 傳輸速度 > 5M*12bit~60Mb/sec



如果把取樣點數改到 500 samples
傳輸時間大約 60ms
這個值差不多可以看做最小延遲, 代表透過 USB通道下指令到儀器回應的最小延遲

受限於這個延遲, 想要透過電腦端擷取 waveform (wfm) 資料的最高速度差不多是 1/60ms ~ 16wfm/sec
只要trigger 大於 16 Hz 你就會發現無論如何程式取資料的方式跟不上資料生產的速度, 一般而言 10-20Hz 以下 pump probe 實驗比較不會有問題, KHz 以上的就會面臨困擾

高訊噪比 -> 更多穩定取樣數去做平均

解決方法:

1. 改用 ethernet 獲取更低的延遲(不過新的機種 USB 的速度已經跟 100M ethernet 差不多)

2. 改用 PCI 或 PXI 介面的 digitalizer (NI, Spectrum Instr.) , FIFO 配合 PCI/PCIe 介面 >1Gb/sec 頻寬

3. 想辦法讓示波器利用本身的 ASIC 完成需要的運算 (measurements), PC 端只擷取運算後少量的特徵資料 (ex. FWHM, 積分值, peak 值 , FFT 頻譜 等等), 或是已經 averege 過的資料
4. Lecroy 有一種特殊介面 LSIB 可以提供接近 PCI 的傳輸頻寬 (不過應該還是輸 NI or Spectrum)

TELEDYNE LECROY
Everywhereyoulook™

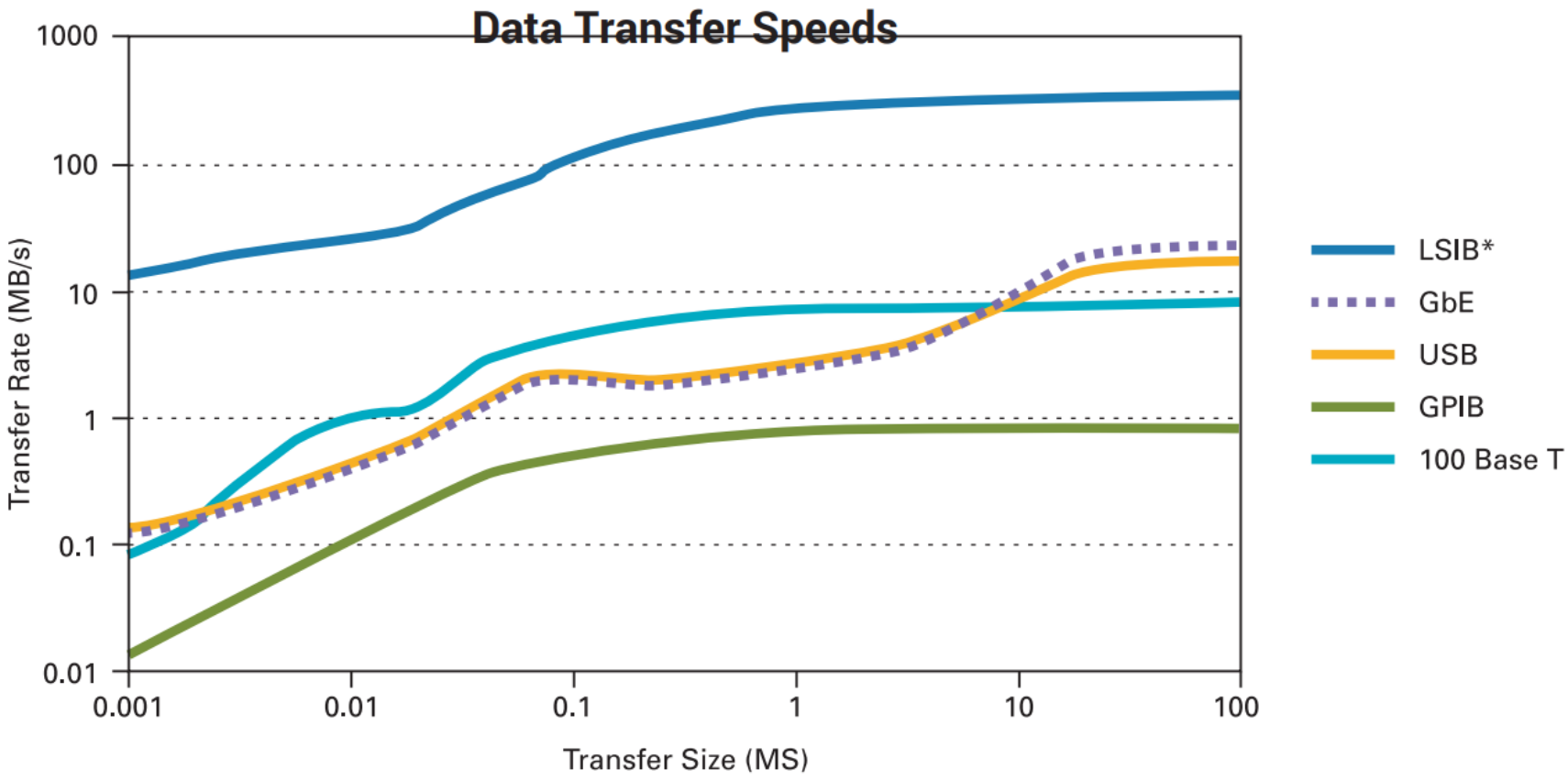
LSIB
Serial Interface
Bus

Key Features

- Up to 325 MB/s transfer rate
- Standard x4 PCI Express® connection
- Connection options for both Desktop and Laptop computers
- 3M and 7M cable lengths to adapt to various test setups

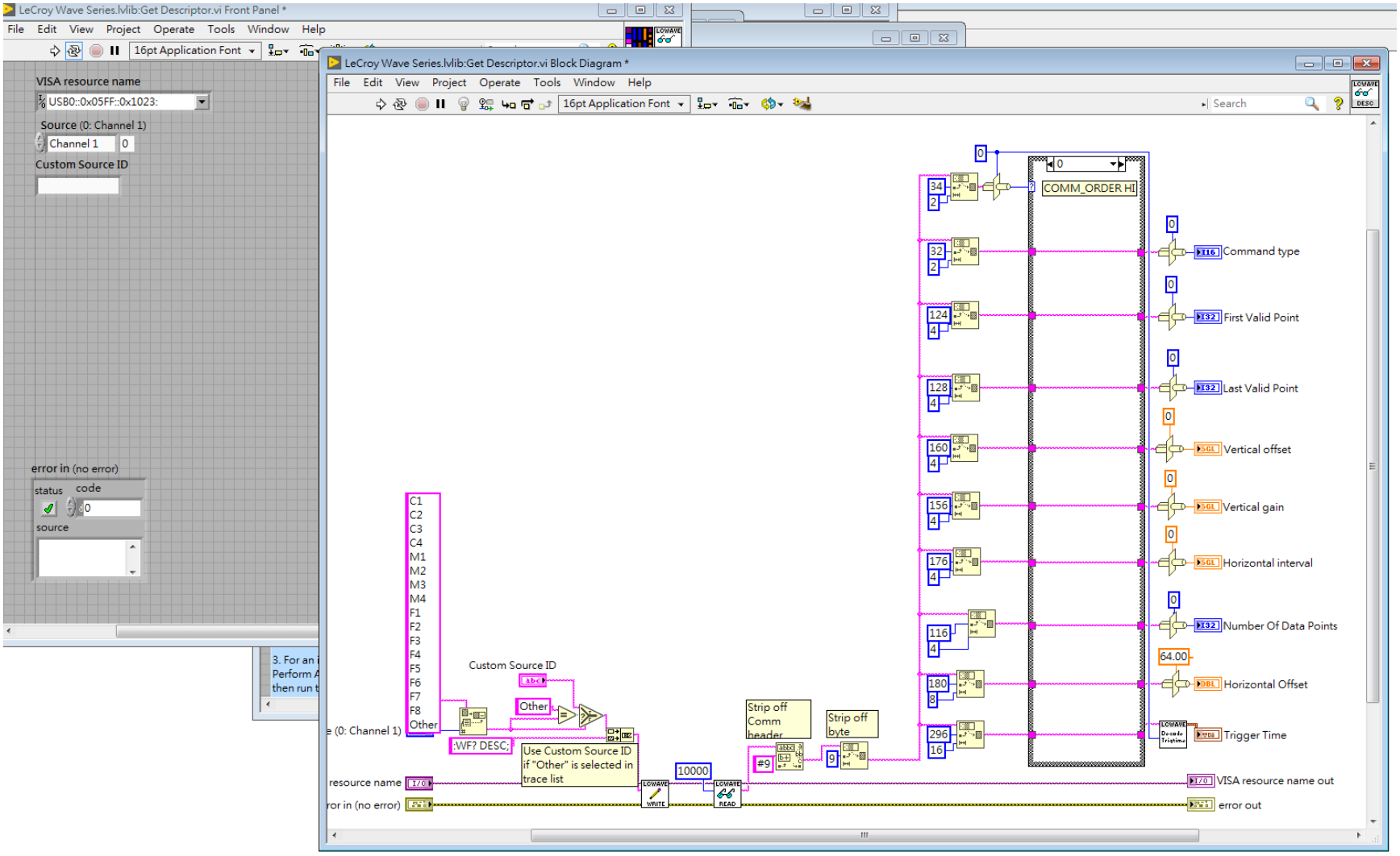
LSIB (Teledyne LeCroy Serial Interface

LSIB is geared towards users who



* Measured with 16-bit data using LSIB-HOSTBOARD

這些 VI 底層都寫了什麼鬼?



其實是一整包弄好類似 SCPI 指令, 一般使用者不太有機會直接看400多頁的指令說明用 C/C++ 之類的語言寫出從示波器取值的程式

http://cdn.teledynelecroy.com/files/manuals/maui-remote-control-and-automation-manual.pdf

PRx:VOLT_DIV, PRx:VDIV

Description

The PRx:VOLT_DIV command sets the vertical sensitivity at the ADP30x input. The effective gain of the differential probe is factored into the vertical sensitivity.

The valid range of arguments is fixed by the probe type. If an out-of-range value is entered, the oscilloscope will set the vertical sensitivity to the closest value and set the VAB bit (bit 2) in the STB register.

The PRx:VOLT_DIV? query returns the vertical sensitivity at the probe input of the specified channel.

Command Syntax

```
<channel>:VOLT_DIV <sensitivity> [V]
<channel>:= {PR1, PR2, PR3, PR4}
<sensitivity>:= 200 mV to 350 V for ADP350; 1 V to 350 V for ADP300.
```

The suffix V is optional.

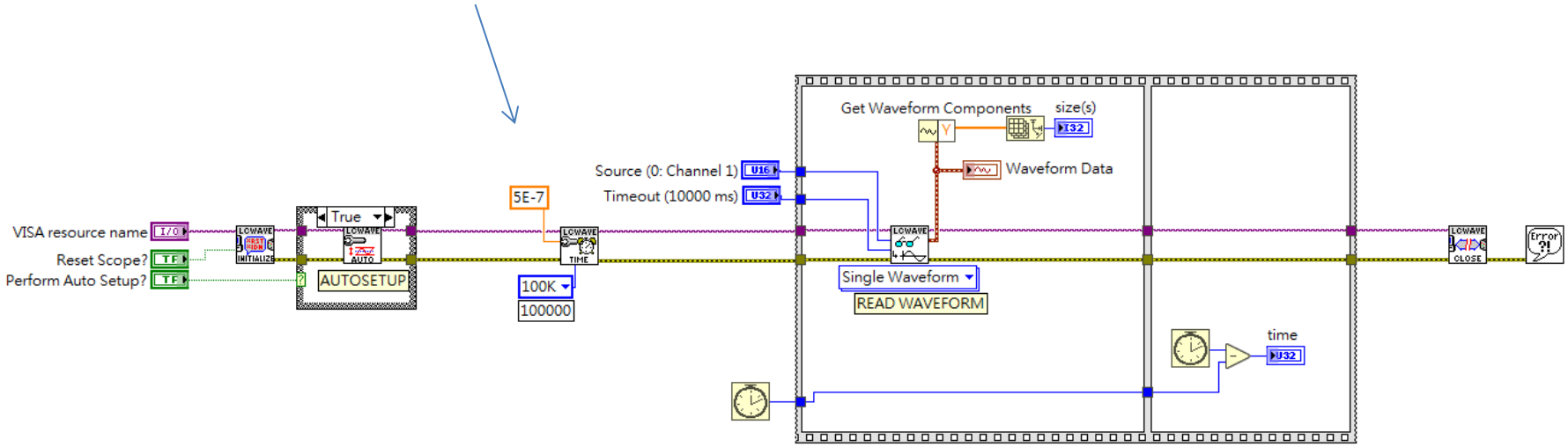
Query Syntax

```
<channel>:VOLT_DIV?
```

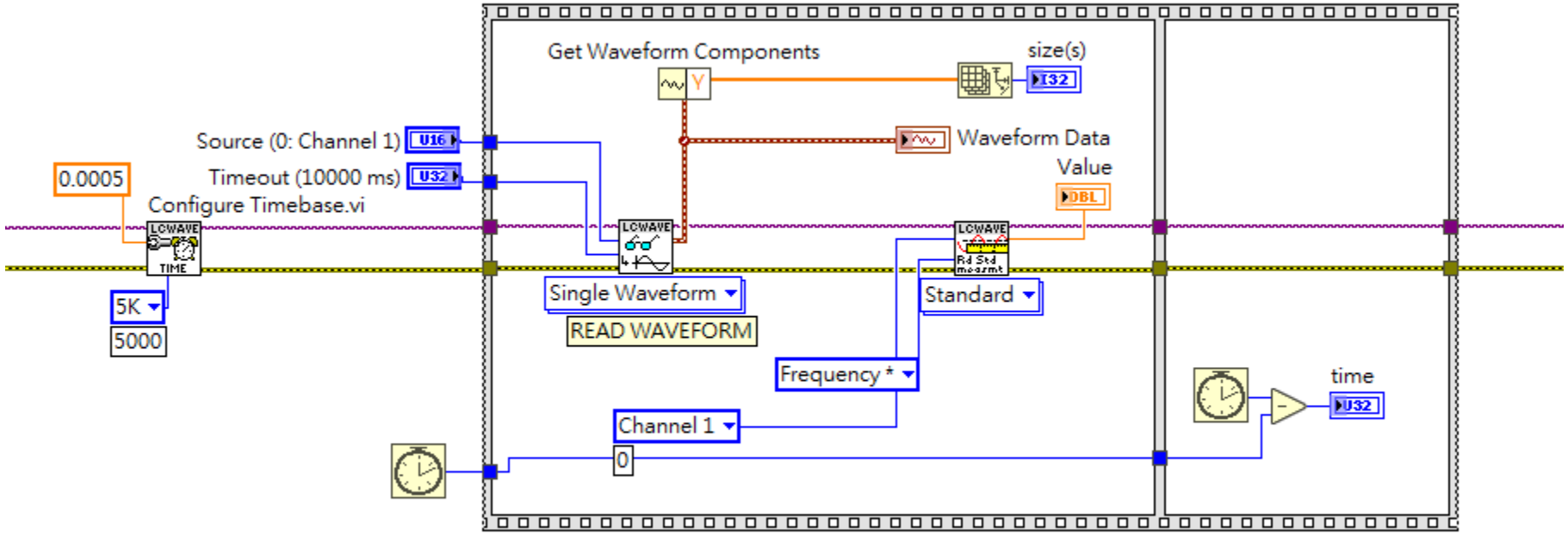
Response Format

```
<channel>:VDIV <sensitivity>
```

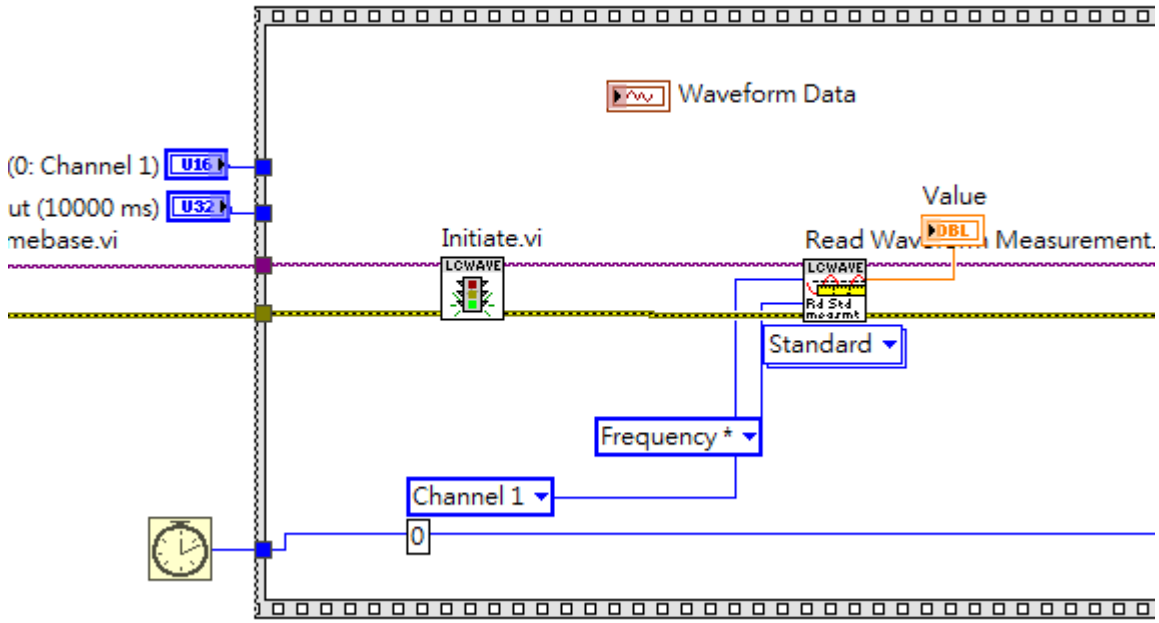
Configure 類型指令放在資料擷取之前, 比如說很常用的 timebase, 示波器的總取樣時間就是 10*timebase



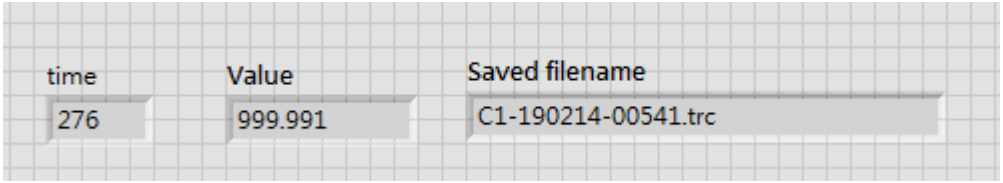
Measurement 類指令可以放在 read waveform 之後

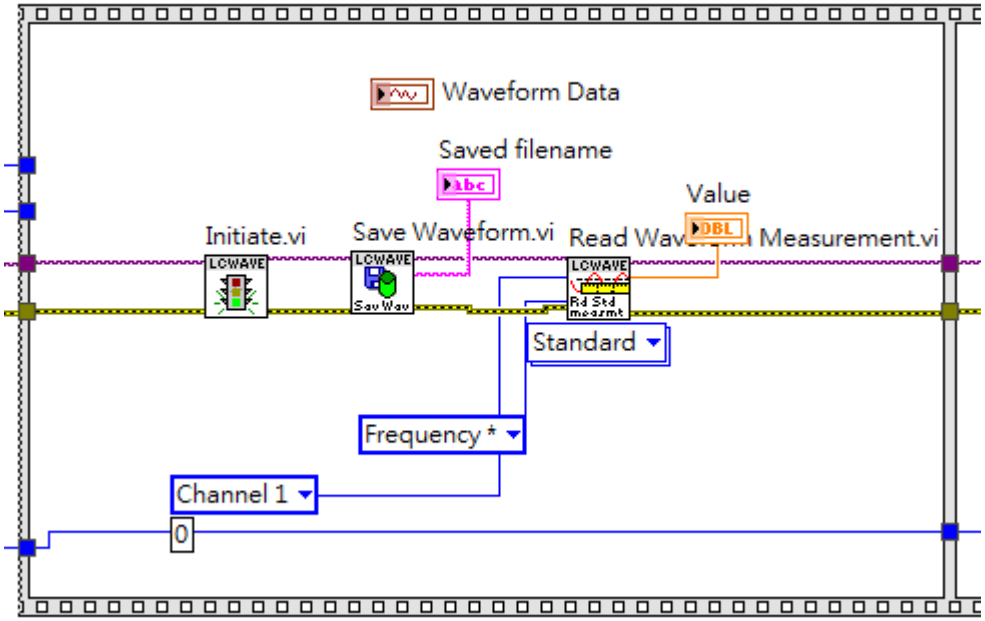


不要 read waveform , 直接下指令 re-arm 示波器取波型, 只取 measurement 的值 ex. 同樣 5M sample point , read waveform 改成 low level 指令的 initiate 就可以將速率從 0.X wfm/sec 提升到 ~10 wfm/sec



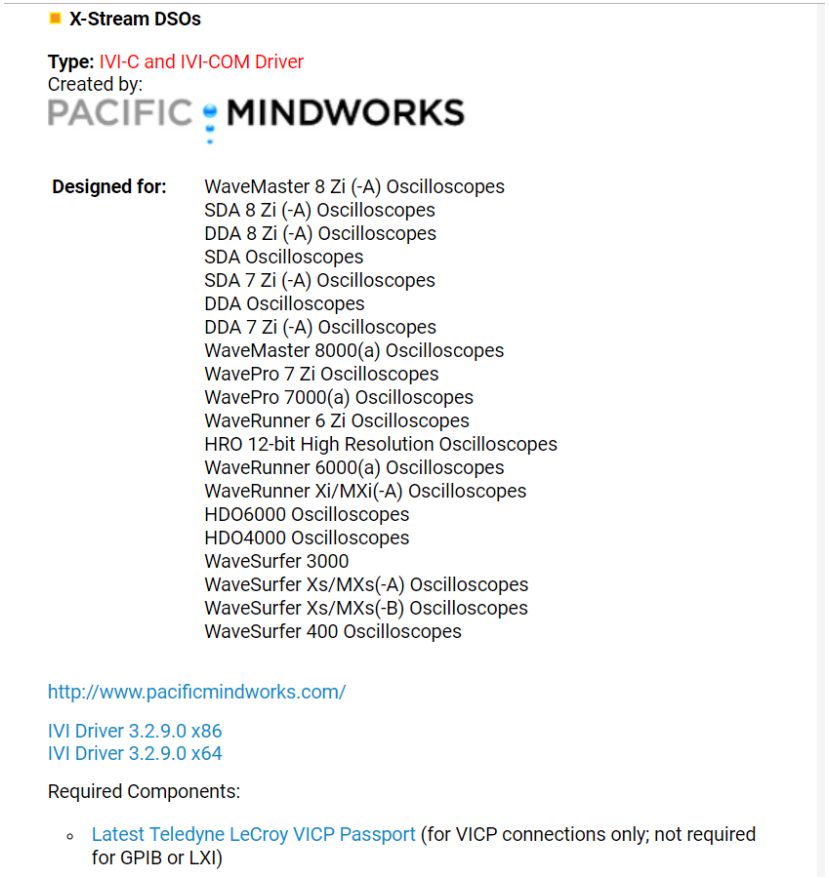
直接下令讓 waveform 儲存在示波器中 (現代高性能示波器通常是 x86 電腦, 硬碟都放很大). 速度會比把資料丟到 PC 再存檔更快. 同樣 5Mpts 只需要 276ms 即能完成存取





要透過 ethernet 控制示波器 Lecroy 需要 VICP passport

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



■ **X-Stream DSOs**

Type: IVI-C and IVI-COM Driver
Created by:
PACIFIC MINDWORKS

Designed for:
WaveMaster 8 Zi (-A) Oscilloscopes
SDA 8 Zi (-A) Oscilloscopes
DDA 8 Zi (-A) Oscilloscopes
SDA Oscilloscopes
SDA 7 Zi (-A) Oscilloscopes
DDA Oscilloscopes
DDA 7 Zi (-A) Oscilloscopes
WaveMaster 8000(a) Oscilloscopes
WavePro 7 Zi Oscilloscopes
WavePro 7000(a) Oscilloscopes
WaveRunner 6 Zi Oscilloscopes
HRO 12-bit High Resolution Oscilloscopes
WaveRunner 6000(a) Oscilloscopes
WaveRunner Xi/MXi(-A) Oscilloscopes
HDO6000 Oscilloscopes
HDO4000 Oscilloscopes
WaveSurfer 3000
WaveSurfer Xs/MXs(-A) Oscilloscopes
WaveSurfer Xs/MXs(-B) Oscilloscopes
WaveSurfer 400 Oscilloscopes

http://www.pacificmindworks.com/

IVI Driver 3.2.9.0 x86
IVI Driver 3.2.9.0 x64

Required Components:

- Latest Teledyne LeCroy VICP Passport (for VICP connections only; not required for GPIB or LXI)