UNIVERSITÀ DEGLI STUDI DI TRIESTE

Dipartimento di Ingegneria e Architettura

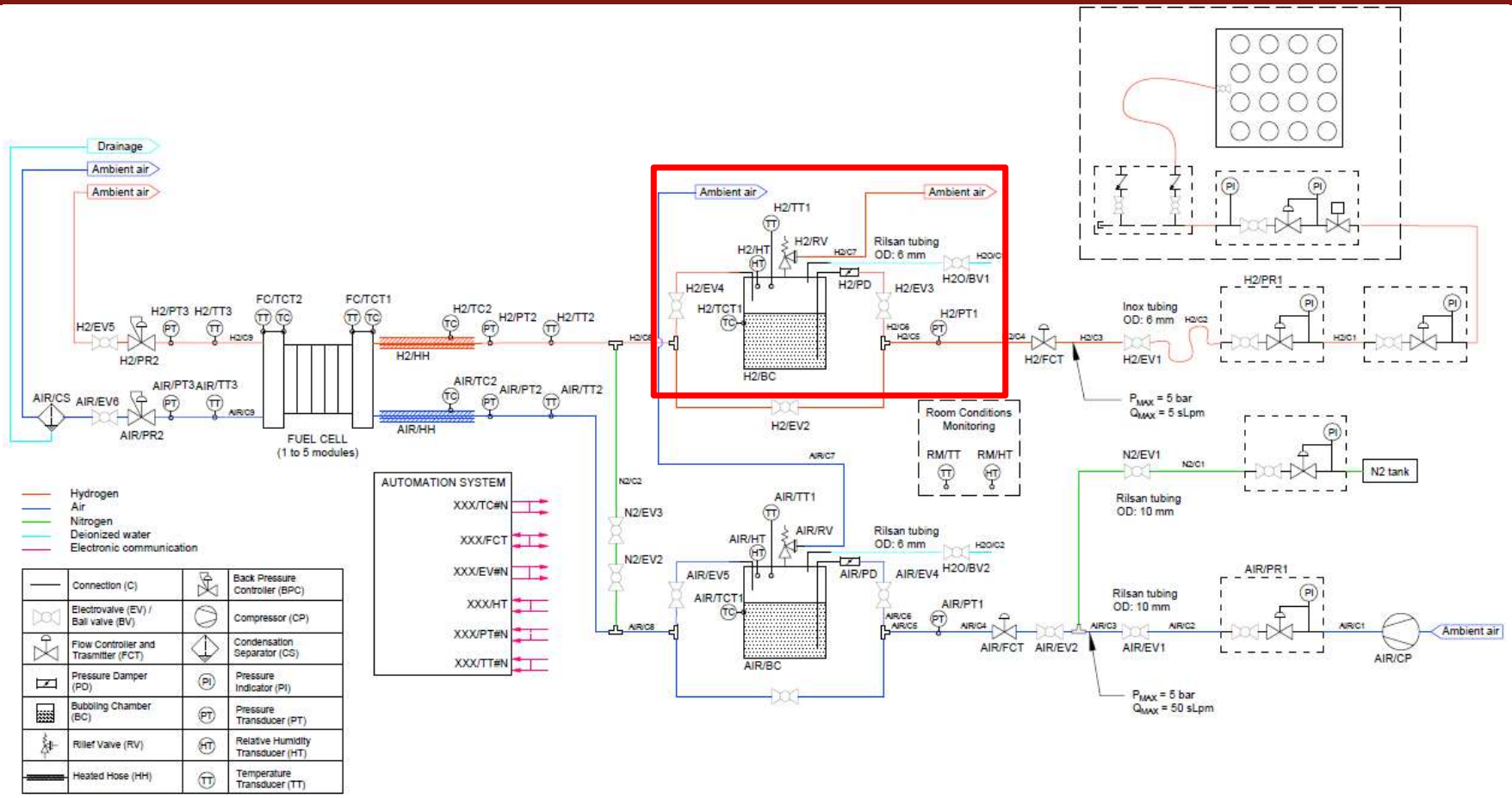
LABVIEW

AN INTRODUCTION

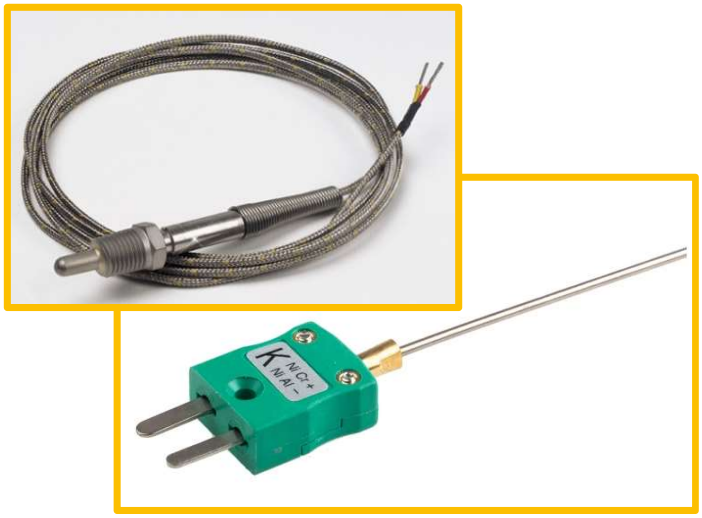
Prof. Marco Bogar

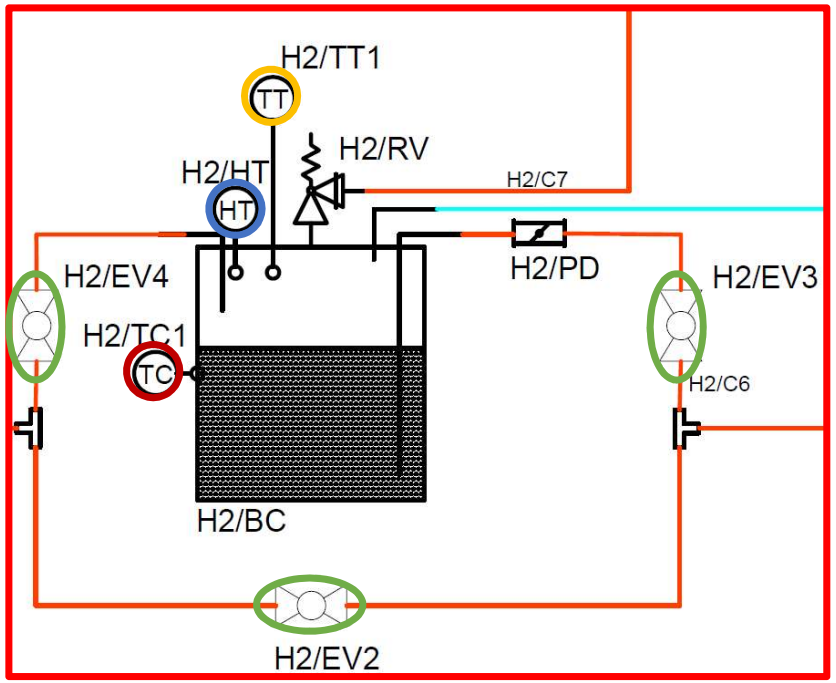
A.A. 2022-2023

PLANT DESIGN AND DATA ACQUISITION

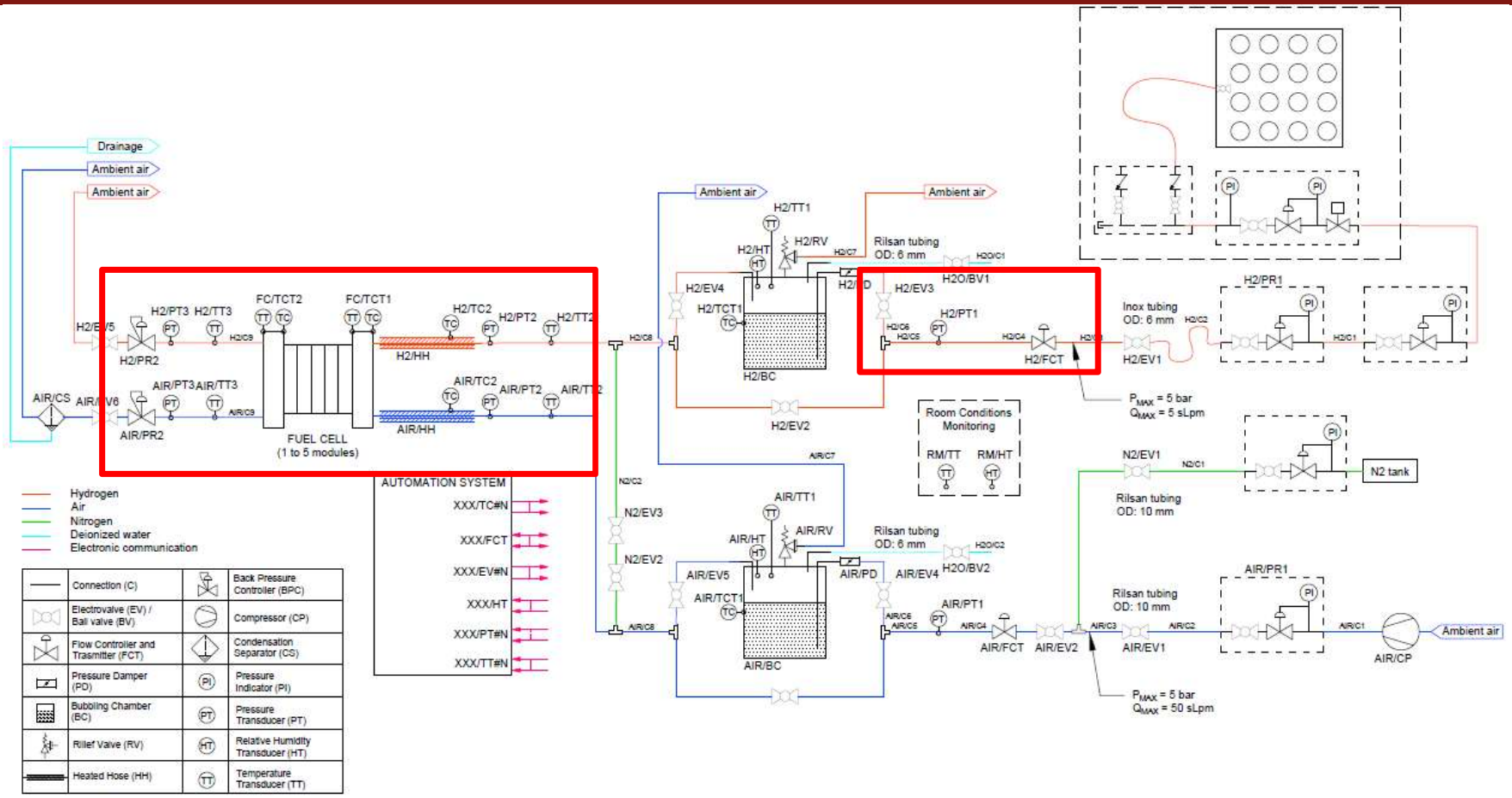


PLANT DESIGN AND DATA ACQUISITION

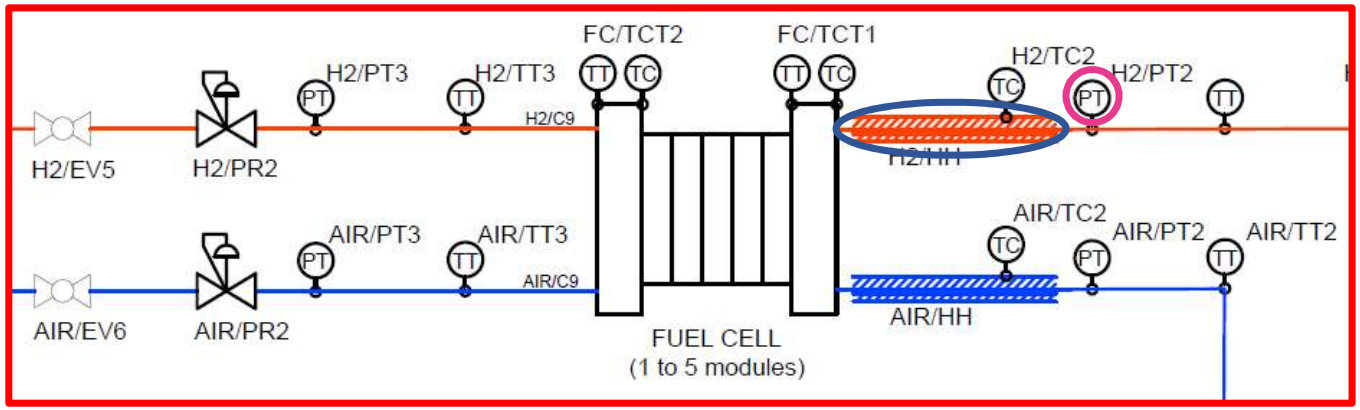


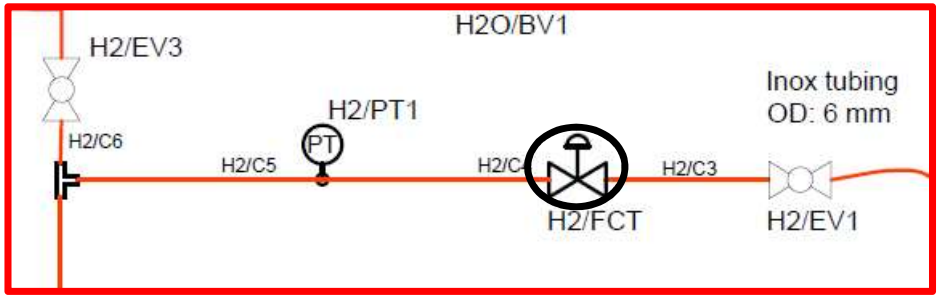


PLANT DESIGN AND DATA ACQUISITION

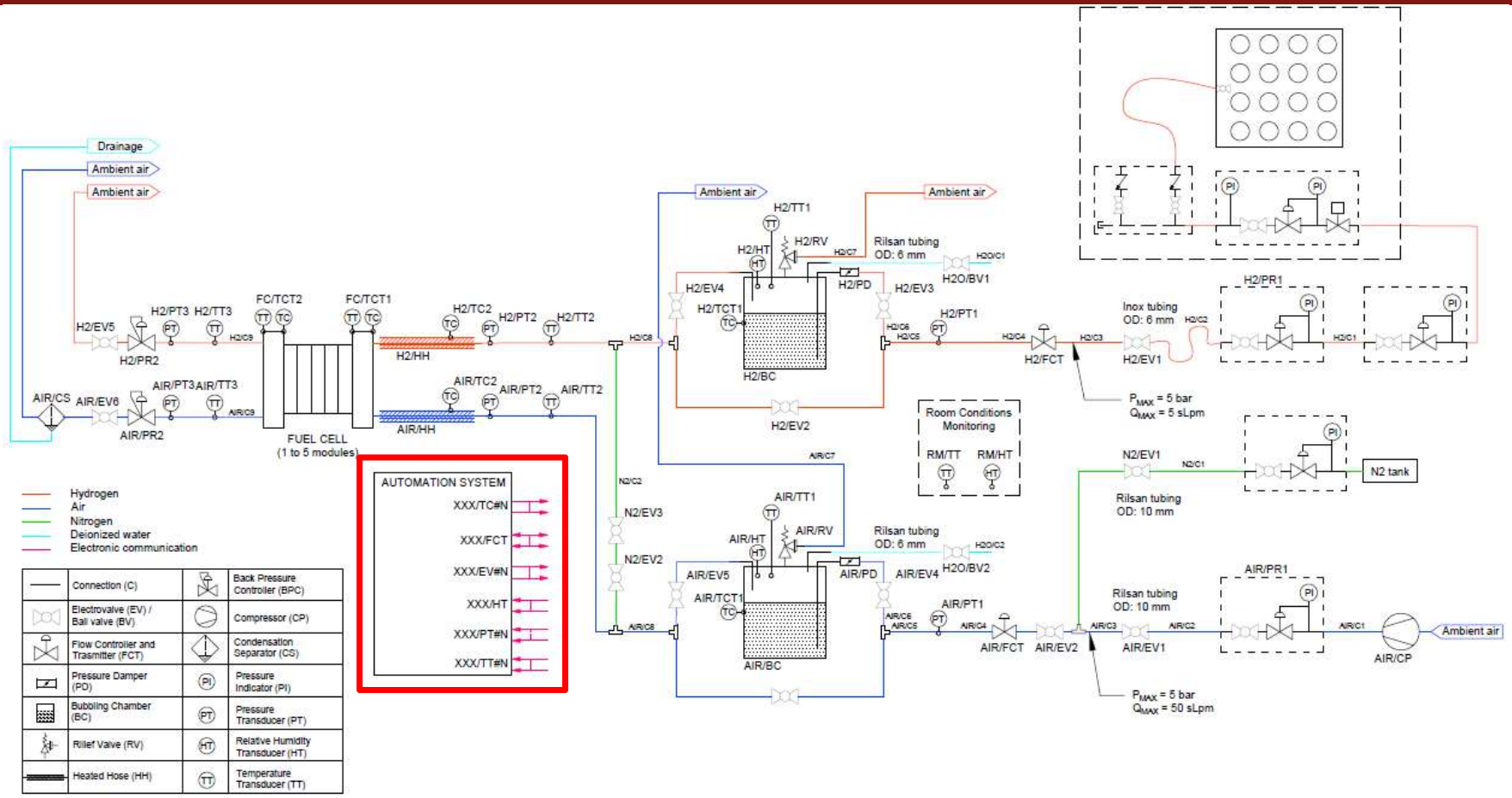


PLANT DESIGN AND DATA ACQUISITION

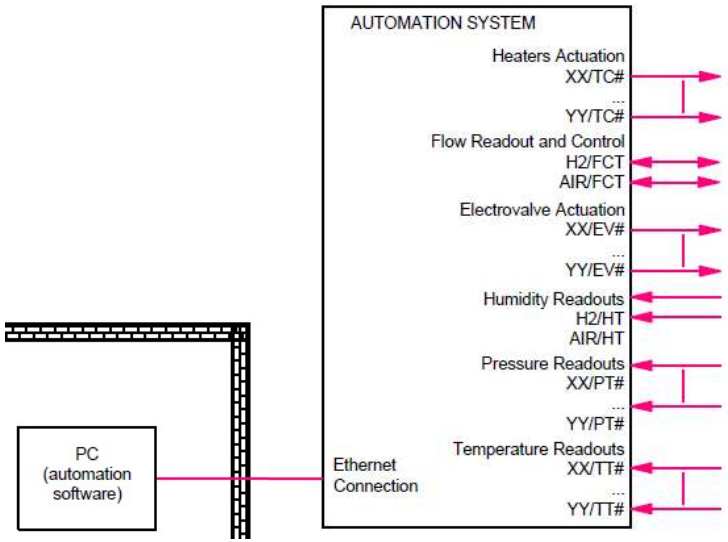




PLANT DESIGN AND DATA ACQUISITION



PLANT DESIGN AND DATA ACQUISITION



To relays

Digital communication (ETH, RS-232, RS-485, …)

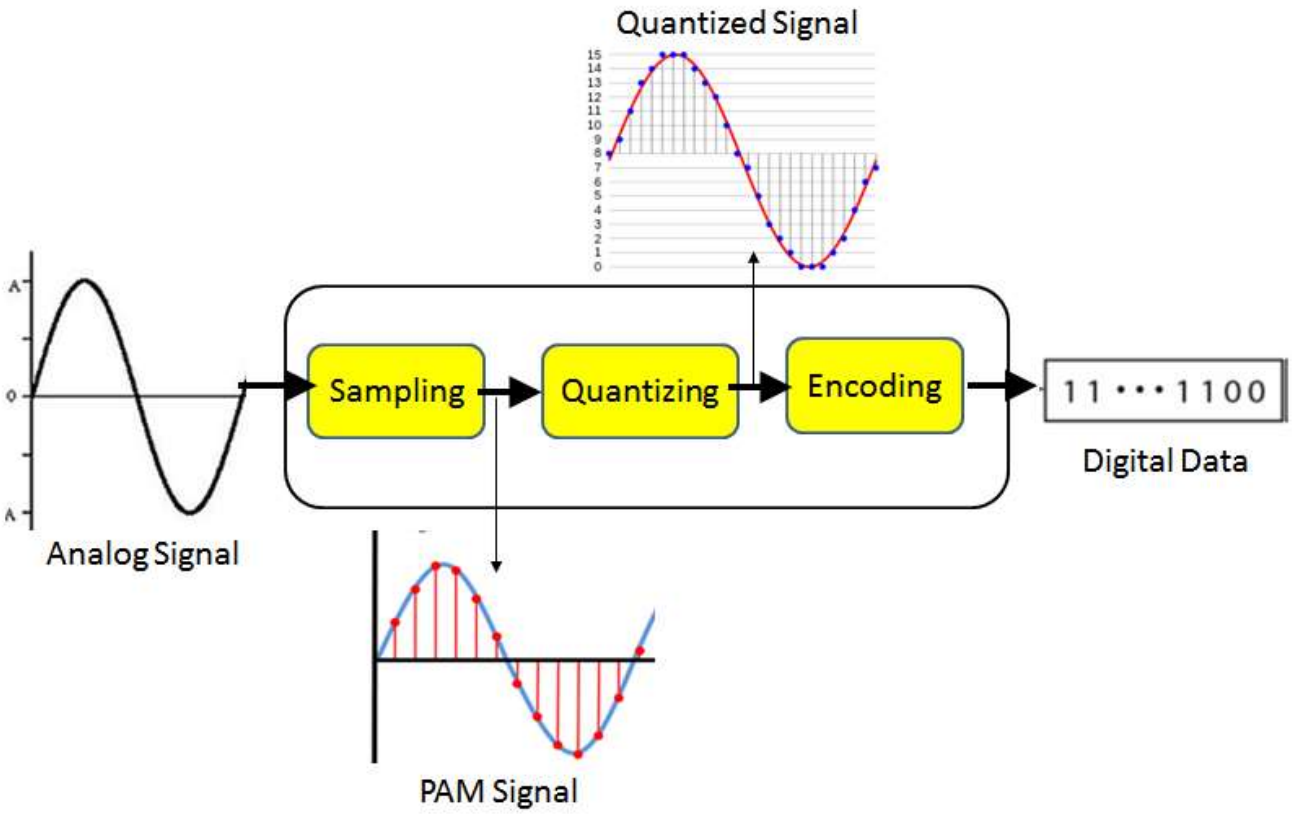
Digital output

Analogue voltage input

Analogue current input (power supply to be externally provided)

Differential voltage input

DATA ACQUISITION / ADC

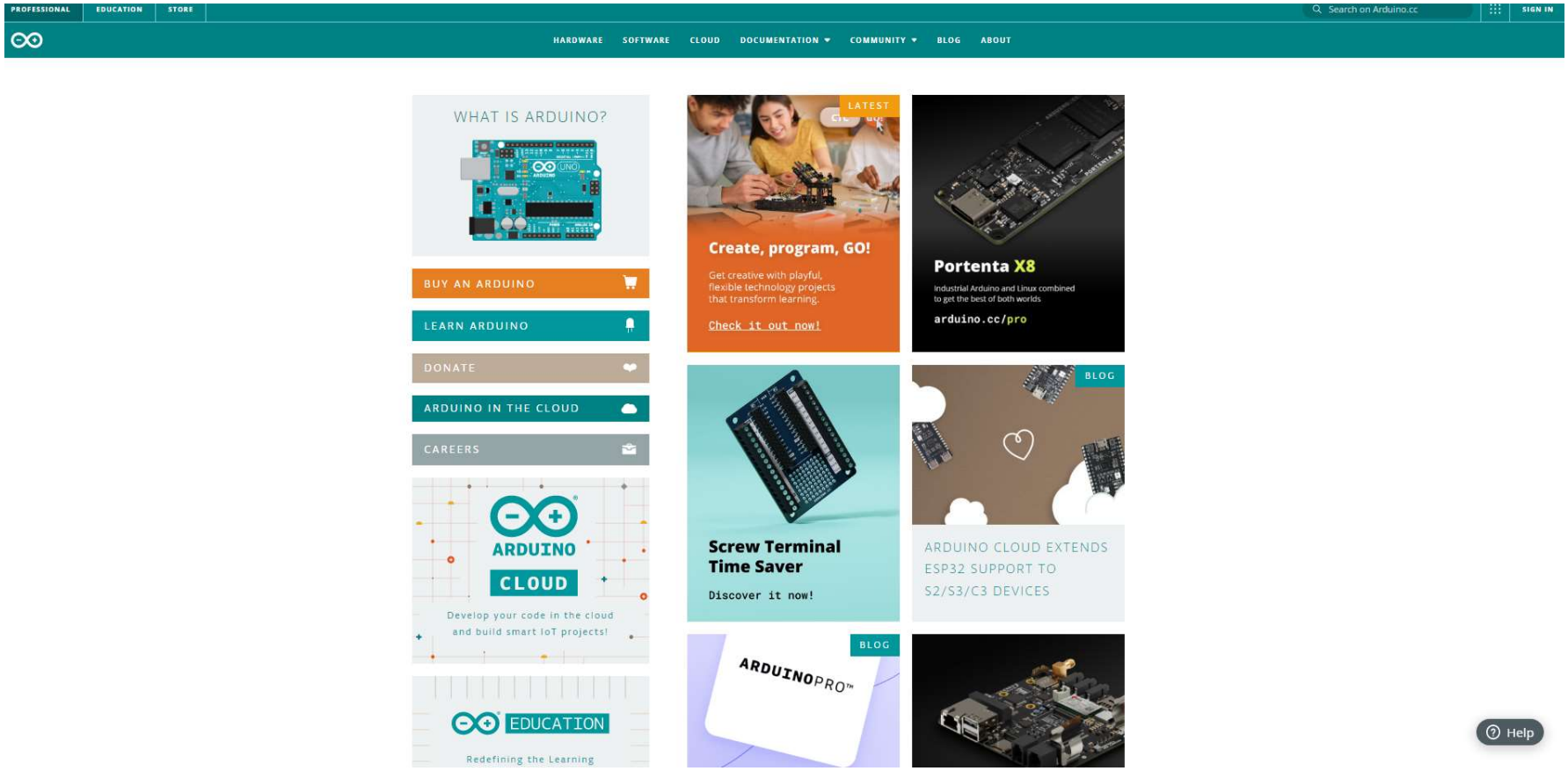


PLC

Programmable Logic Controller

- Short response time
- Suitable for operating in harsh environments
- Easy connection system and programming language

ARDUINO


PROFESSIONAL
EDUCATION
STORE
Search on Arduino.cc
SIGN IN
HARDWARE
SOFTWARE
CLOUD
DOCUMENTATION
COMMUNITY
BLOG
ABOUT
WHAT IS ARDUINO?
BUY AN ARDUINO
LEARN ARDUINO
DONATE
ARDUINO IN THE CLOUD
CAREERS
ARDUINO
CLOUD
Develop your code in the cloud and build smart IoT projects!
EDUCATION
Redefining the Learning
LATEST
Create, program, GO!
Get creative with playful, flexible technology projects that transform learning.
Check it out now!
Portenta X8
Industrial Arduino and Linux combined to get the best of both worlds
arduino.cc/pro
Screw Terminal Time Saver
Discover it now!
BLOG
ARDUINO CLOUD EXTENDS ESP32 SUPPORT TO S2/S3/C3 DEVICES
BLOG
ARDUINOPRO™
Help

ARDUINO

Boards

Arduino UNO R3	Arduino Mega 2560 Rev3	Arduino Leonardo	Arduino UNO Mini Limited Edition
Arduino Due	Arduino Micro	Arduino Zero	Arduino UNO WiFi Rev2

Shields

Arduino Motor Shield Rev3	Arduino 4 Relay Shield	Arduino Ethernet Shield Rev2

ReadAnalogVoltage | Arduino 1.8.19

File Modifica Sketch Strumenti Aiuto

ReadAnalogVoltage

```
/*
  ReadAnalogVoltage

  Reads an analog input on pin 0, converts it to voltage, and prints the result to the Serial Monitor.
  Graphical representation is available using Serial Plotter (Tools > Serial Plotter menu).
  Attach the center pin of a potentiometer to pin A0, and the outside pins to +5V and ground.

  This example code is in the public domain.

  https://www.arduino.cc/en/Tutorial/BuiltInExamples/ReadAnalogVoltage
*/

// the setup routine runs once when you press reset:
void setup() {
  // initialize serial communication at 9600 bits per second:
  Serial.begin(9600);
}

// the loop routine runs over and over again forever:
void loop() {
  // read the input on analog pin 0:
  int sensorValue = analogRead(A0);
  // Convert the analog reading (which goes from 0 - 1023) to a voltage (0 - 5V):
  float voltage = sensorValue * (5.0 / 1023.0);
  // print out the value you read:
  Serial.println(voltage);
}
```

NATIONAL INSTRUMENTS

PXI

Meet demanding test objectives with the widest portfolio of industry-leading modular instruments and configurable software interfaces.

LabVIEW

Create applications using an intuitive graphical programming language with unparalleled hardware connectivity and extensive IP libraries.

DAQ Products

Explore data acquisition products with sensor-specific, conditioned I/O for accurate and precise measurements.

NATIONAL INSTRUMENTS

PXI

Meet demanding test objectives with the widest portfolio of industry-leading modular instruments and configurable software interfaces.

What is PXI?

NI PXI systems provide high-performance modular instruments and other I/O modules that feature specialized synchronization and key software features for test and measurement applications from device validation to automated production test. NI is the PXI industry leader, with the broadest array of best-in-class products and services on the market.

More on PXI

WATCH THE VIDEO

NATIONAL INSTRUMENTS

PXI

Meet demanding test objectives with the widest portfolio of industry-leading modular instruments and configurable software interfaces.

Controller

PXI controllers are either integrated or remote. Integrated controllers contain everything you need to run your PXI system without an external PC, while remote controllers let you control your PXI system from desktops, laptops, or server computers.

View PXI controllers

Modules

NI offers more than 600 PXI modules that acquire data, trigger and synchronize devices, generate and route signals, and make a variety of measurements ranging from DC to mmWave. Also, the PXI portfolio includes modular instruments—such as oscilloscopes and digital multimeters—that can replace traditional box instruments and with which you can integrate PXI switches in a variety of topologies. Because PXI is an open industry standard, nearly 1,500 products are available from more than 70 different instrument vendors.

- PXI Multifunction I/O Module →
- PXI Digital I/O Module →
- Device for PXI Remote Control →
- PXI Digital Multimeter →

NATIONAL INSTRUMENTS

PXI

Meet demanding test objectives with the widest portfolio of industry-leading modular instruments and configurable software interfaces.

Chassis

The chassis—the PXI system backbone—is comparable to a desktop PC's mechanical enclosure and motherboard. It provides power, cooling, and a communication bus to the system, and supports multiple instrumentation modules within the same enclosure. PXI uses commercial PC-based PCI and PCI Express bus technology while combining rugged CompactPCI modular packaging, as well as key timing and synchronization features. Chassis range in size from four to 18 slots to fit the needs of any application, whether you require a portable, benchtop, rack-mount, or embedded system.

View PXI chassis

NATIONAL INSTRUMENTS

PXI

Meet demanding test objectives with the widest portfolio of industry-leading modular instruments and configurable software interfaces.

Industry-Standard

NI led the creation of the PXI standards body to create an open standard, so you can augment your NI system with specialty modules from up to 60 other vendors.

High-Performance

NI PXI hardware utilizes the latest technology, incorporating powerful multicore processors, FPGAs, and other technology to increase measurement range and performance.

Scalable

PXI's architecture makes it possible to synchronize measurements across multiple modules or multiple chassis, so you can add to your systems as requirements change.

Accurate

PXI offers some of the highest frequency and accuracy specifications, so you can ensure your test systems deliver the production test results you need.

NATIONAL INSTRUMENTS

DAQ Products

Explore data acquisition products with sensor-specific, conditioned I/O for accurate and precise measurements.

Data Acquisition (DAQ)

Create DAQ systems with NI devices, sensors, and software.

What is DAQ?

Data acquisition (DAQ) is the process of measuring an electrical or physical phenomenon, such as voltage, current, temperature, pressure, or sound. A DAQ system consists of sensors, DAQ measurement hardware, and a computer with programmable software.

Data Acquisition Basics and Technology

WATCH VIDEO

NATIONAL INSTRUMENTS CRIO

NATIONAL INSTRUMENTS DAQ PRODUCTS

PC-Based Systems

Achieve electrical and physical measurements with a customizable, accurate, yet cost-effective way to conduct benchtop measurements.

CompactDAQ

This portable, flexible approach is ideal for applications with a wide mix of measurement types, where scalability and flexibility are important. Hardware ruggedness makes it a great fit for high-channel-count distributed applications in the field.

CompactRIO

Take advantage of real-time data processing capabilities, sensor-specific conditioned I/O, and a closely integrated software toolchain for long-running, industrial data acquisition applications.

PXI

Use this modular approach for high-channel-count data acquisition and sensor measurement applications. Systems range from tens to hundreds of channels, mixing and matching measurement functionality and output capabilities.

NATIONAL INSTRUMENTS

DAQ Products

Explore data acquisition products with sensor-specific, conditioned I/O for accurate and precise measurements.

Accurate

Maximize the absolute accuracy of your measurements with NI's industry-leading performance for automated data acquisition.

Flexible

Build mixed-measurement systems tailored to your needs and swap out or add hardware as your needs change.

Scalable

Choose from hardware options that let you control multiple data acquisition systems as part of one synchronized application.

Programmable

Program your hardware with the same API in your choice of language, including G, Python, ANSI C, C#, and .NET. Or, use interactive software without writing code.

NATIONAL INSTRUMENTS LABVIEW

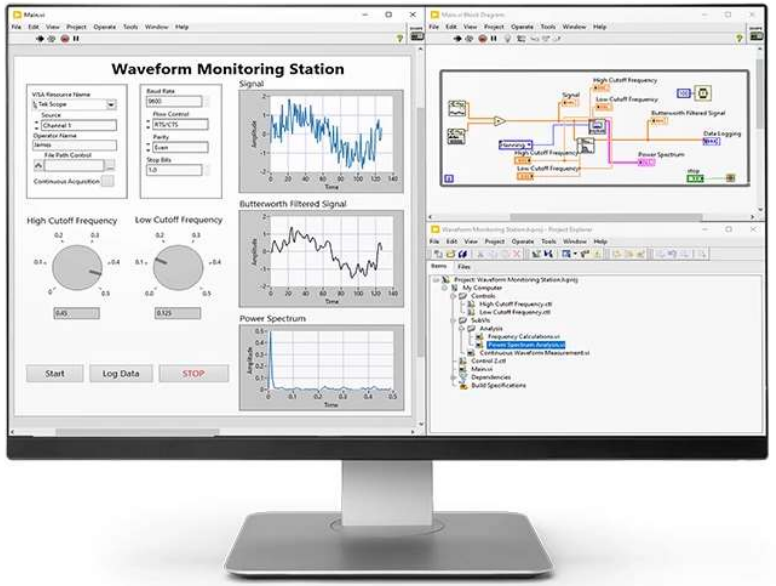
LabVIEW

Create applications using an intuitive graphical programming language with unparalleled hardware connectivity and extensive IP libraries.

What Is LabVIEW?

LabVIEW is a graphical programming environment engineers use to develop automated research, validation, and production test systems.

See Pricing



LABVIEW

LABoratory Virtual Instruments Engineering Workbench

Graphical programming language that allows for:

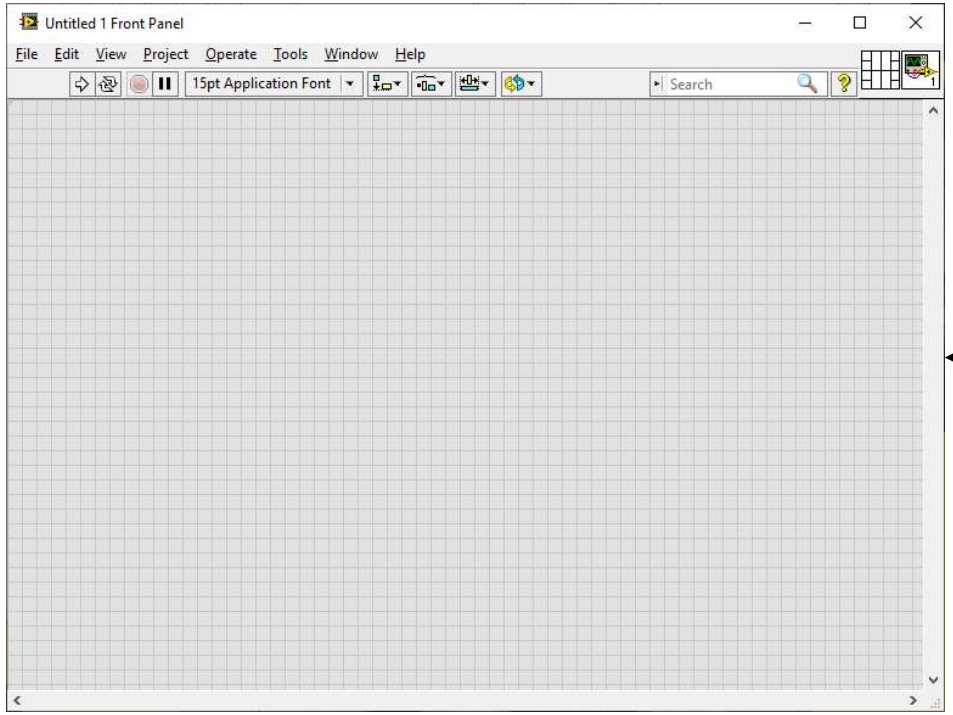
- instrument control
- data acquisition
- pre/post data processing

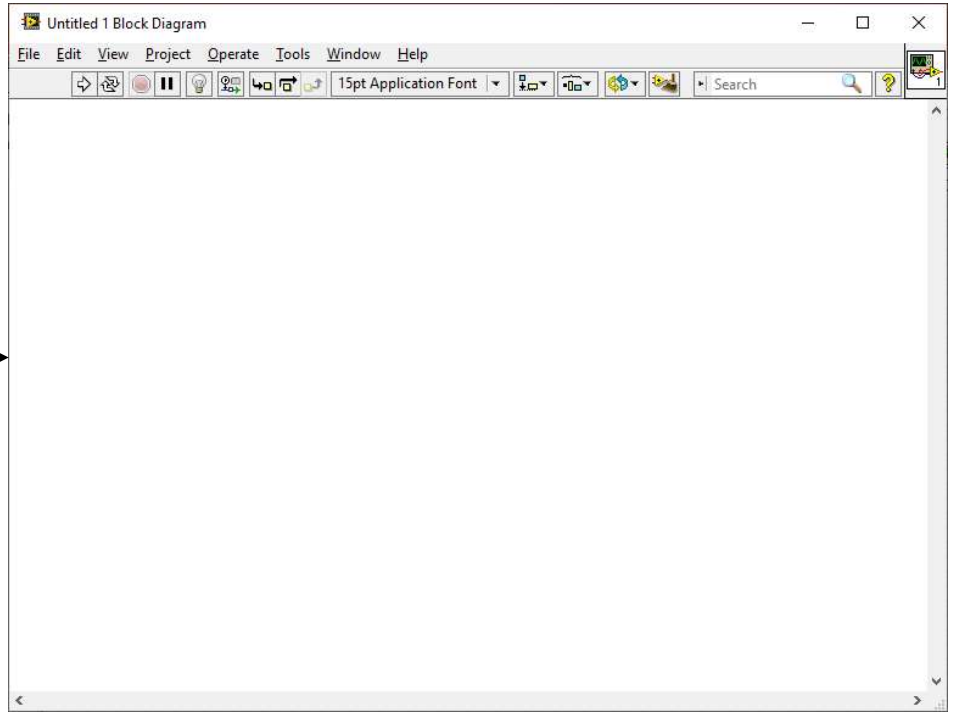
Graphical programming language: graphical symbols rather than textual language to describe programming actions

Such a software was born in 1986: up to date embeds lots of libraries for communicate with most of the hardware available on the market.

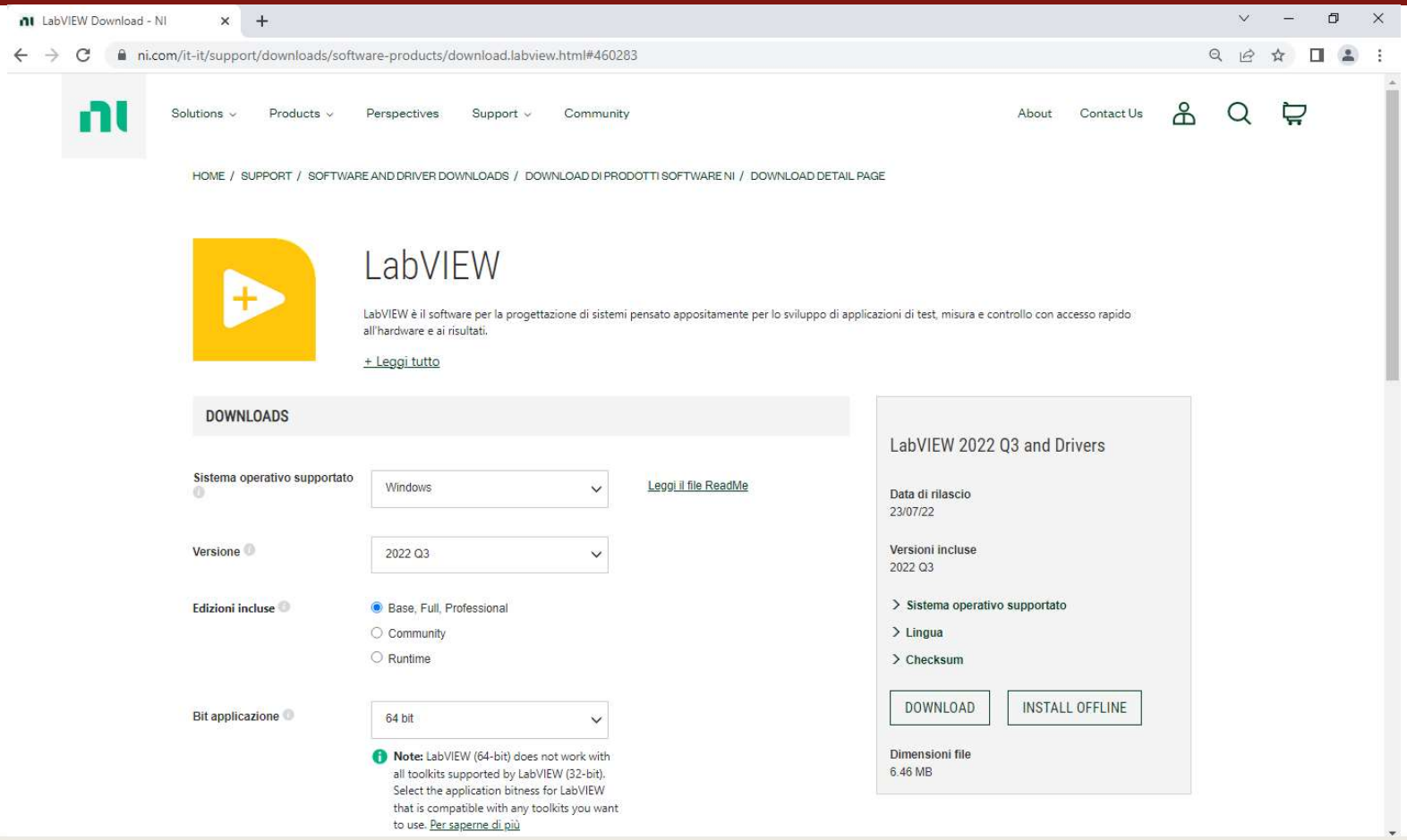
LABVIEW

A program developed by means of LV is called Virtual Instrument (VI).

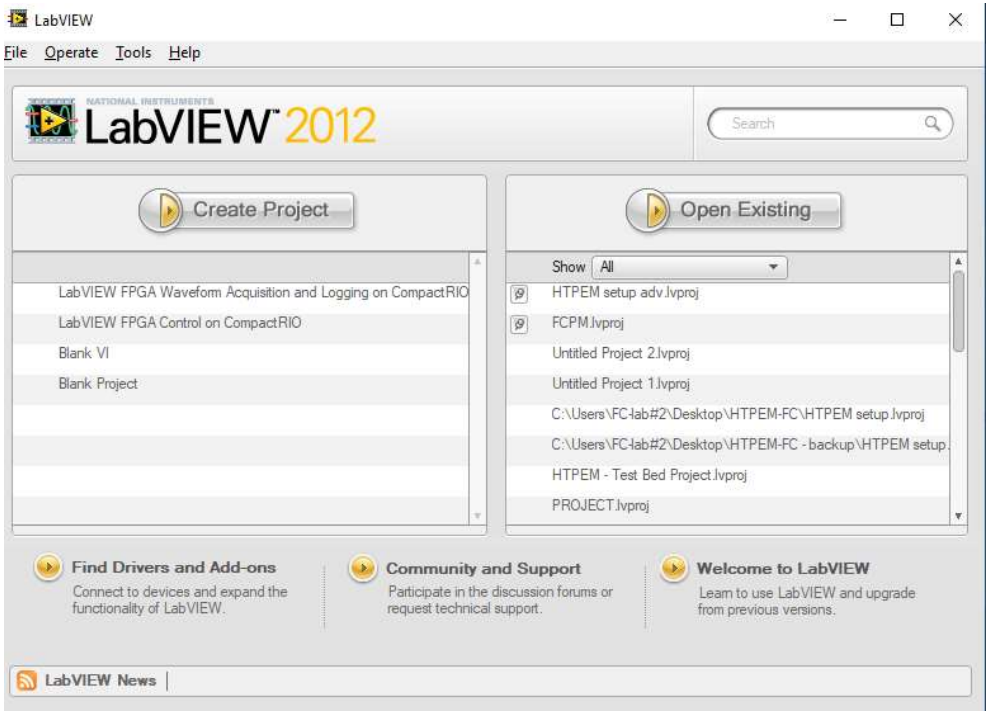




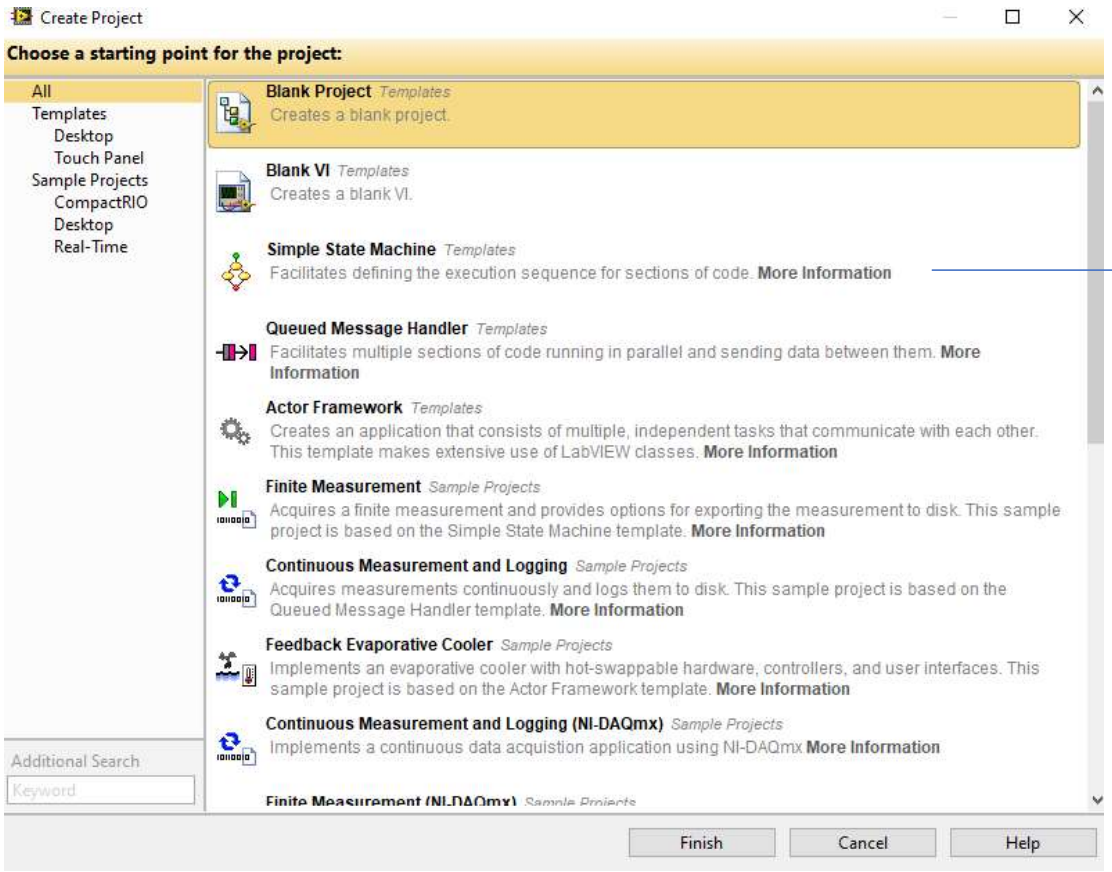
LABVIEW

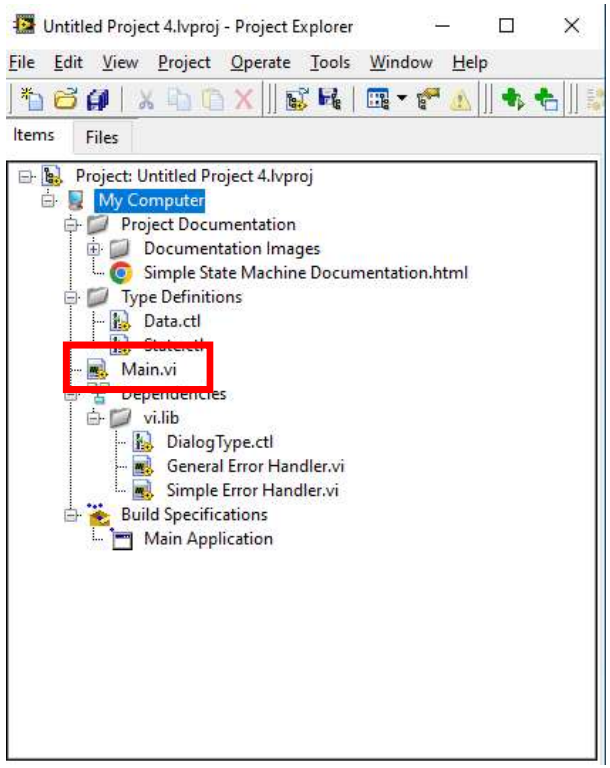

LabVIEW Download - NI
ni.com/it-it/support/downloads/software-products/download.labview.html#460283
Solutions
Products
Perspectives
Support
Community
About
Contact Us
HOME / SUPPORT / SOFTWARE AND DRIVER DOWNLOADS / DOWNLOAD DI PRODOTTI SOFTWARE NI / DOWNLOAD DETAIL PAGE
LabVIEW
LabVIEW è il software per la progettazione di sistemi pensato appositamente per lo sviluppo di applicazioni di test, misura e controllo con accesso rapido all'hardware e ai risultati.
+ Leggi tutto
DOWNLOADS
Sistema operativo supportato
Windows
Leggi il file ReadMe
Versione
2022 Q3
Edizioni incluse
Base, Full, Professional
Community
Runtime
Bit applicazione
64 bit
Note: LabVIEW (64-bit) does not work with all toolkits supported by LabVIEW (32-bit). Select the application bitness for LabVIEW that is compatible with any toolkits you want to use. Per saperne di più
LabVIEW 2022 Q3 and Drivers
Data di rilascio
23/07/22
Versioni incluse
2022 Q3
Sistema operativo supportato
Lingua
Checksum
DOWNLOAD
INSTALL OFFLINE
Dimensioni file
6.46 MB

LABVIEW

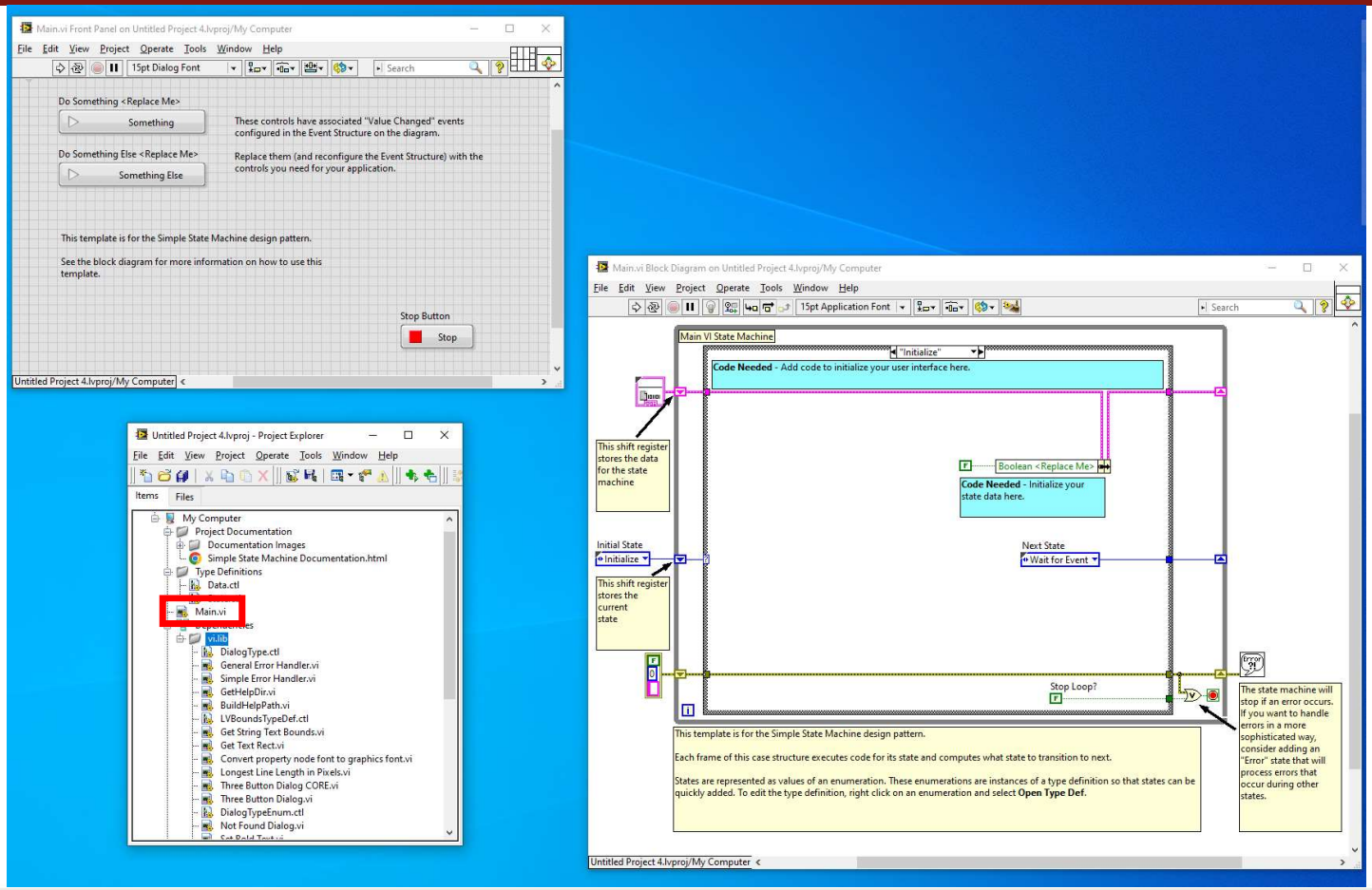

LabVIEW
File Operate Tools Help
NATIONAL INSTRUMENTS
LabVIEW 2012
Search
Create Project
Open Existing
LabVIEW FPGA Waveform Acquisition and Logging on CompactRIO
LabVIEW FPGA Control on CompactRIO
Blank VI
Blank Project
Show All
HTPEM setup adv.lvproj
FCPM.lvproj
Untitled Project 2.lvproj
Untitled Project 1.lvproj
C:\Users\FC-lab#2\Desktop\HTPEM-FC\HTPEM setup.lvproj
C:\Users\FC-lab#2\Desktop\HTPEM-FC - backup\HTPEM setup.
HTPEM - Test Bed Project.lvproj
PROJECT.lvproj
Find Drivers and Add-ons
Connect to devices and expand the functionality of LabVIEW.
Community and Support
Participate in the discussion forums or request technical support.
Welcome to LabVIEW
Learn to use LabVIEW and upgrade from previous versions.
LabVIEW News

LABVIEW

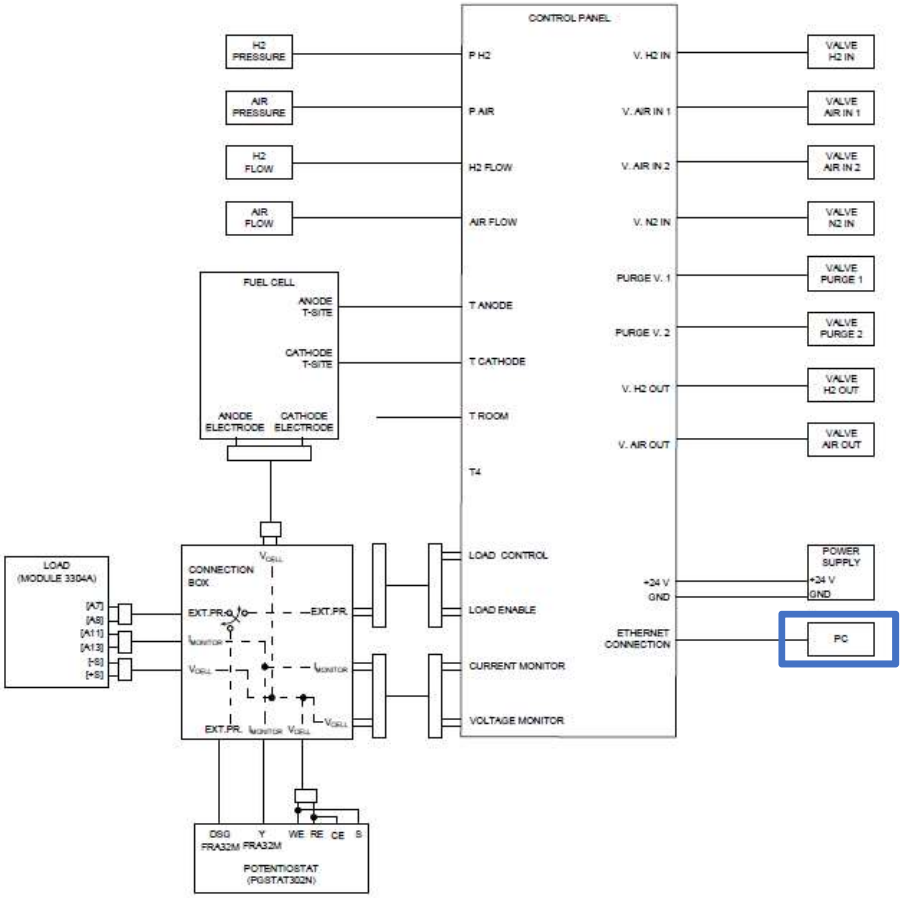

Create Project
Choose a starting point for the project:
All
Templates
Desktop
Touch Panel
Sample Projects
CompactRIO
Desktop
Real-Time
Blank Project Templates
Creates a blank project.
Blank VI Templates
Creates a blank VI.
Simple State Machine Templates
Facilitates defining the execution sequence for sections of code. More Information
Queued Message Handler Templates
Facilitates multiple sections of code running in parallel and sending data between them. More Information
Actor Framework Templates
Creates an application that consists of multiple, independent tasks that communicate with each other. This template makes extensive use of LabVIEW classes. More Information
Finite Measurement Sample Projects
Acquires a finite measurement and provides options for exporting the measurement to disk. This sample project is based on the Simple State Machine template. More Information
Continuous Measurement and Logging Sample Projects
Acquires measurements continuously and logs them to disk. This sample project is based on the Queued Message Handler template. More Information
Feedback Evaporative Cooler Sample Projects
Implements an evaporative cooler with hot-swappable hardware, controllers, and user interfaces. This sample project is based on the Actor Framework template. More Information
Continuous Measurement and Logging (NI-DAQmx) Sample Projects
Implements a continuous data acquistion application using NI-DAQmx More Information
Additional Search
Keyword
Finish
Cancel
Help

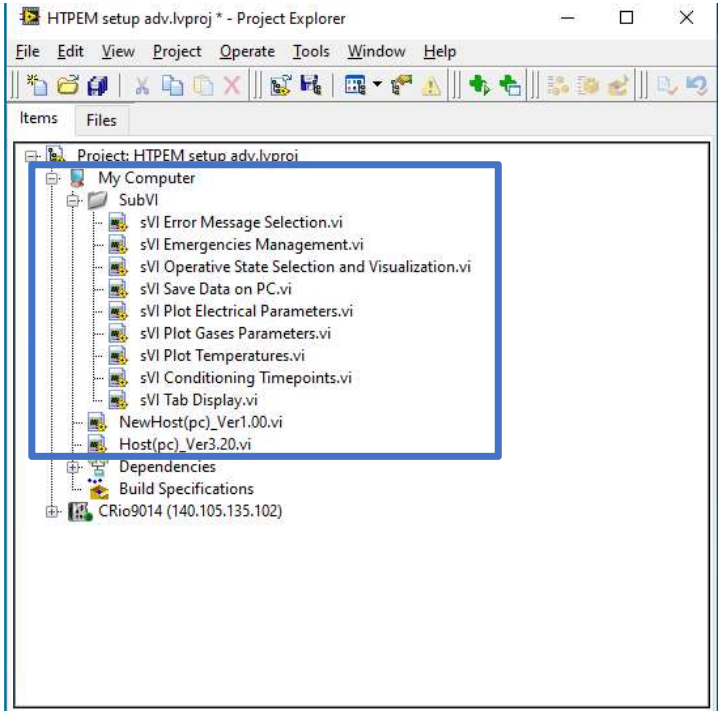

Untitled Project 4.lvproj - Project Explorer
File Edit View Project Operate Tools Window Help
Items
Files
Project: Untitled Project 4.lvproj
My Computer
Project Documentation
Documentation Images
Simple State Machine Documentation.html
Type Definitions
Data.ctl
Main.vi
vi.lib
DialogType.ctl
General Error Handler.vi
Simple Error Handler.vi
Build Specifications
Main Application

LABVIEW

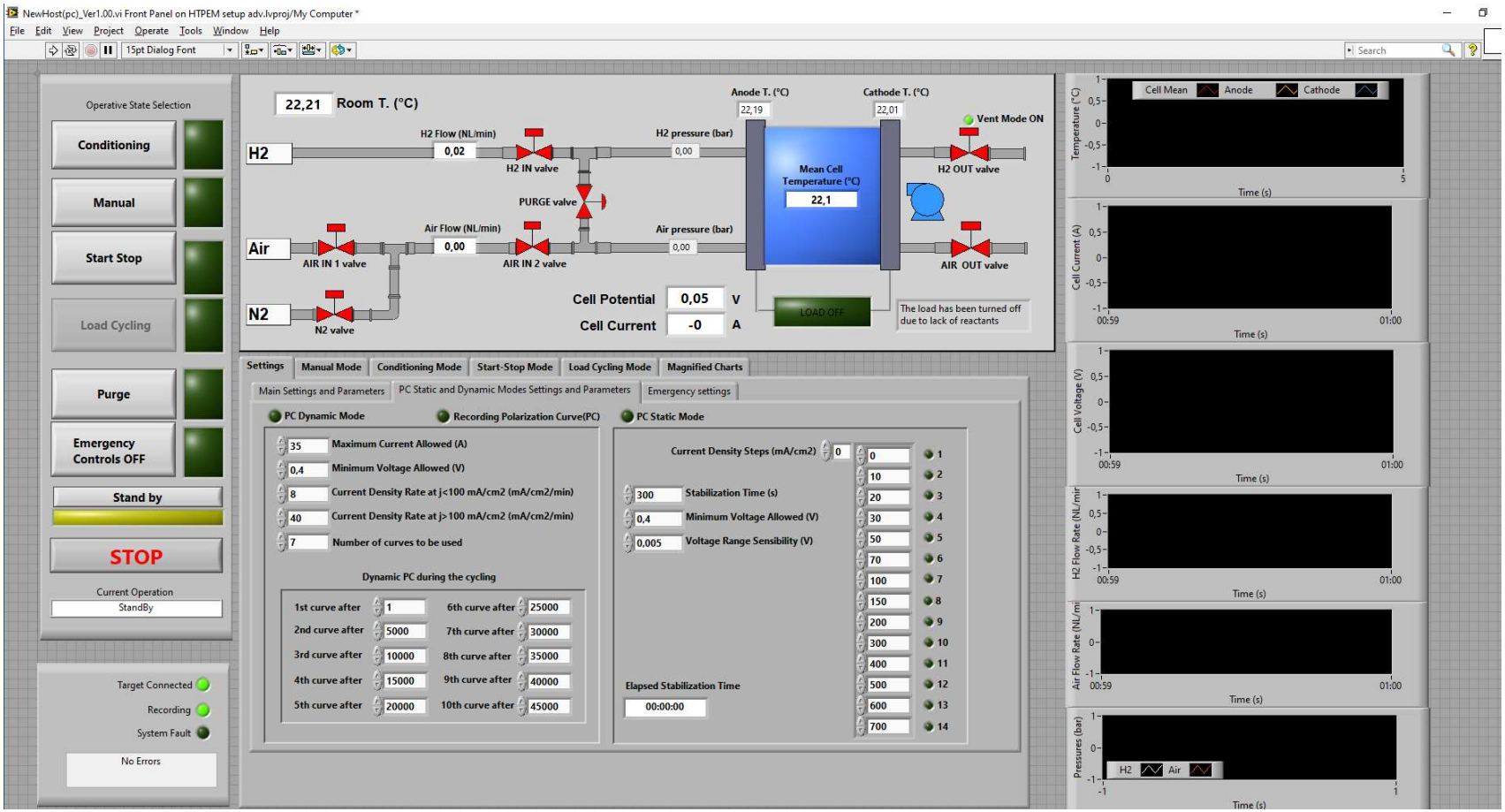

Main.vi Front Panel on Untitled Project 4.lvproj/My Computer
File Edit View Project Operate Tools Window Help
15pt Dialog Font
Search
Do Something <Replace Me>
Something
These controls have associated "Value Changed" events configured in the Event Structure on the diagram.
Do Something Else <Replace Me>
Something Else
Replace them (and reconfigure the Event Structure) with the controls you need for your application.
This template is for the Simple State Machine design pattern.
See the block diagram for more information on how to use this template.
Stop Button
Stop
Untitled Project 4.lvproj/My Computer
Untitled Project 4.lvproj - Project Explorer
File Edit View Project Operate Tools Window Help
Items
Files
My Computer
Project Documentation
Documentation Images
Simple State Machine Documentation.html
Type Definitions
Data.ctl
Main.vi
vi.lib
DialogType.ctl
General Error Handler.vi
Simple Error Handler.vi
GetHelpDir.vi
BuildHelpPath.vi
LVBoundsTypeDef.ctl
Get String Text Bounds.vi
Get Text Rect.vi
Convert property node font to graphics font.vi
Longest Line Length in Pixels.vi
Three Button Dialog CORE.vi
Three Button Dialog.vi
DialogTypeEnum.ctl
Not Found Dialog.vi
Main.vi Block Diagram on Untitled Project 4.lvproj/My Computer
File Edit View Project Operate Tools Window Help
15pt Application Font
Search
Main VI State Machine
"Initialize"
Code Needed - Add code to initialize your user interface here.
This shift register stores the data for the state machine
Boolean <Replace Me>
Code Needed - Initialize your state data here.
Initial State
Initialize
Next State
Wait for Event
This shift register stores the current state
Stop Loop?
The state machine will stop if an error occurs. If you want to handle errors in a more sophisticated way, consider adding an "Error" state that will process errors that occur during other states.
This template is for the Simple State Machine design pattern.
Each frame of this case structure executes code for its state and computes what state to transition to next.
States are represented as values of an enumeration. These enumerations are instances of a type definition so that states can be quickly added. To edit the type definition, right click on an enumeration and select Open Type Def.
Untitled Project 4.lvproj/My Computer

LABVIEW PROJECT – AN EXAMPLE

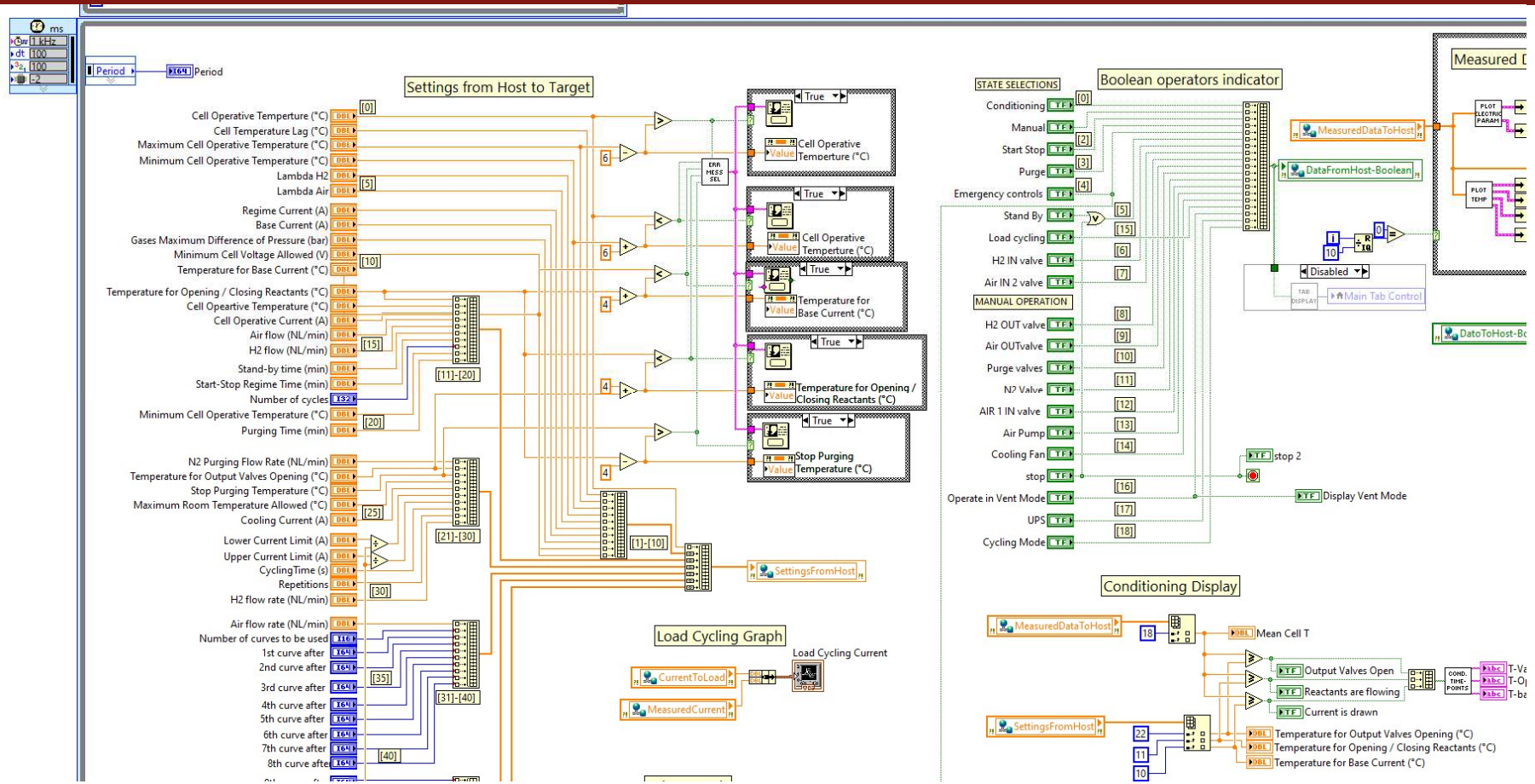




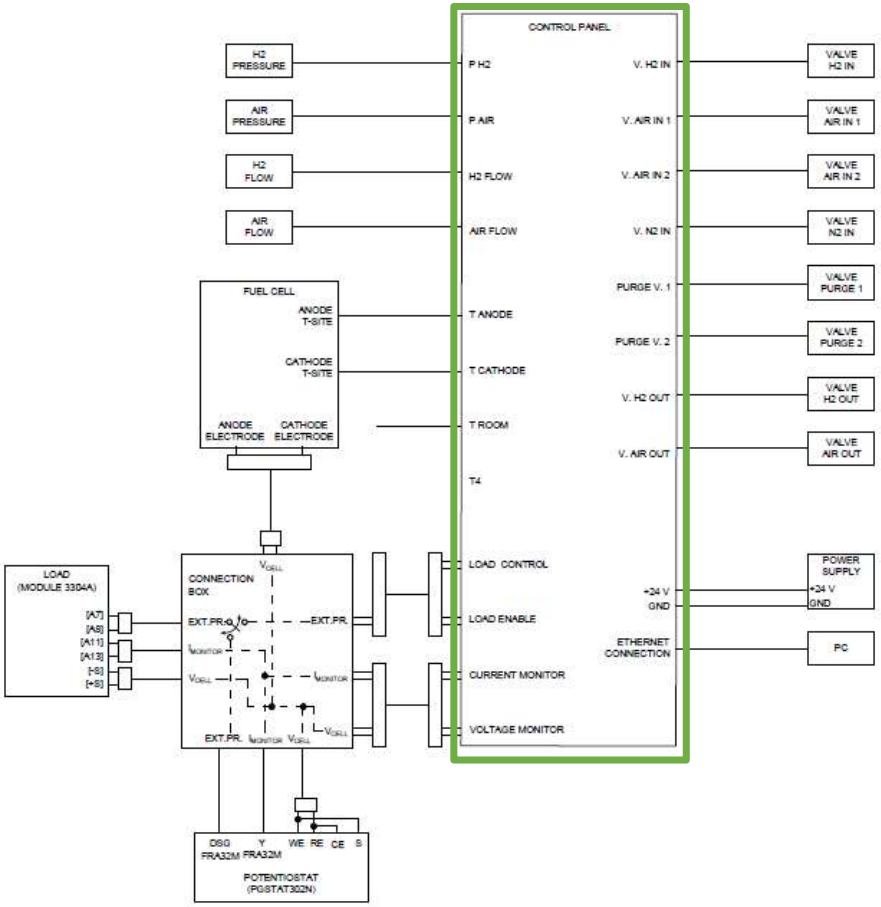
LABVIEW PROJECTS – A REAL EXAMPLE (1)



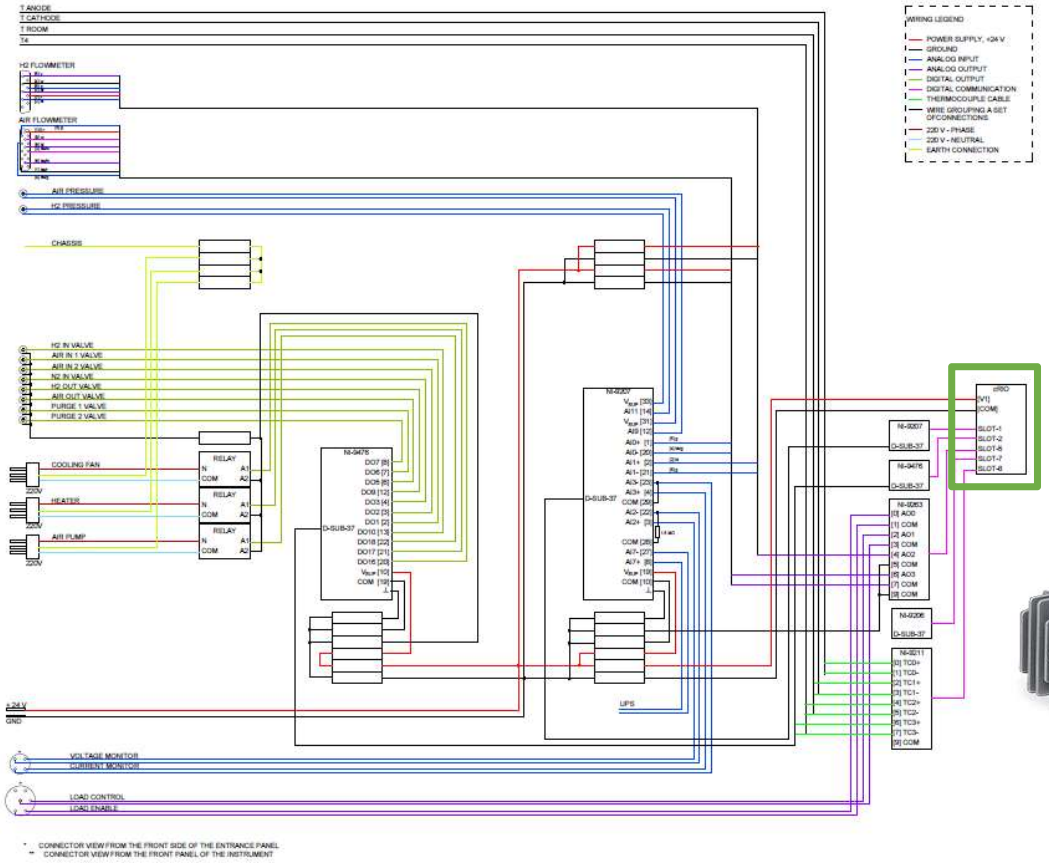
LABVIEW PROJECTS – A REAL EXAMPLE (1)

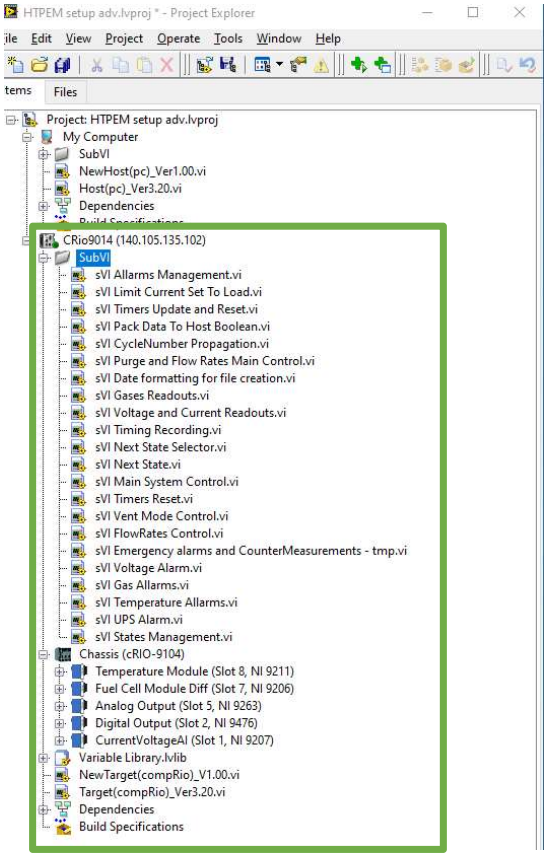


LABVIEW PROJECT – AN EXAMPLE

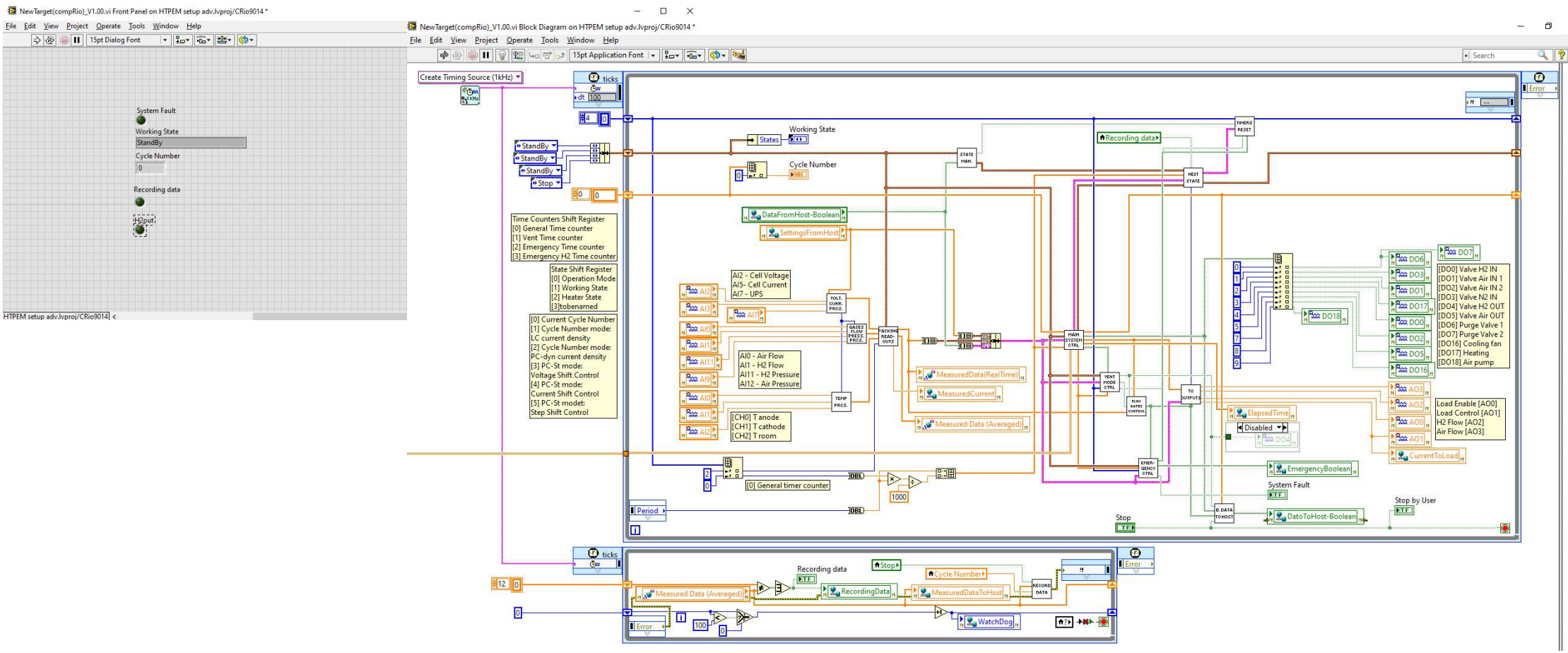


LABVIEW PROJECT – AN EXAMPLE



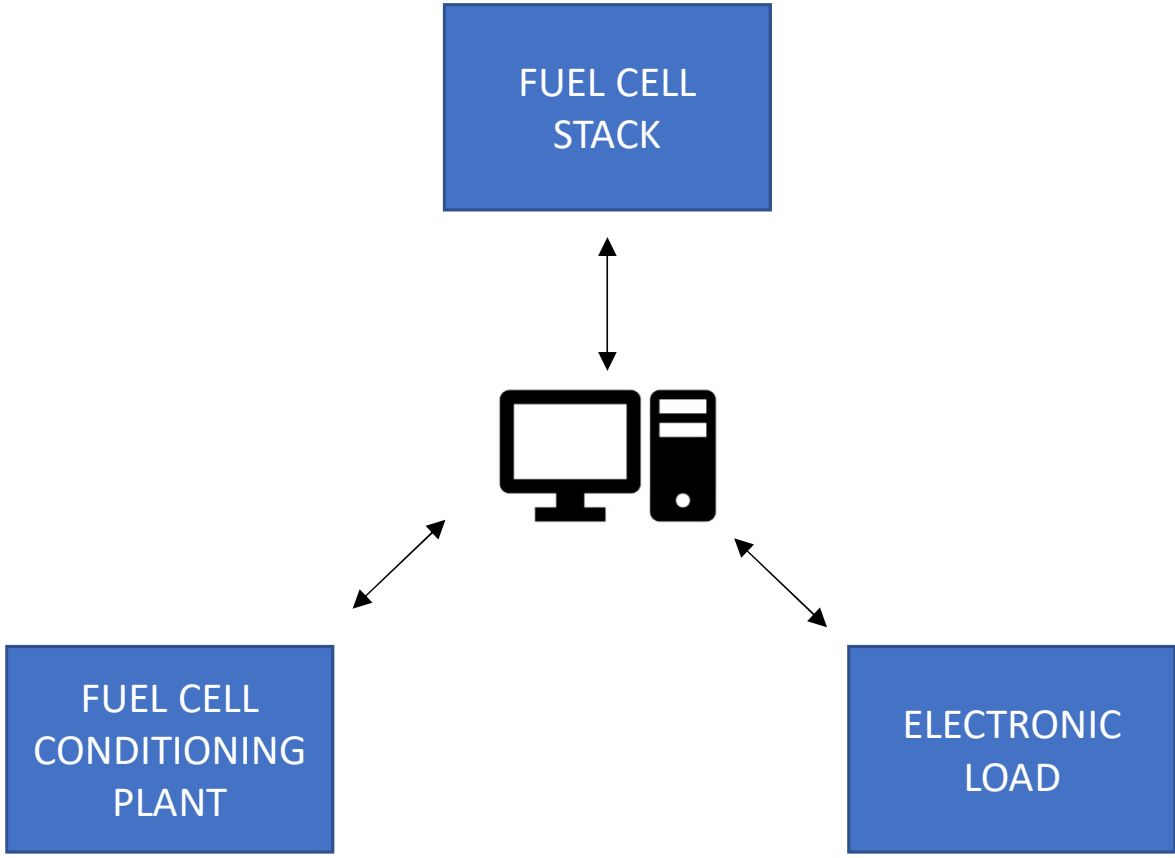


LABVIEW PROJECT – AN EXAMPLE

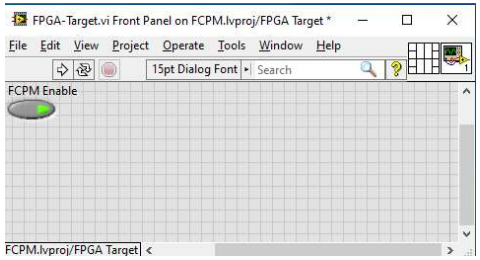


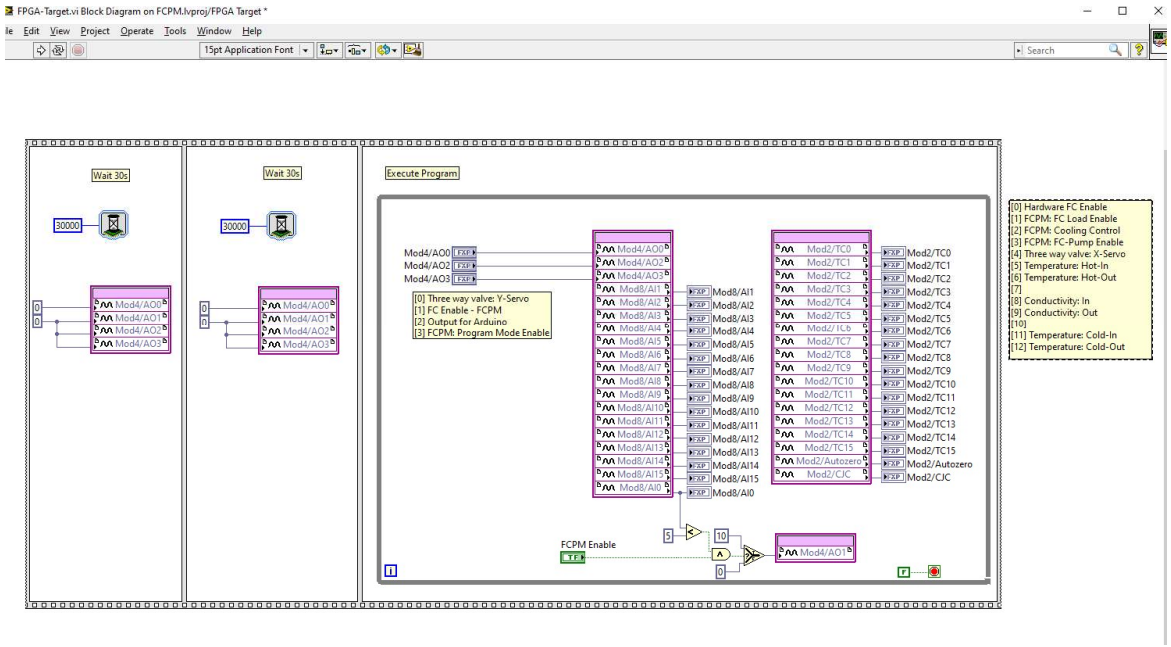
LABVIEW PROJECTS – ANOTHER EXAMPLE

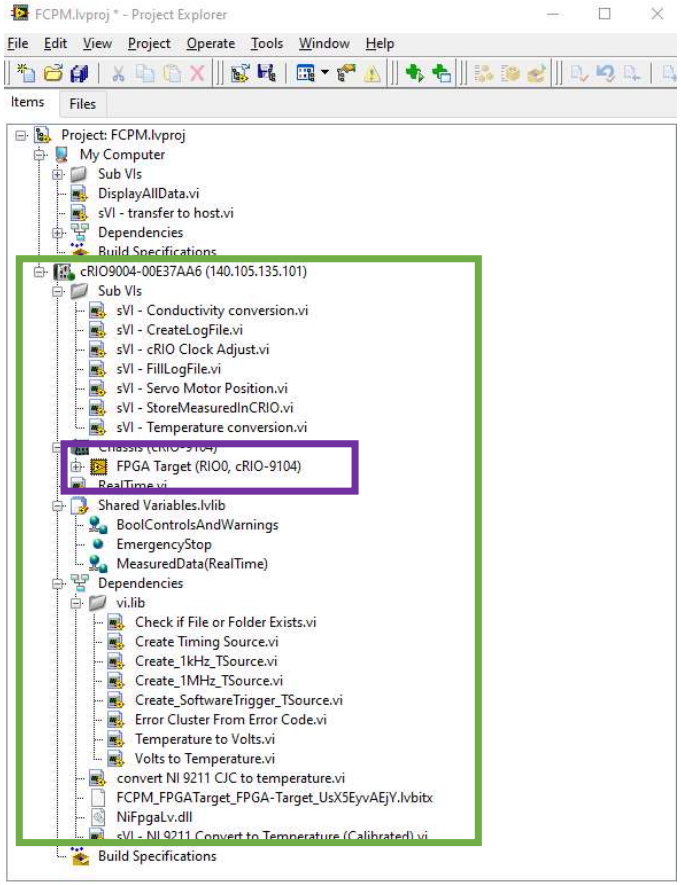
DRAWINGS®



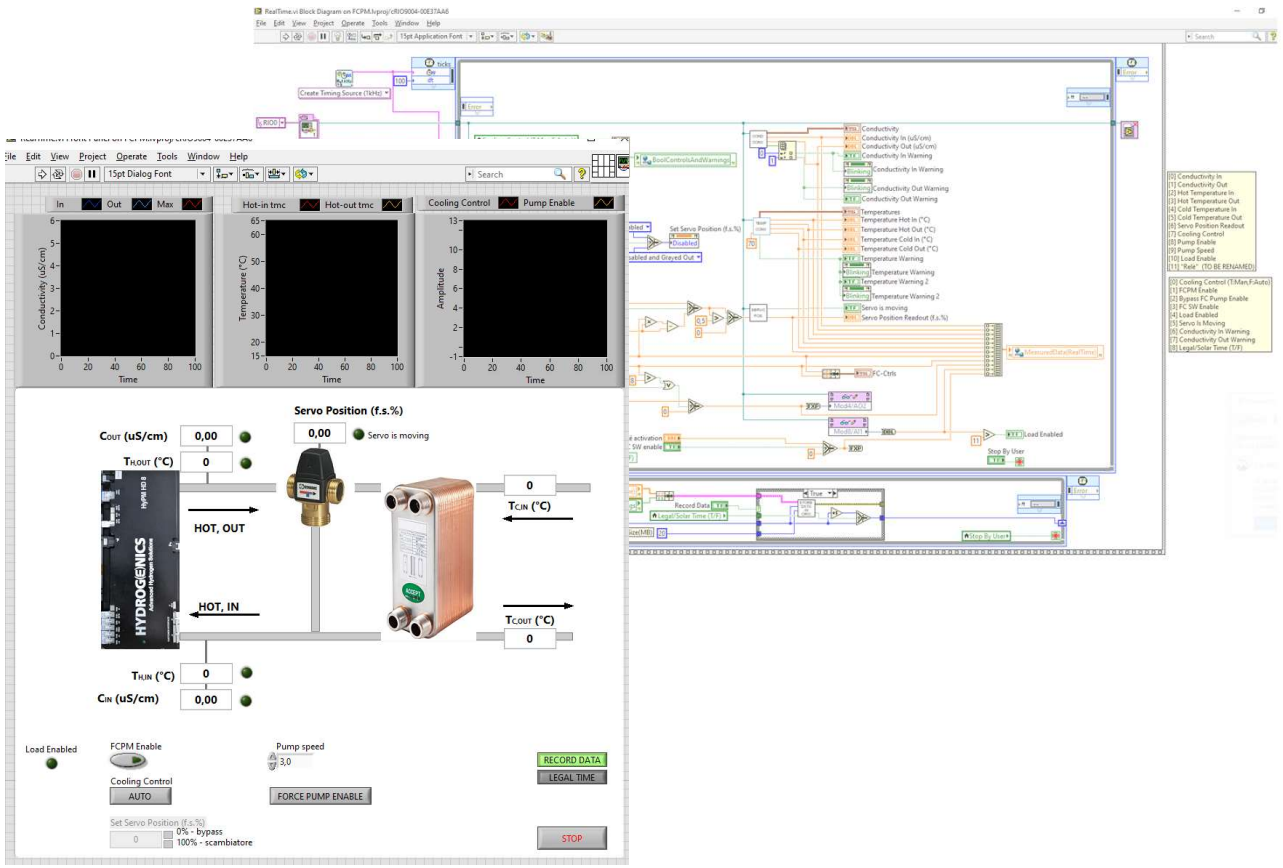
LABVIEW PROJECTS – ANOTHER EXAMPLE

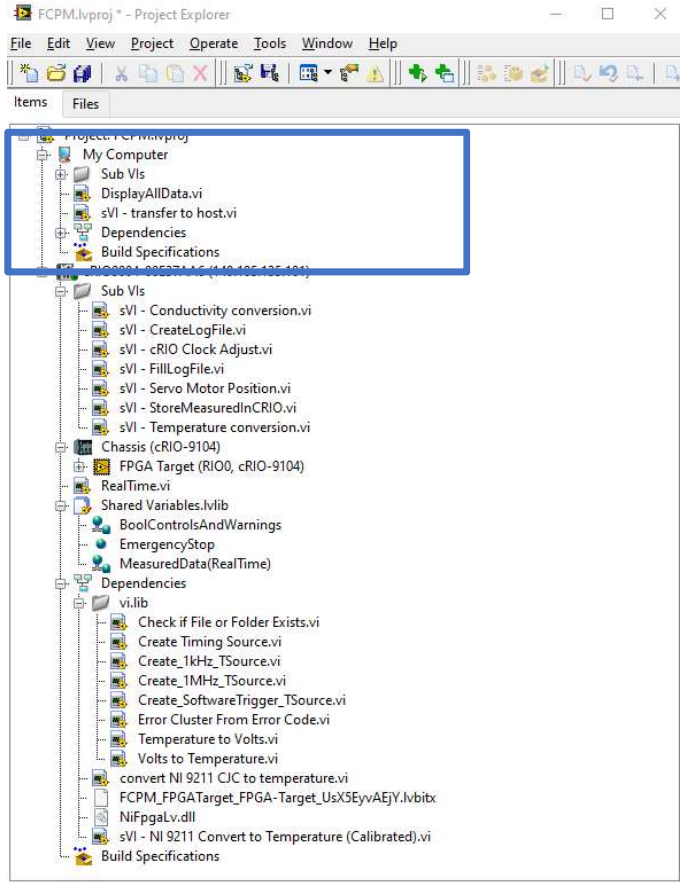




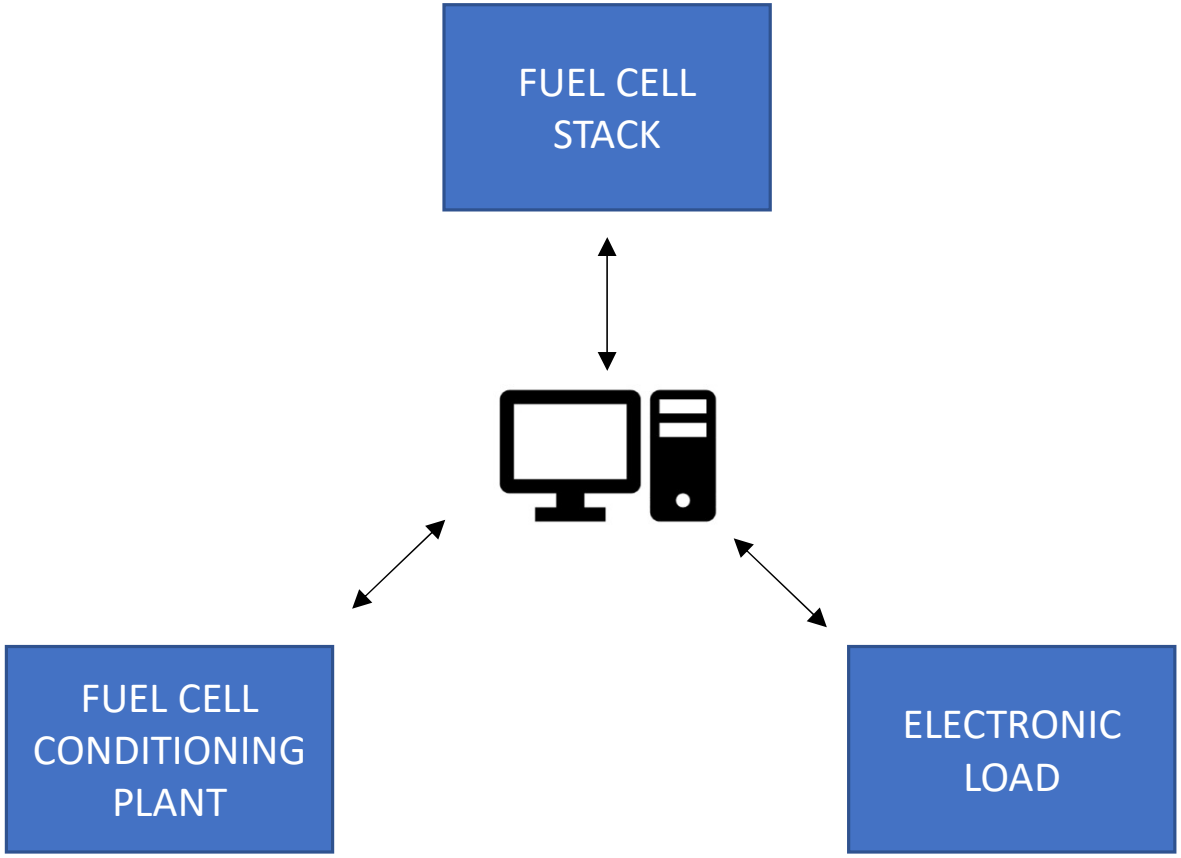


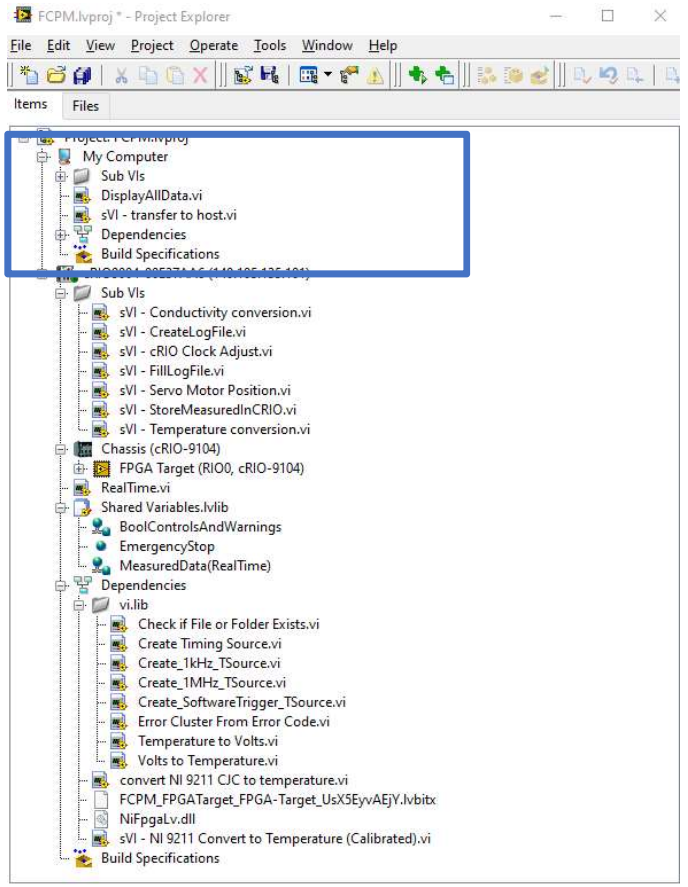
LABVIEW PROJECTS – ANOTHER EXAMPLE



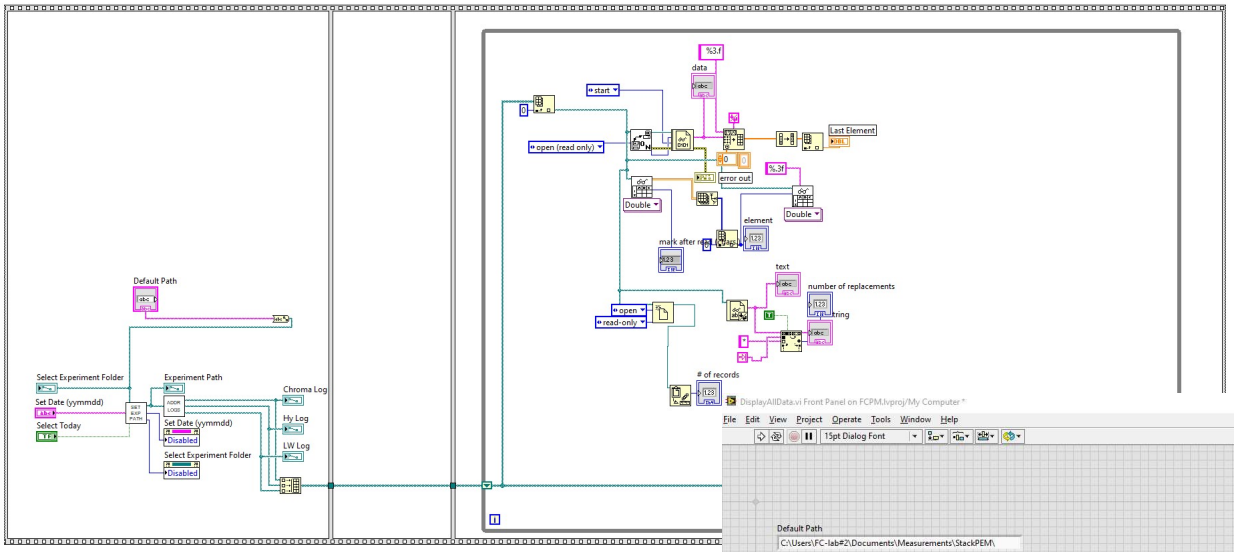


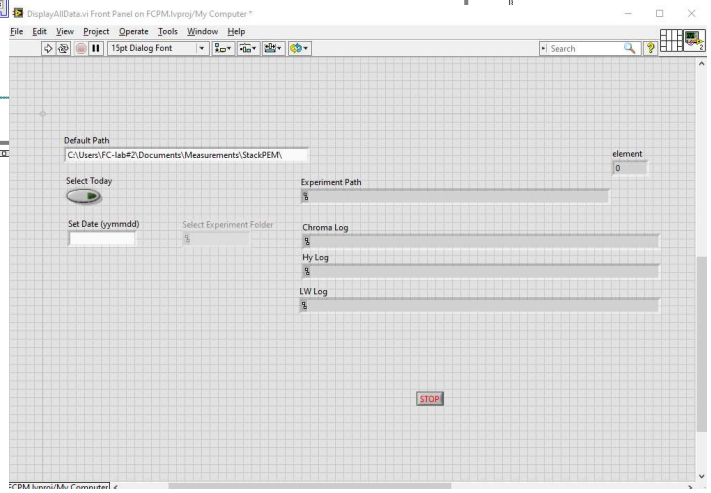
LABVIEW PROJECTS – ANOTHER EXAMPLE

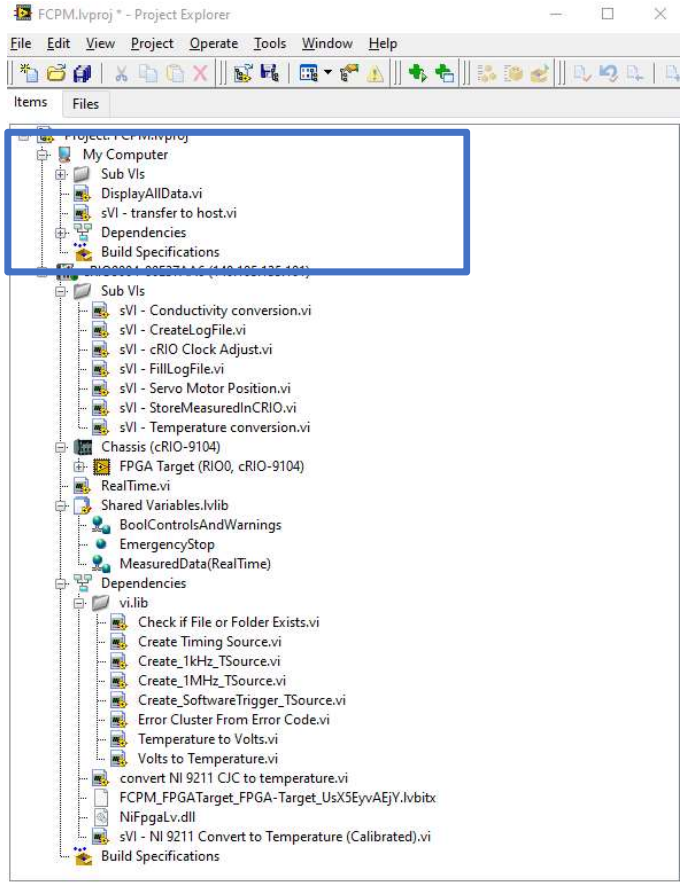




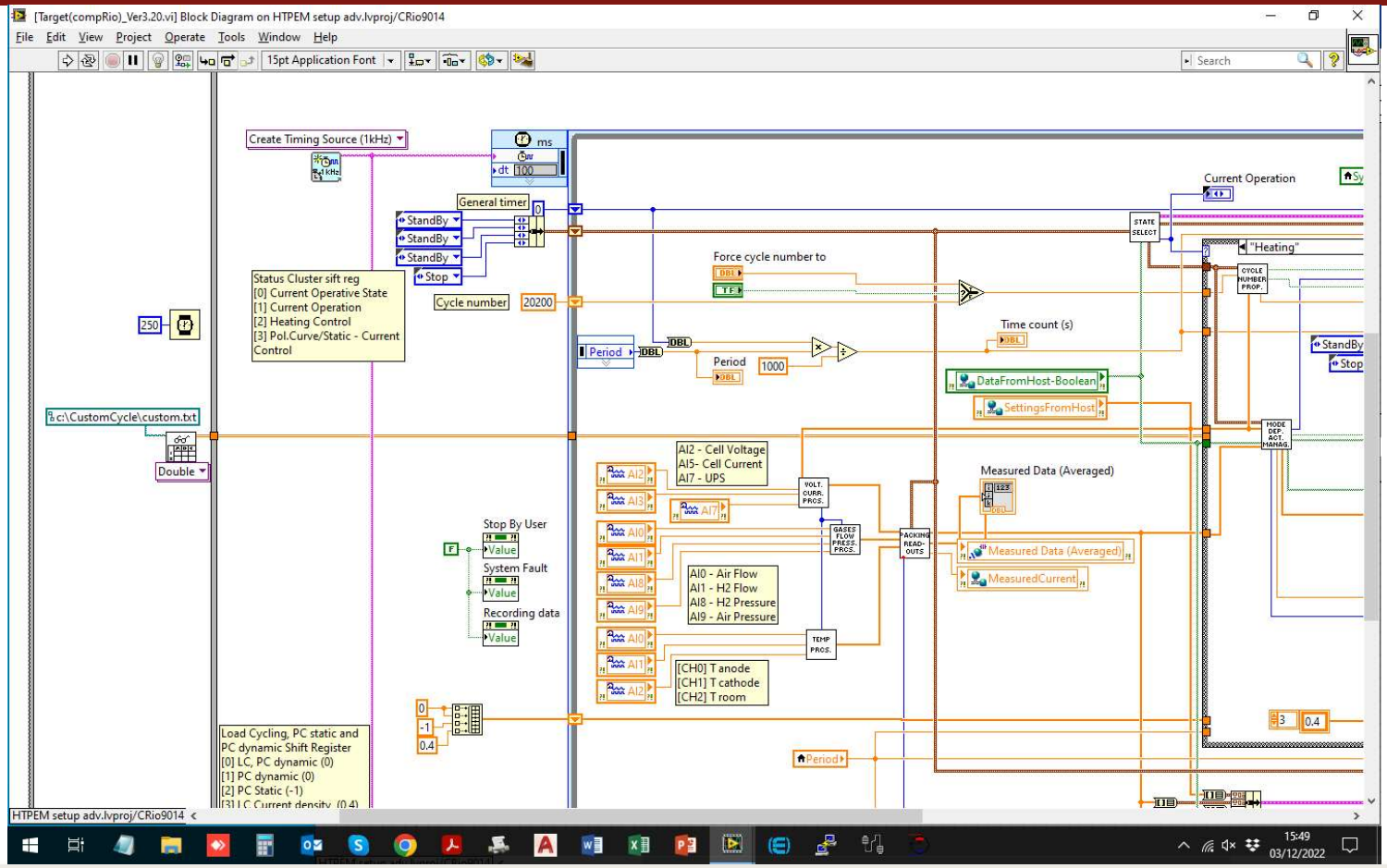
LABVIEW PROJECTS – ANOTHER EXAMPLE



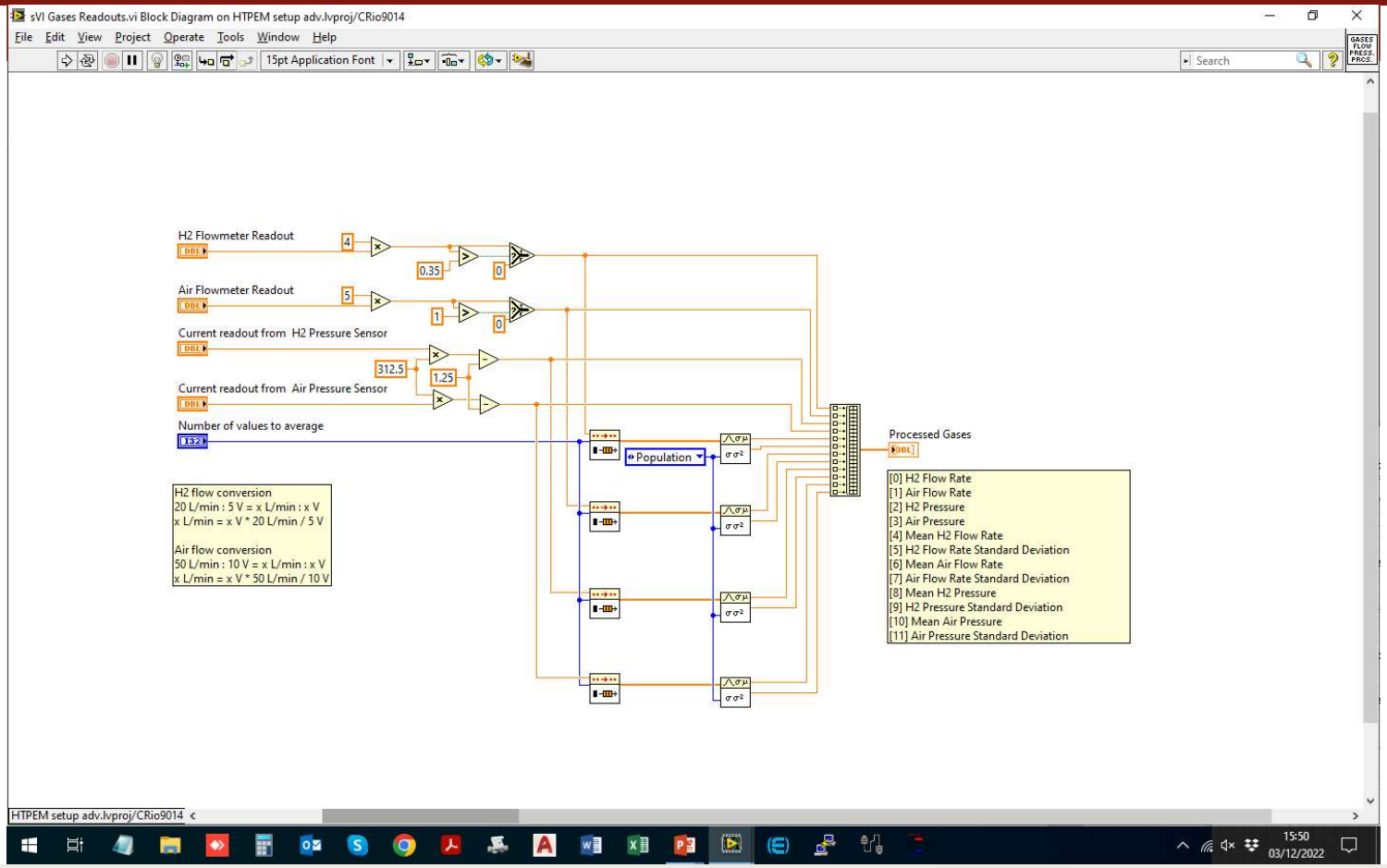




READING LABVIEW

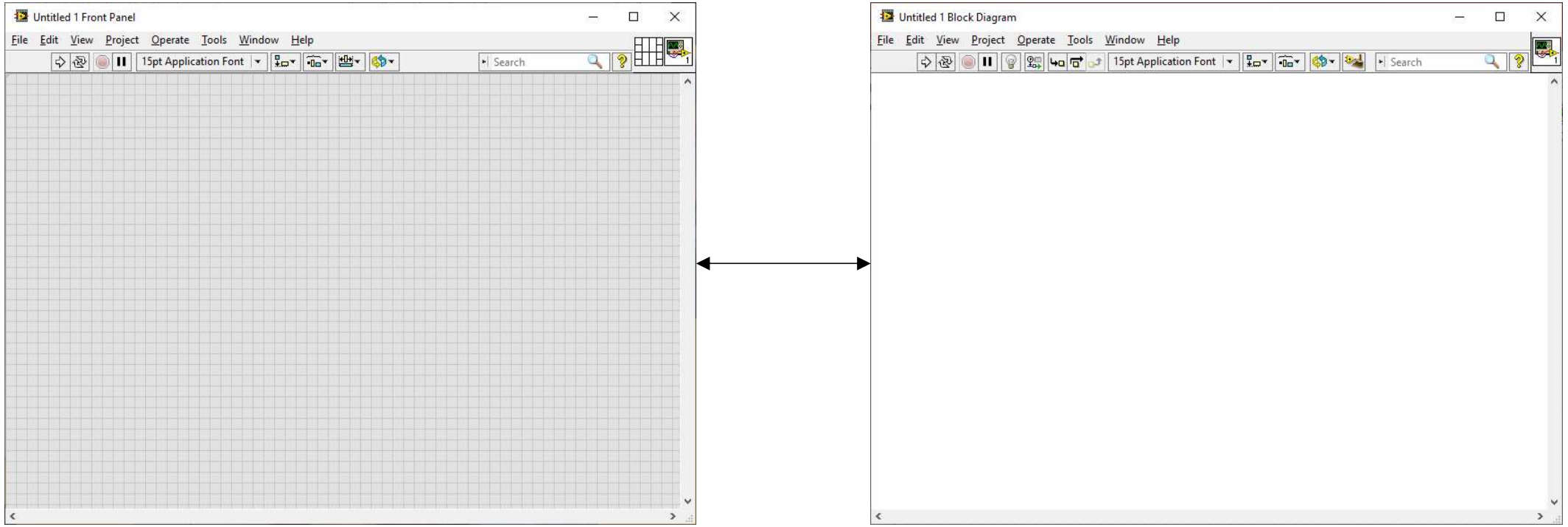


READING LABVIEW

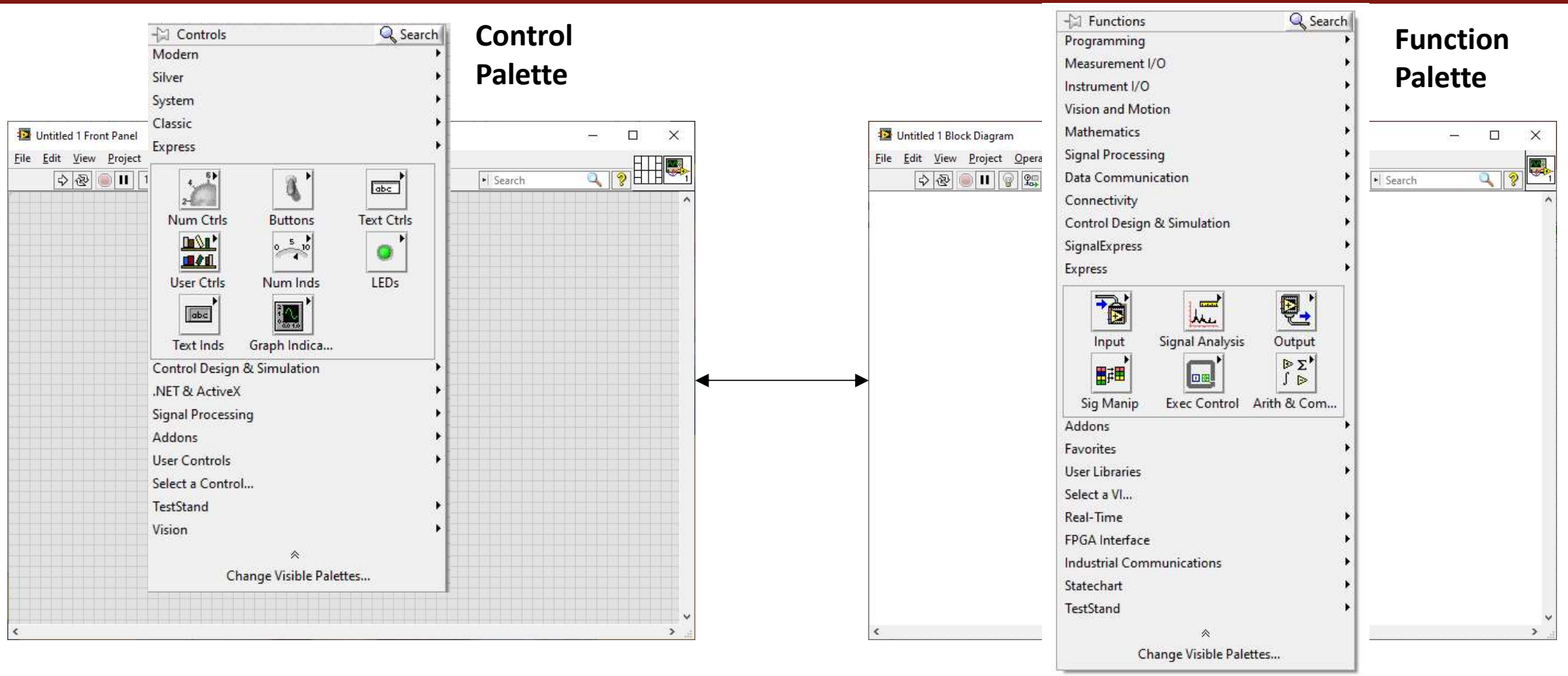


LABVIEW: INTO THE SOFTWARE

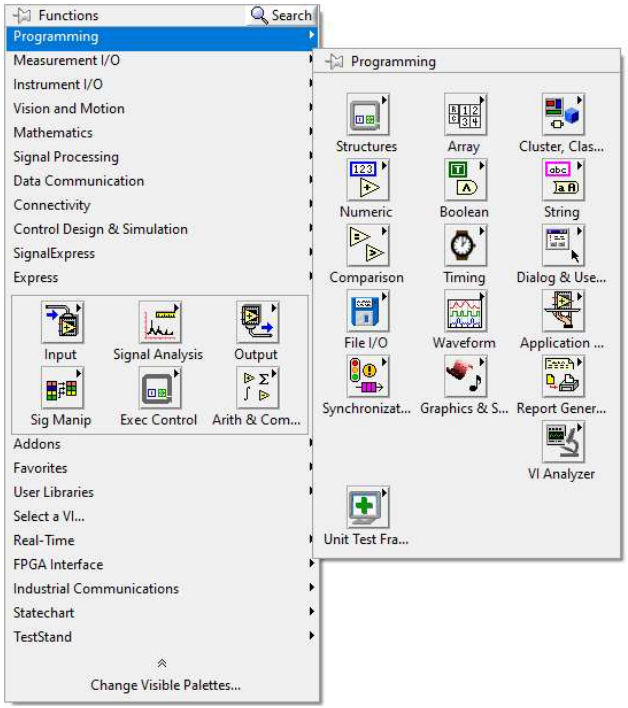
A program developed by means of LV is called Virtual Instrument (VI).

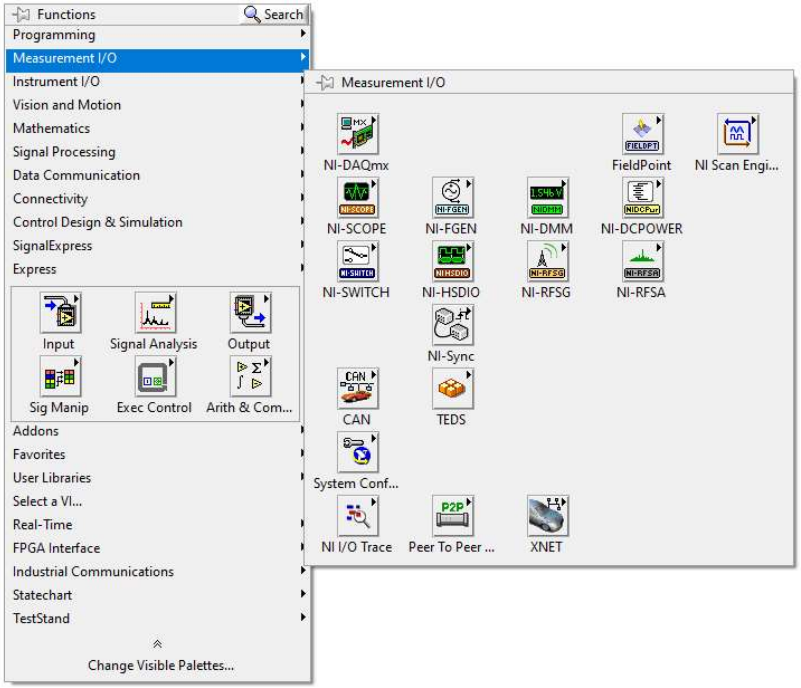


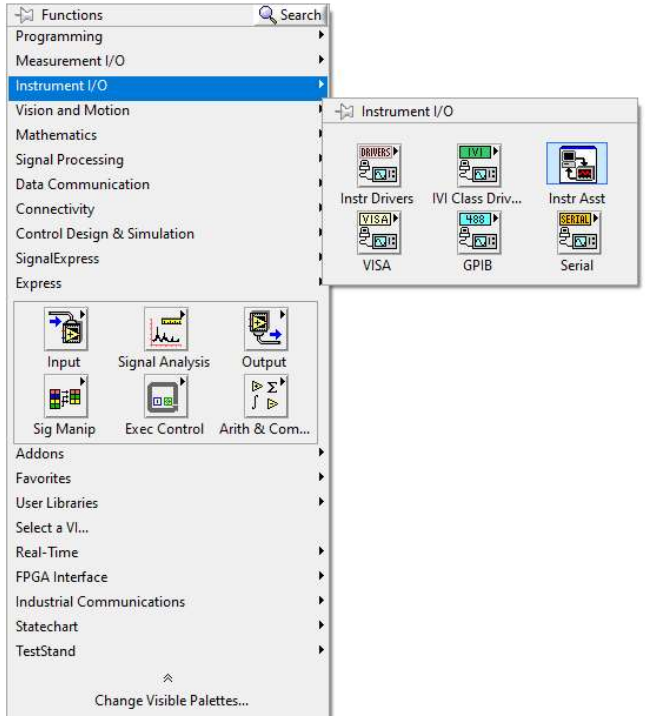
LABVIEW: INTO THE SOFTWARE



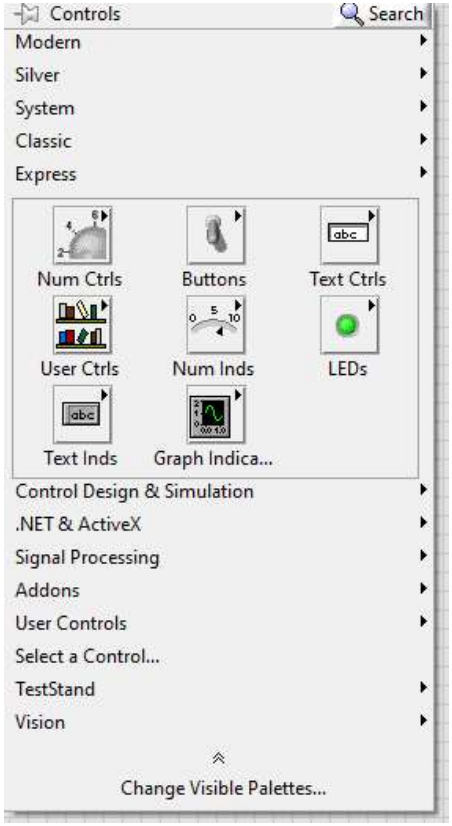
THE BLOCK DIAGRAM - THE FUNCTION PALETTE



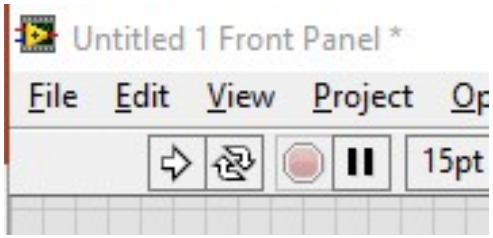


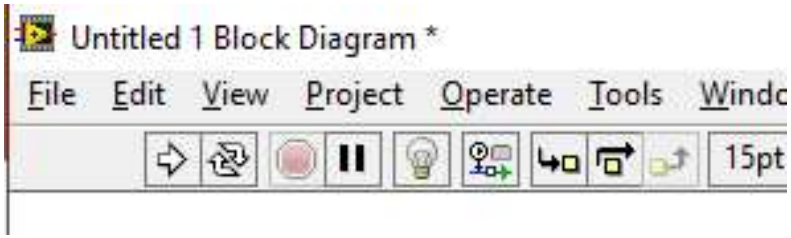


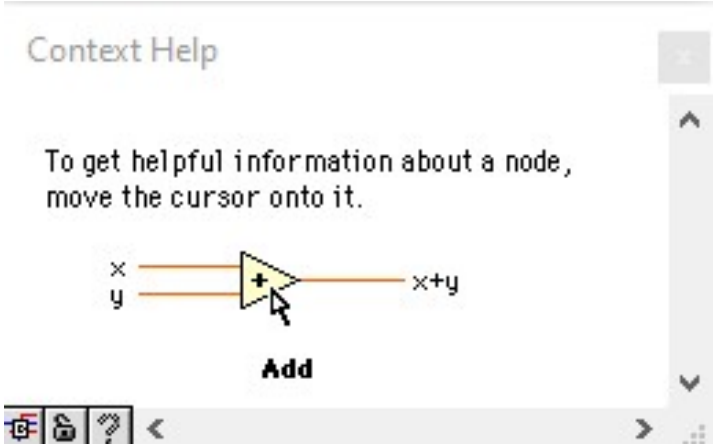
THE FRONT PANEL - THE CONTROL PALETTE



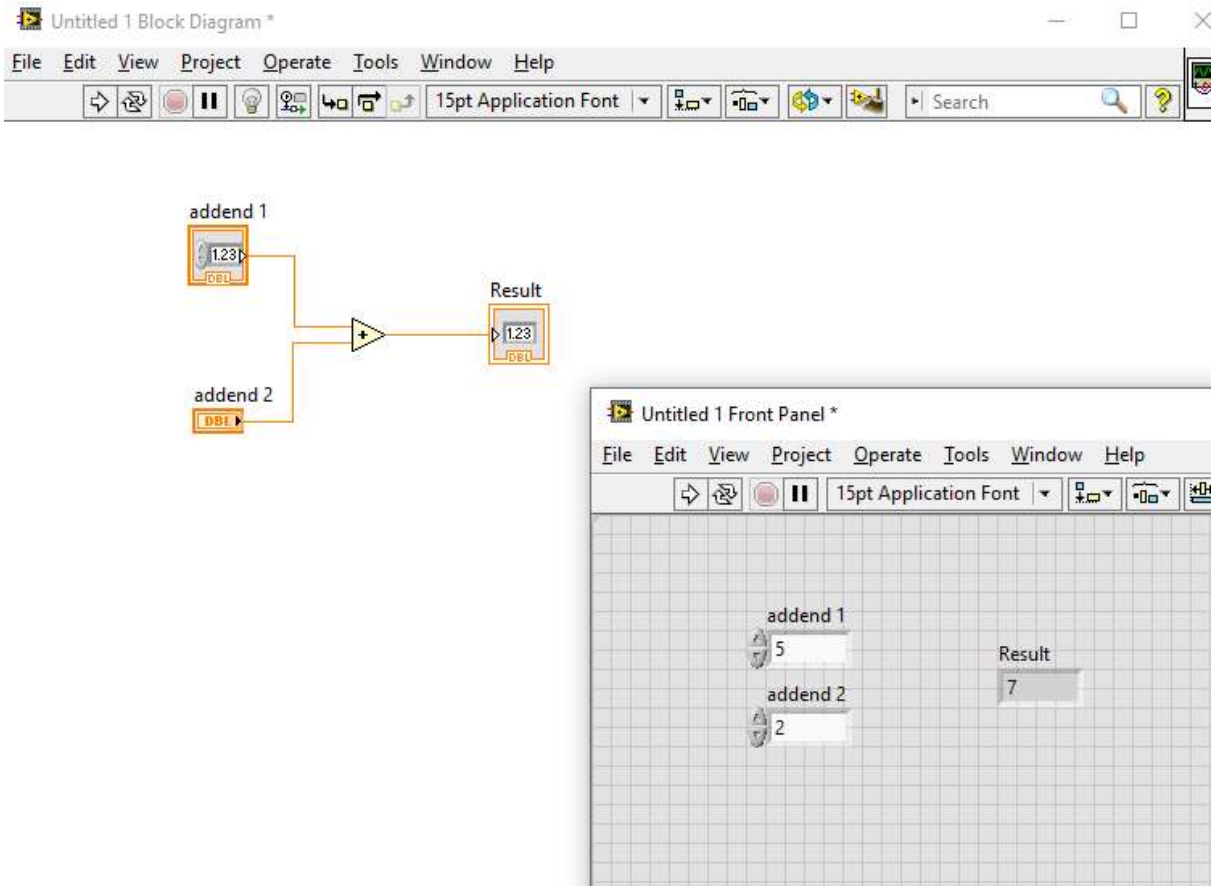
MAIN CONTROLS AND AUXILIARY TOOLS



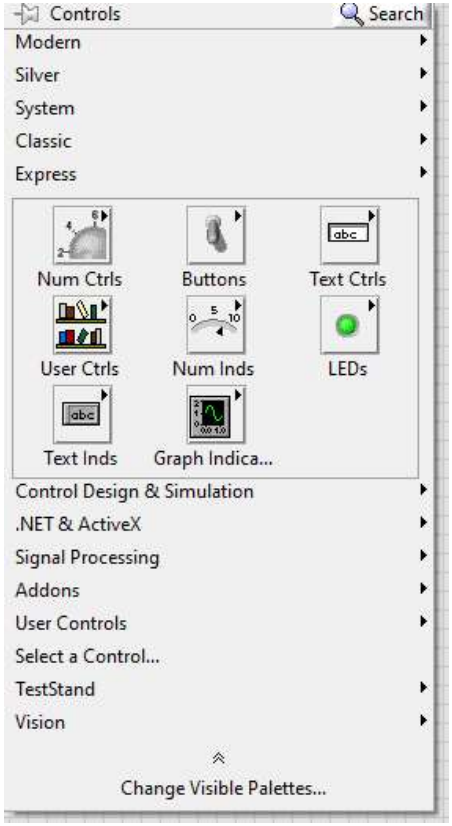




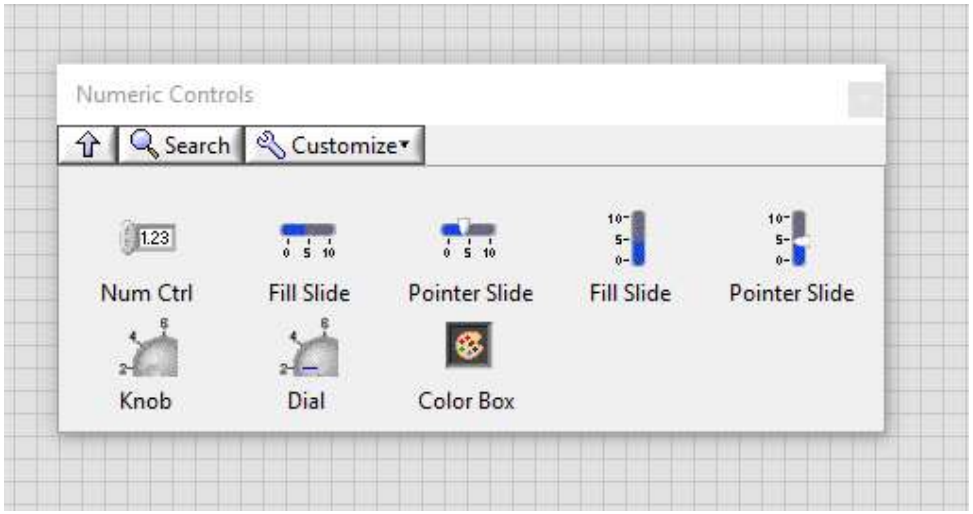
ELEMENT DUALITY

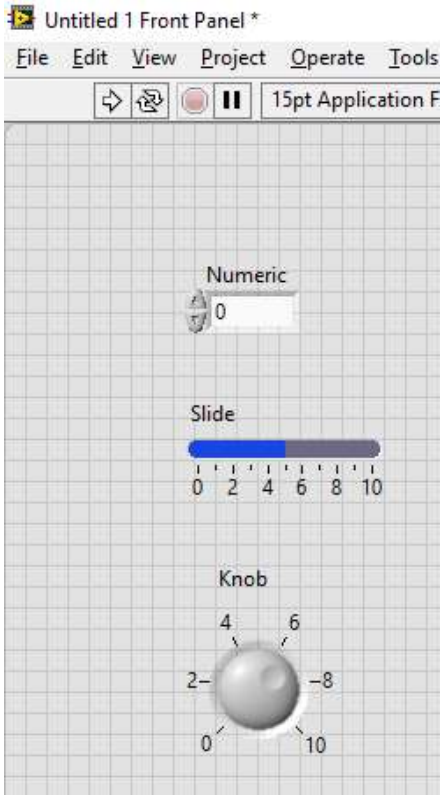


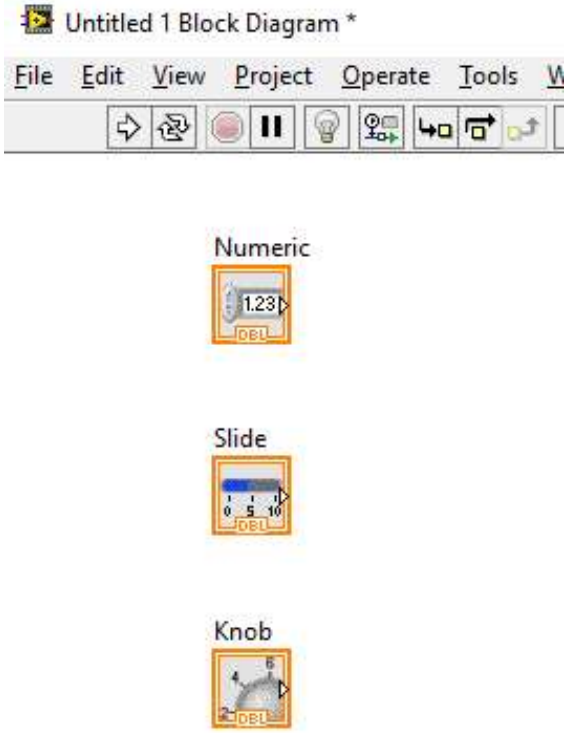
MAIN ELEMENTS FROM THE CONTROL PALETTE



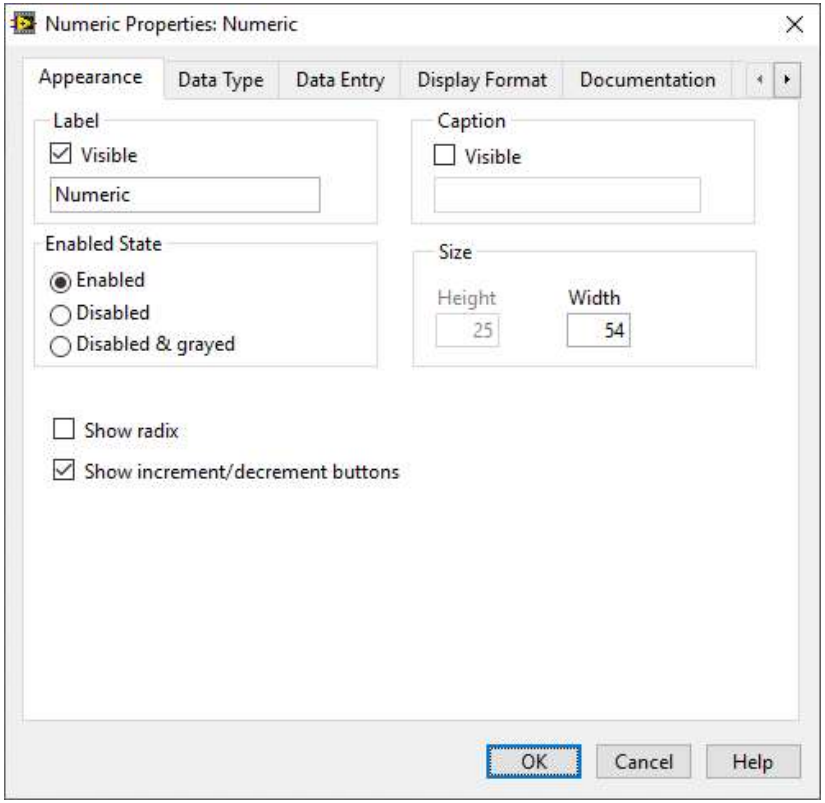
NUMERIC CONTROLS

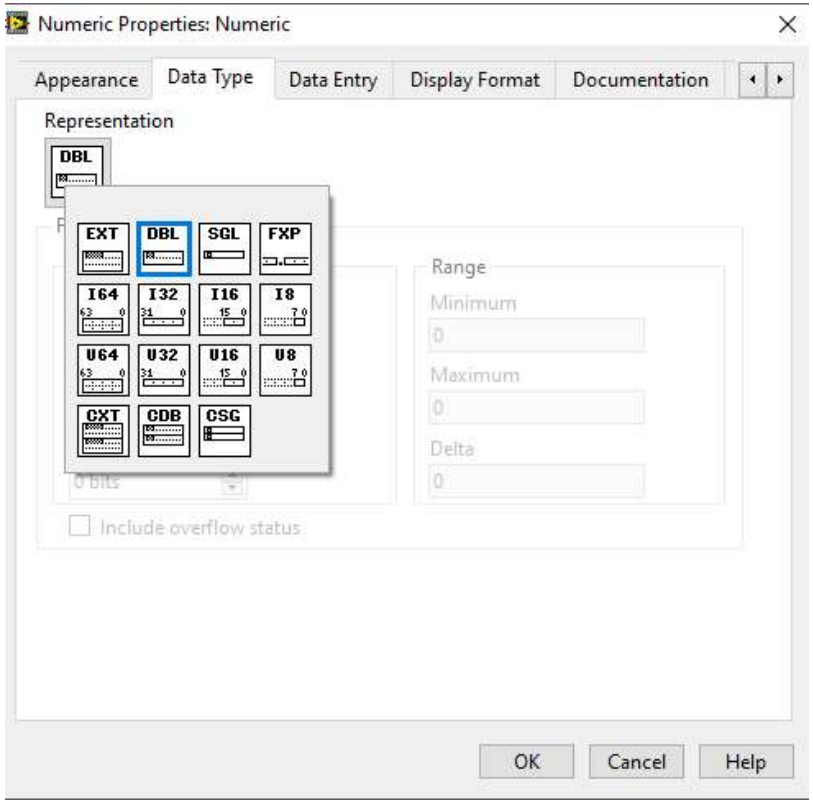




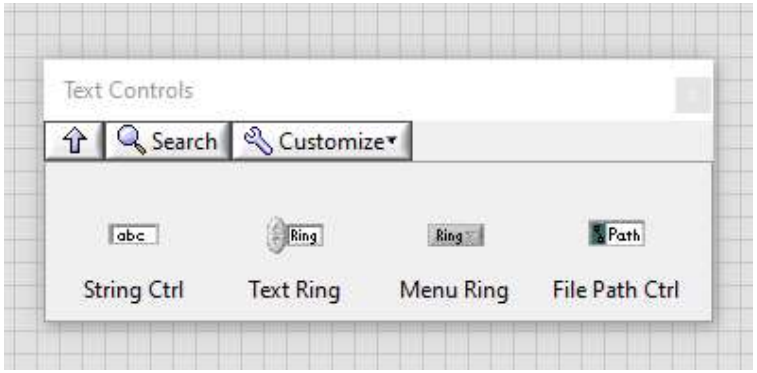


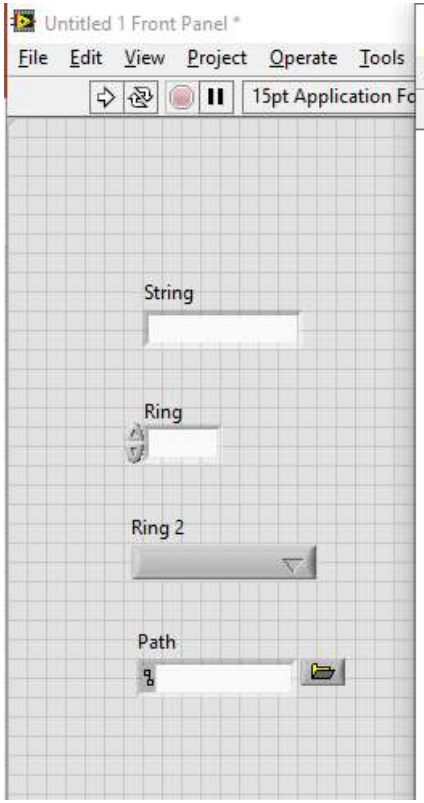
NUMERIC CONTROLS

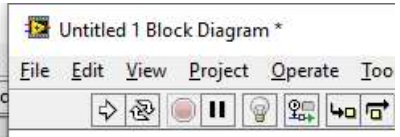


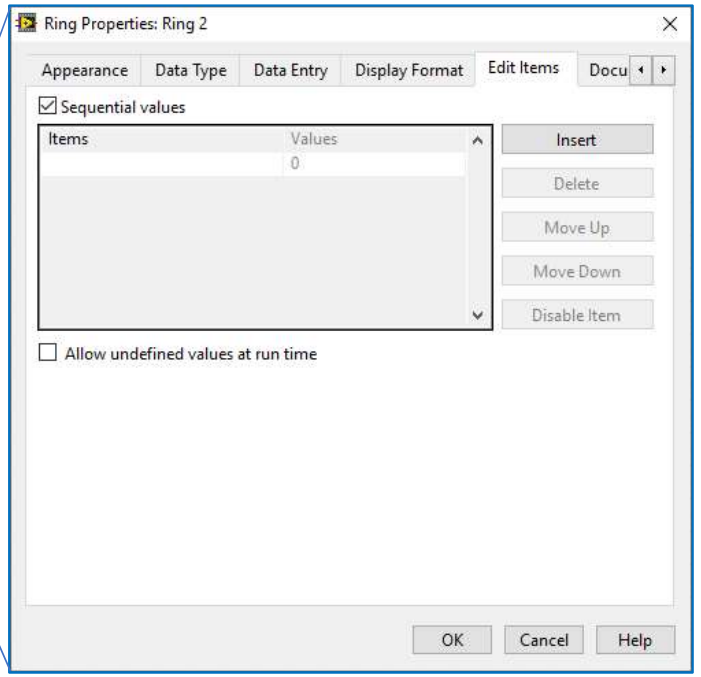


STRING CONTROLS

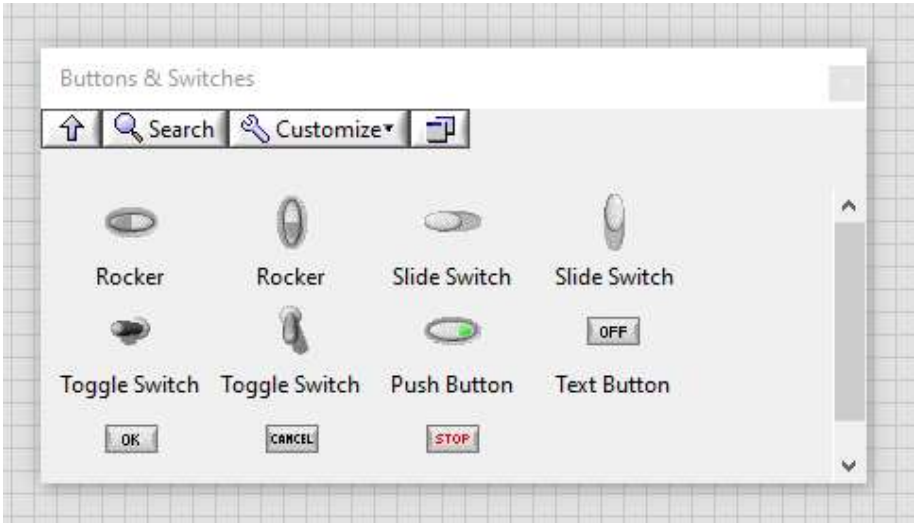


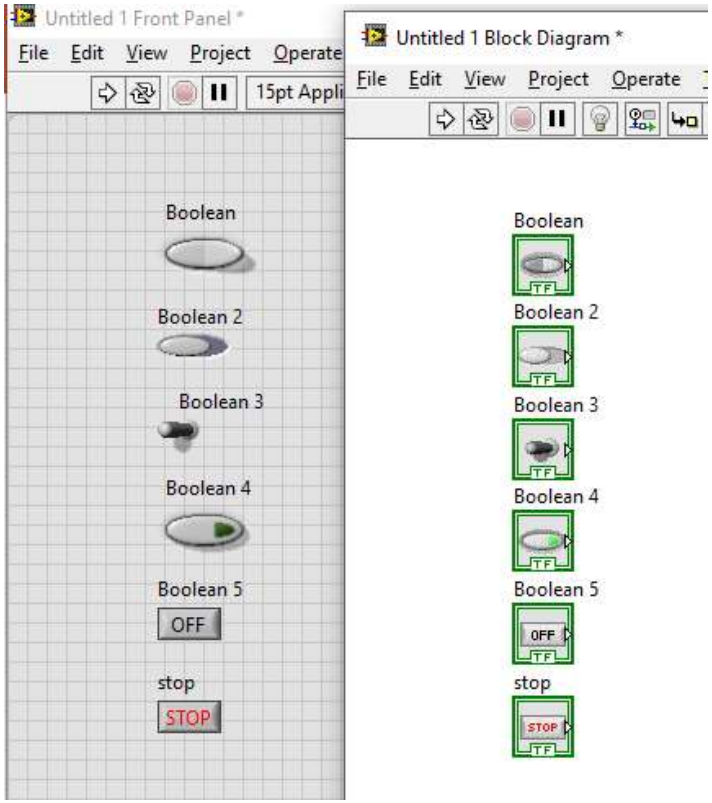




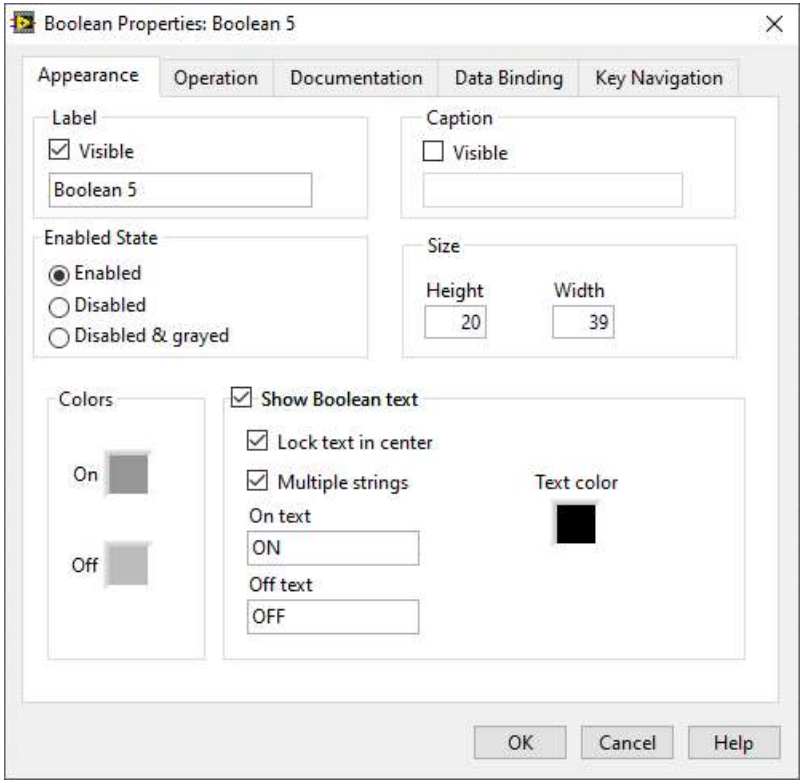


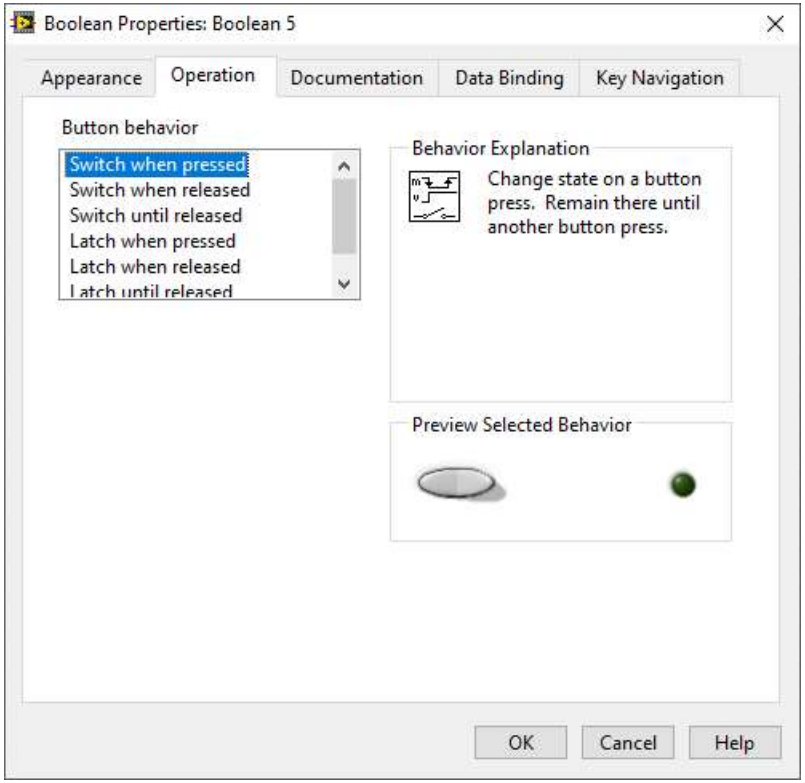
BOOLEAN CONTROLS



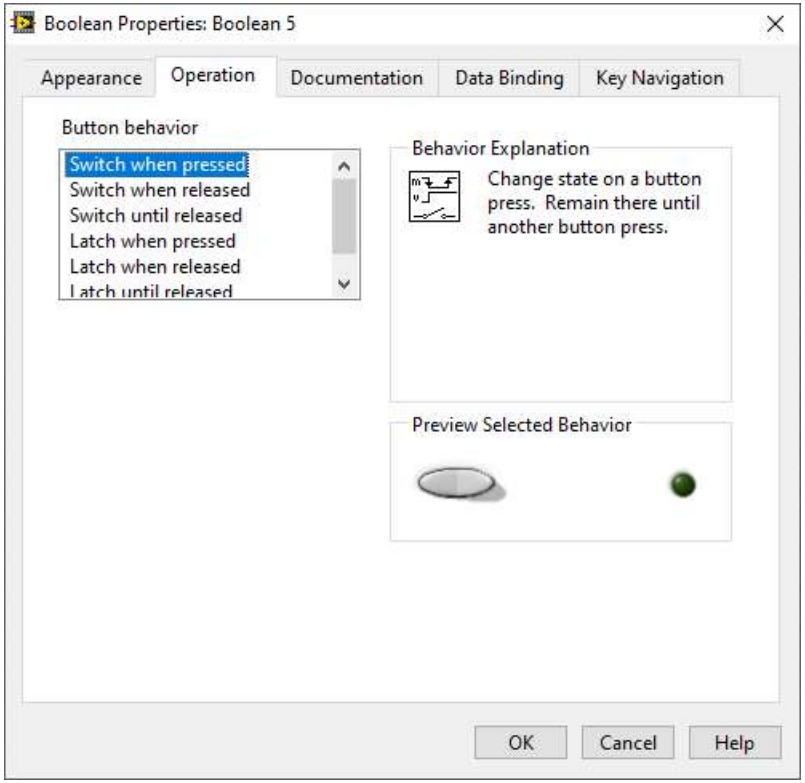


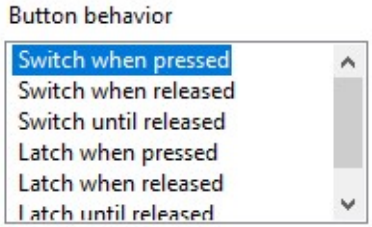
BOOLEAN CONTROLS

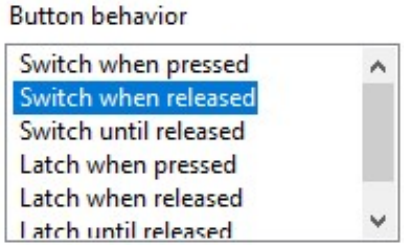


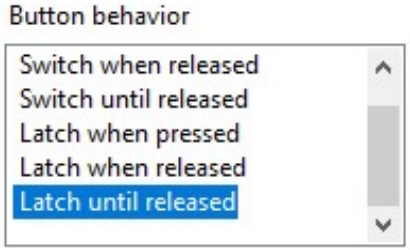


BOOLEAN CONTROLS

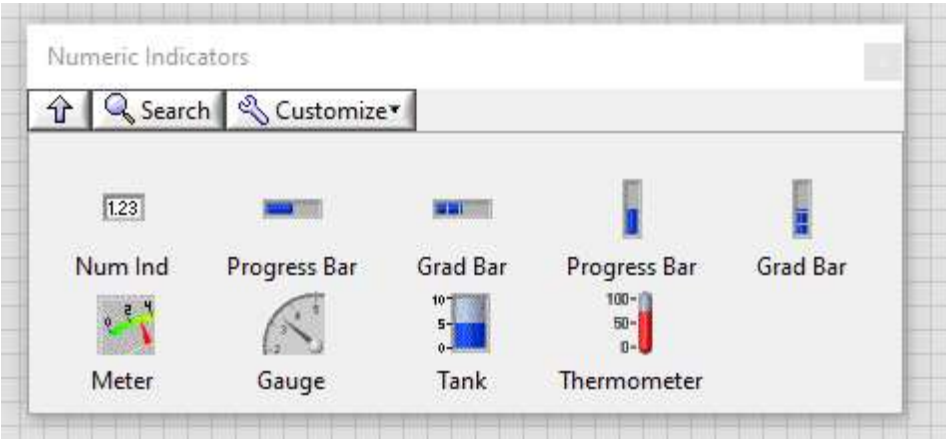


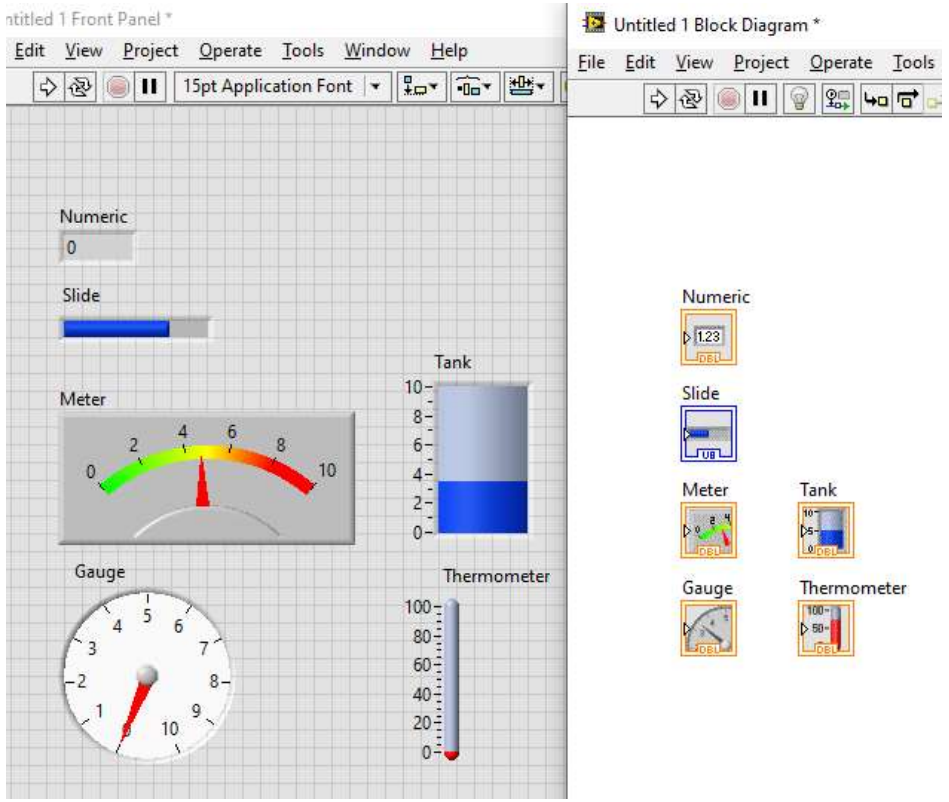




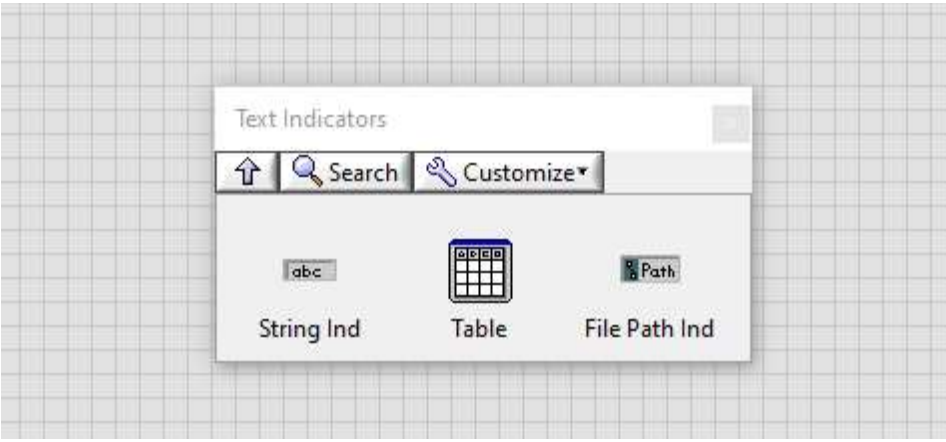


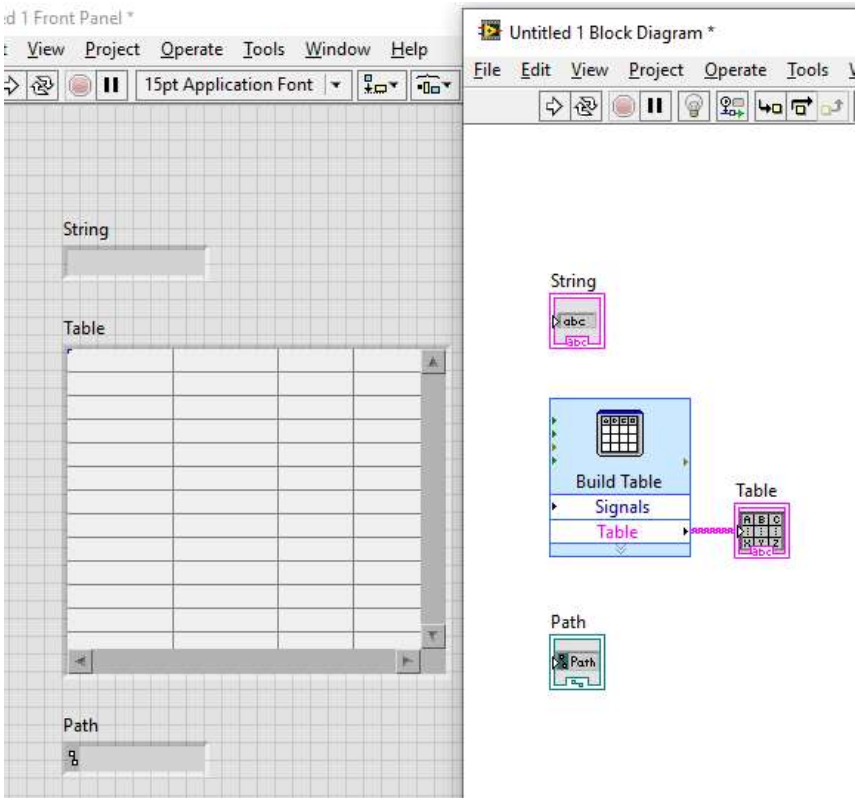
NUMERIC INDICATORS



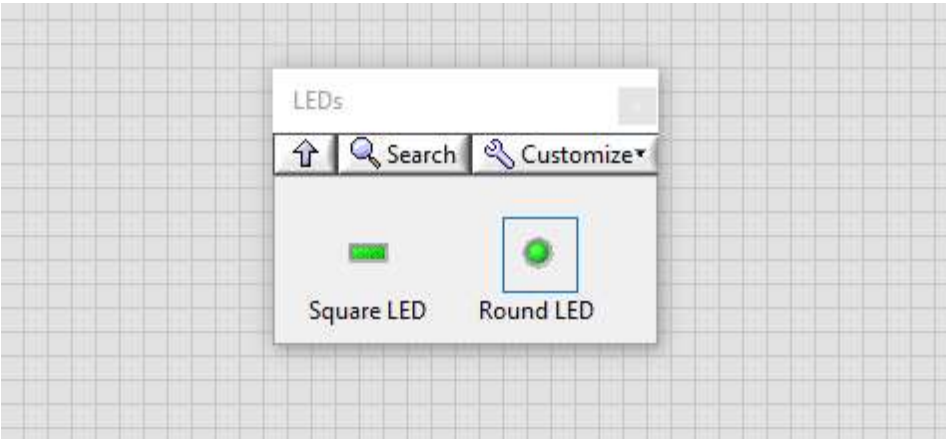


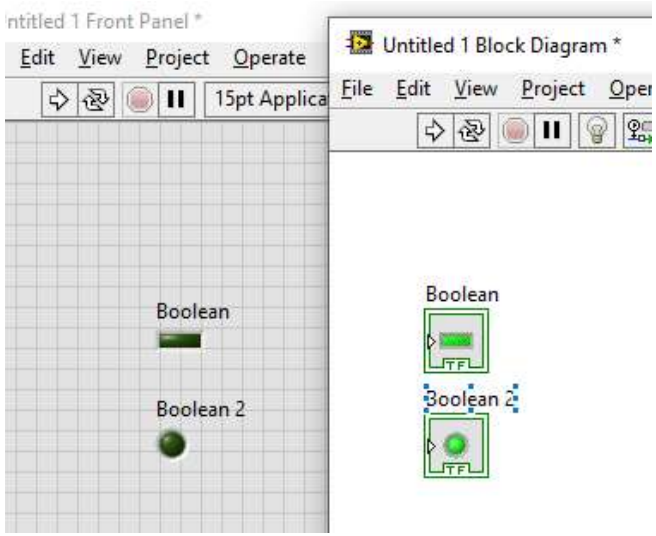
STRING INDICATORS



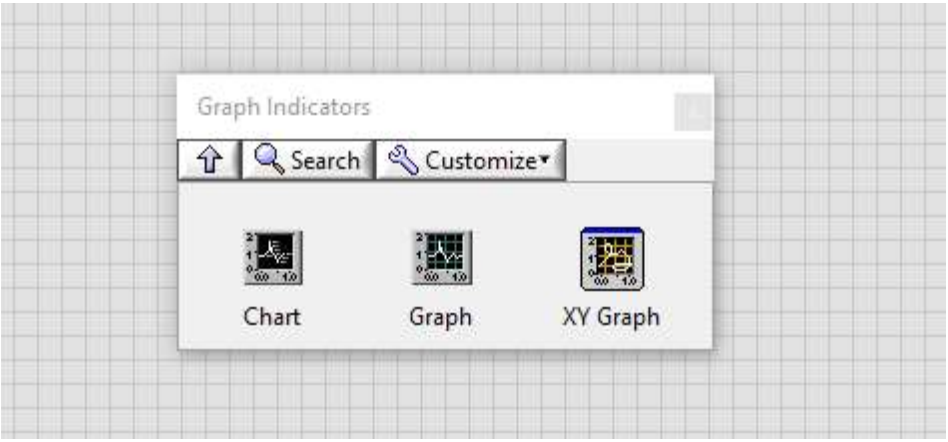


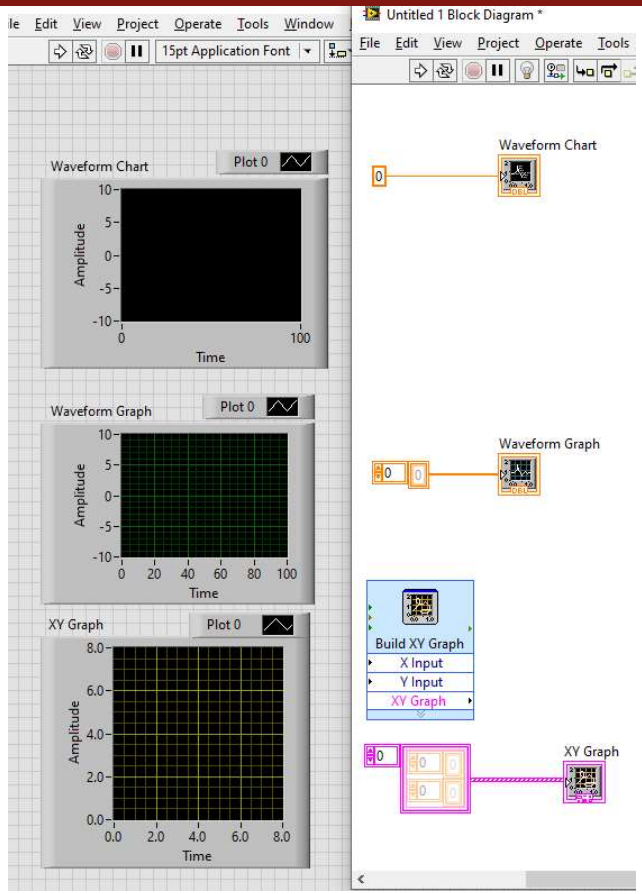
BOOLEAN INDICATORS



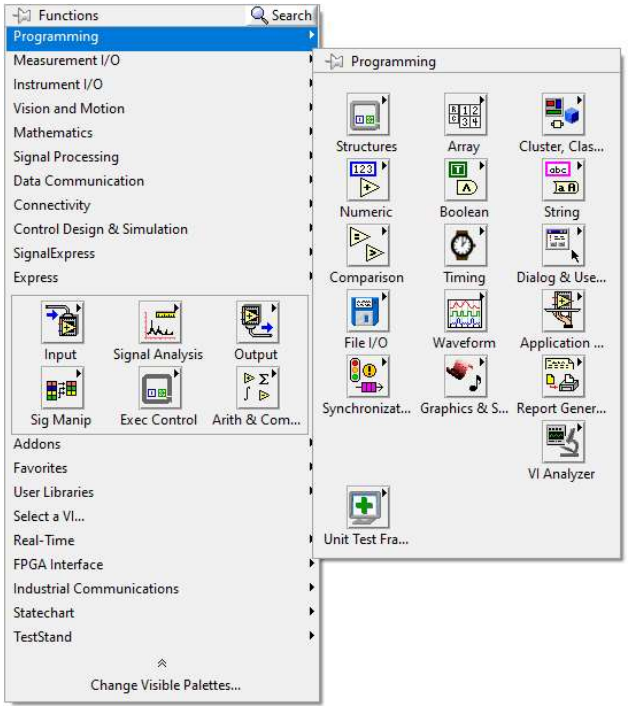


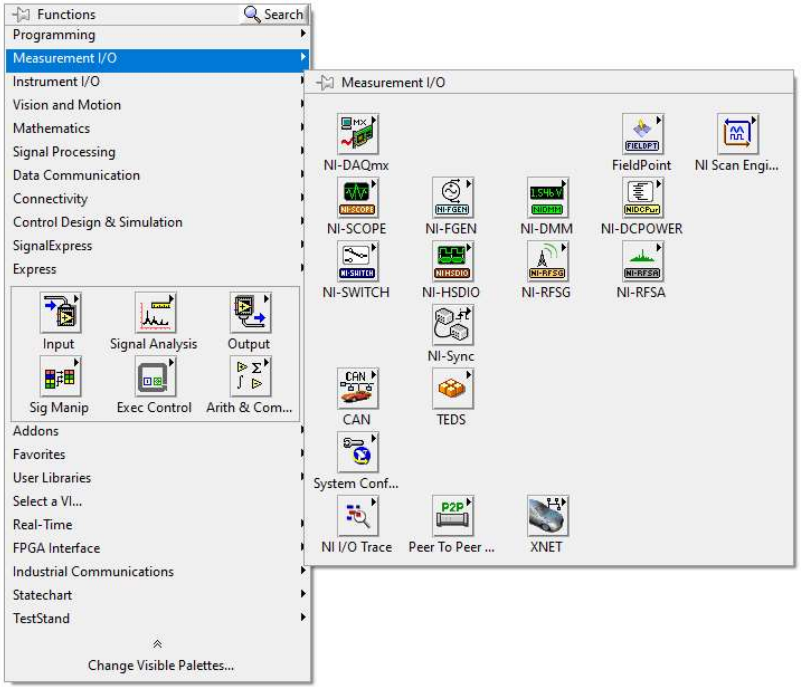
GRAPH INDICATORS

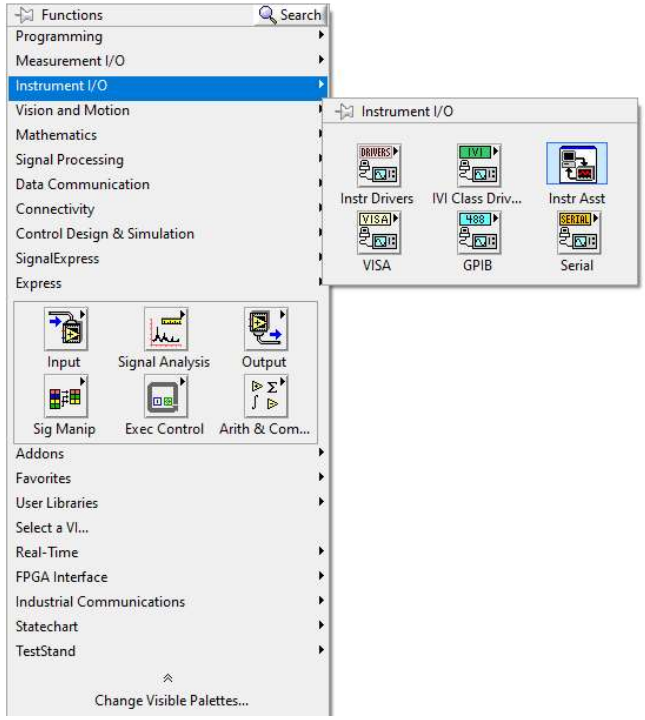




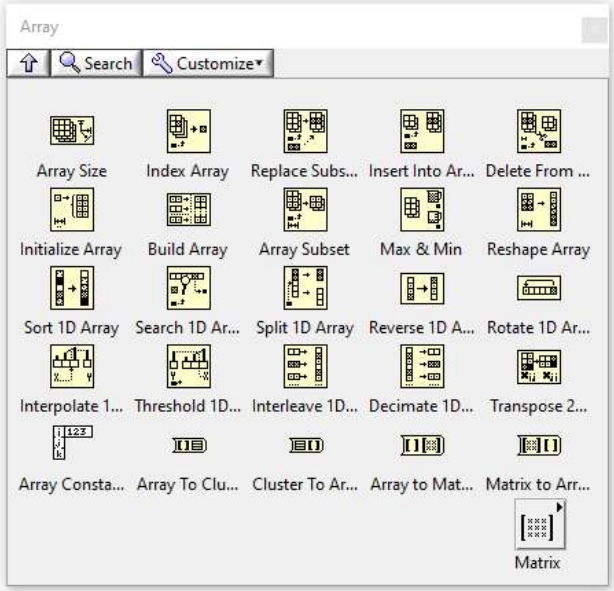
MAIN ELEMENTS FROM THE FUNCTION PALETTE

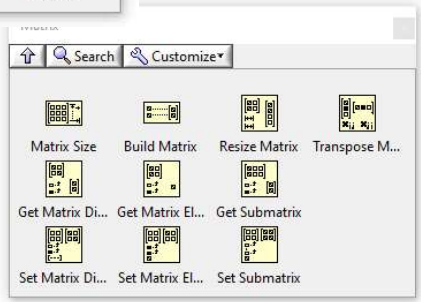


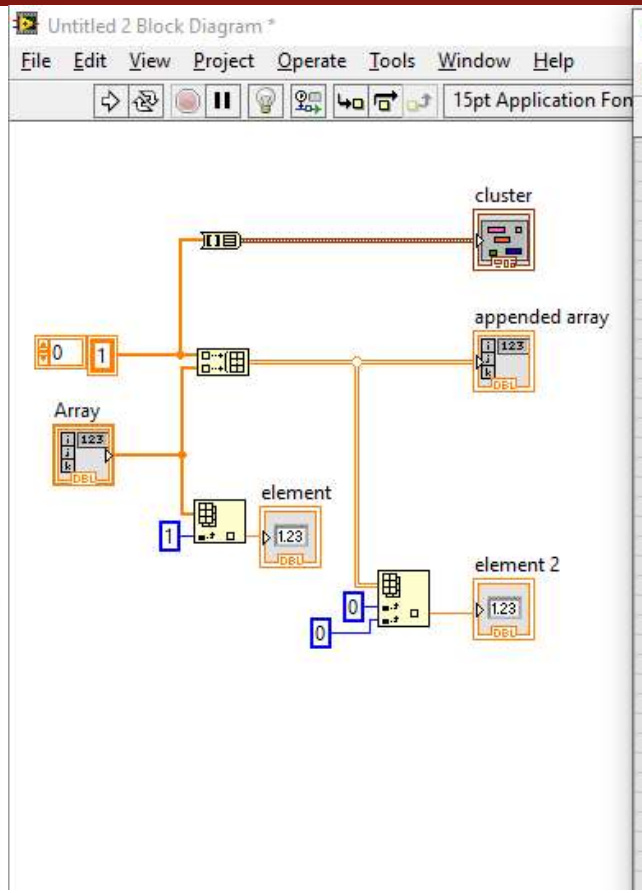


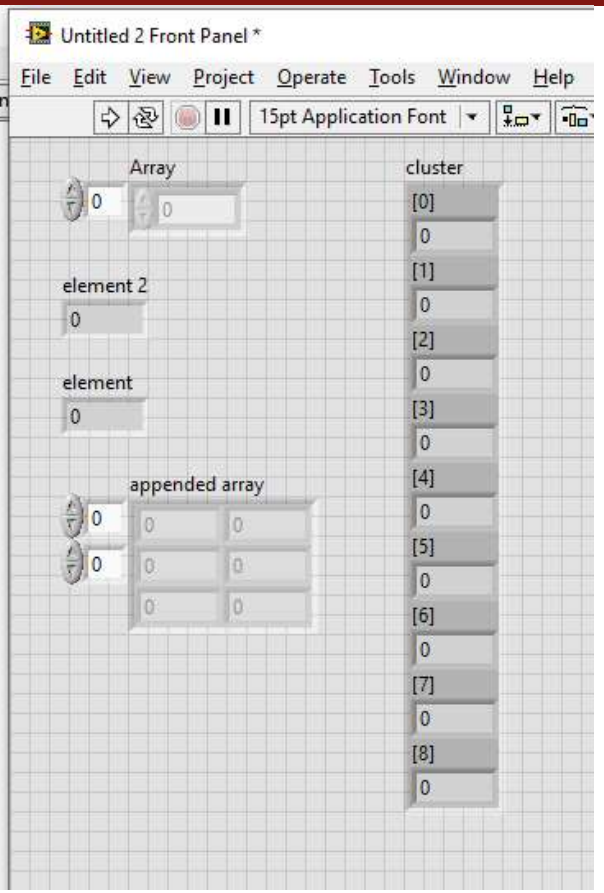


ARRAYS

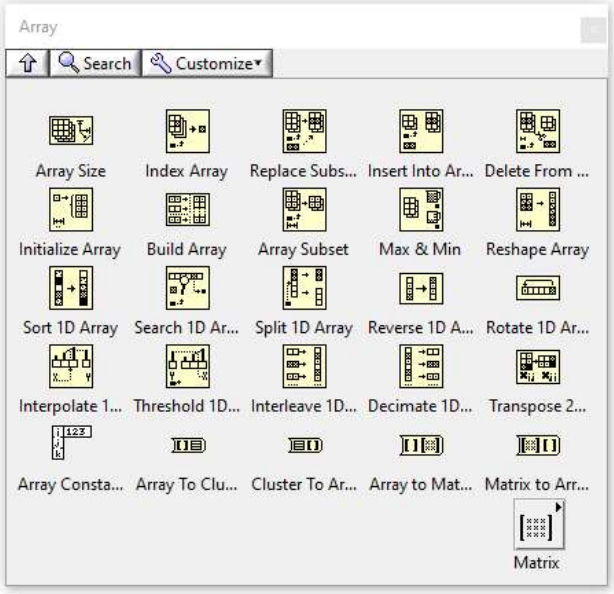

Array
Search
Customize
Array Size
Index Array
Replace Subs...
Insert Into Ar...
Delete From ...
Initialize Array
Build Array
Array Subset
Max & Min
Reshape Array
Sort 1D Array
Search 1D Ar...
Split 1D Array
Reverse 1D A...
Rotate 1D Ar...
Interpolate 1...
Threshold 1D...
Interleave 1D...
Decimate 1D...
Transpose 2...
Array Consta...
Array To Clu...
Cluster To Ar...
Array to Mat...
Matrix to Arr...
Matrix

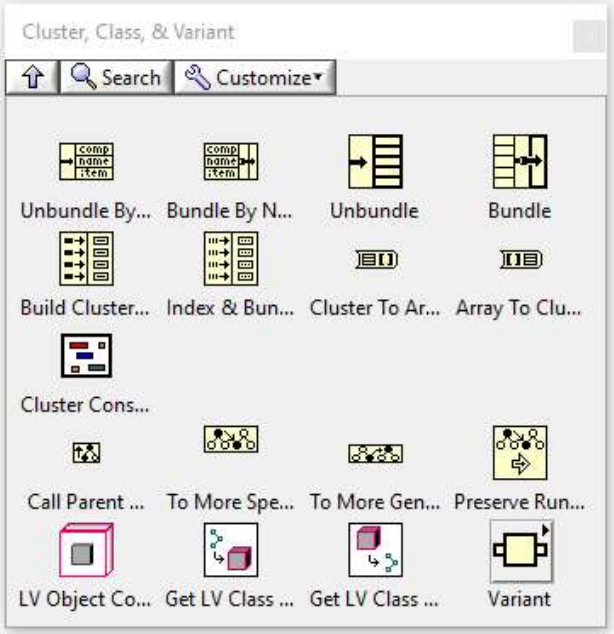

Search
Customize
Matrix Size
Build Matrix
Resize Matrix
Transpose M...
Get Matrix Di...
Get Matrix El...
Get Submatrix
Set Matrix Di...
Set Matrix El...
Set Submatrix


Untitled 2 Block Diagram *
File Edit View Project Operate Tools Window Help
15pt Application Font
cluster
appended array
Array
element
element 2

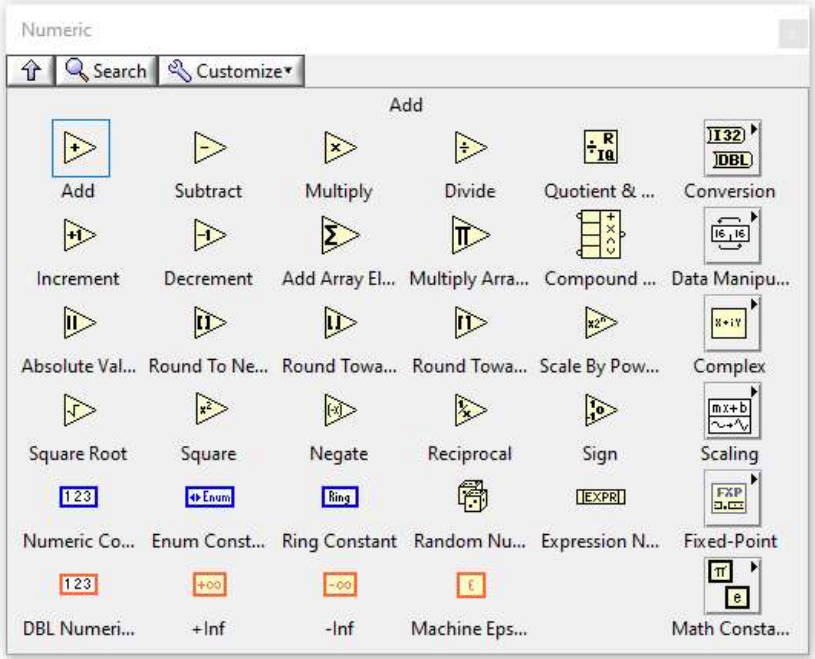

Untitled 2 Front Panel *
File Edit View Project Operate Tools Window Help
15pt Application Font
Array
cluster
element 2
element
appended array

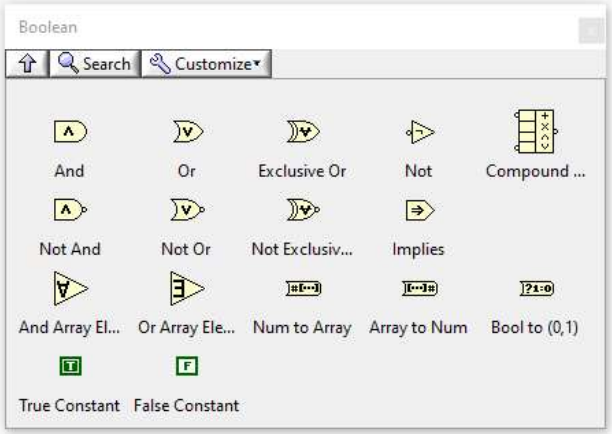
ARRAYS AND CLUSTERS



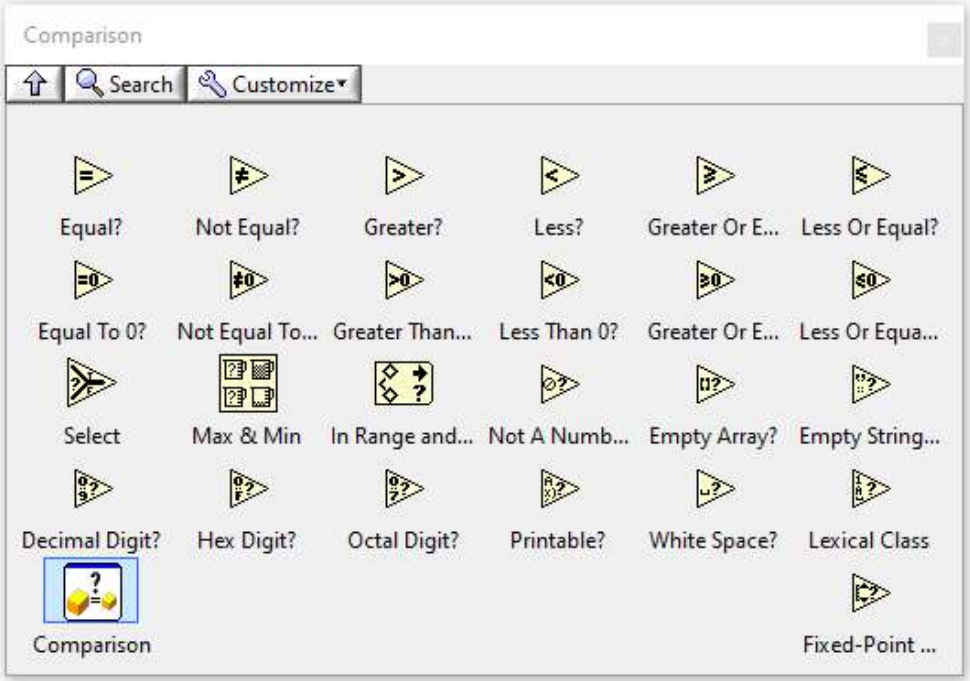


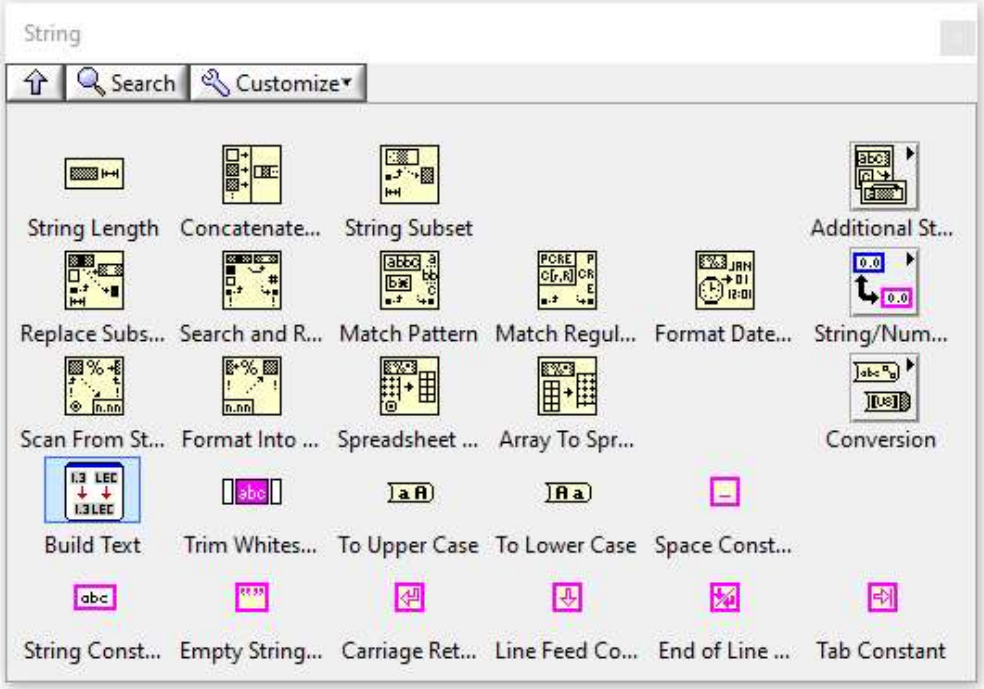
OPERATIONS


Numeric
Search
Customize
Add
Add
Subtract
Multiply
Divide
Quotient & ...
Conversion
Increment
Decrement
Add Array El...
Multiply Arra...
Compound ...
Data Manipu...
Absolute Val...
Round To Ne...
Round Towa...
Round Towa...
Scale By Pow...
Complex
Square Root
Square
Negate
Reciprocal
Sign
Scaling
Numeric Co...
Enum Const...
Ring Constant
Random Nu...
Expression N...
Fixed-Point
DBL Numeri...
+Inf
-Inf
Machine Eps...
Math Consta...

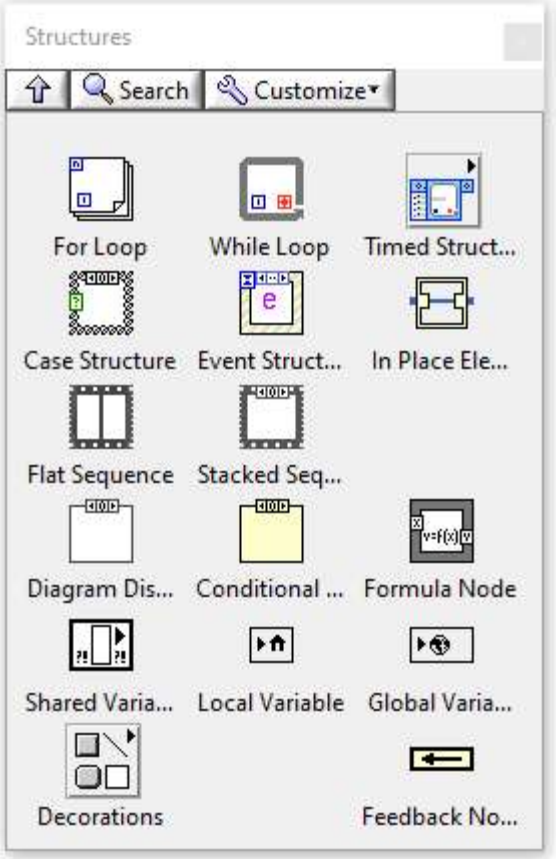

Boolean
Search
Customize
And
Or
Exclusive Or
Not
Compound ...
Not And
Not Or
Not Exclusiv...
Implies
And Array El...
Or Array Ele...
Num to Array
Array to Num
Bool to (0,1)
True Constant
False Constant

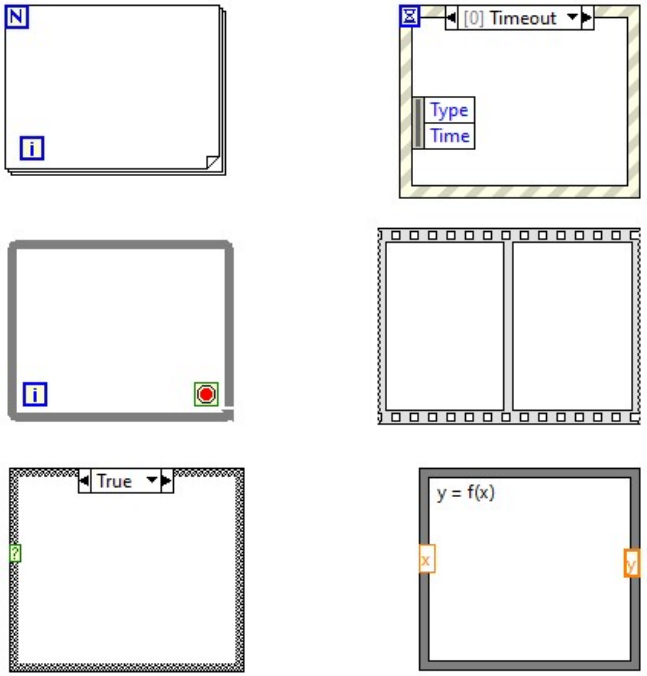
OPERATIONS

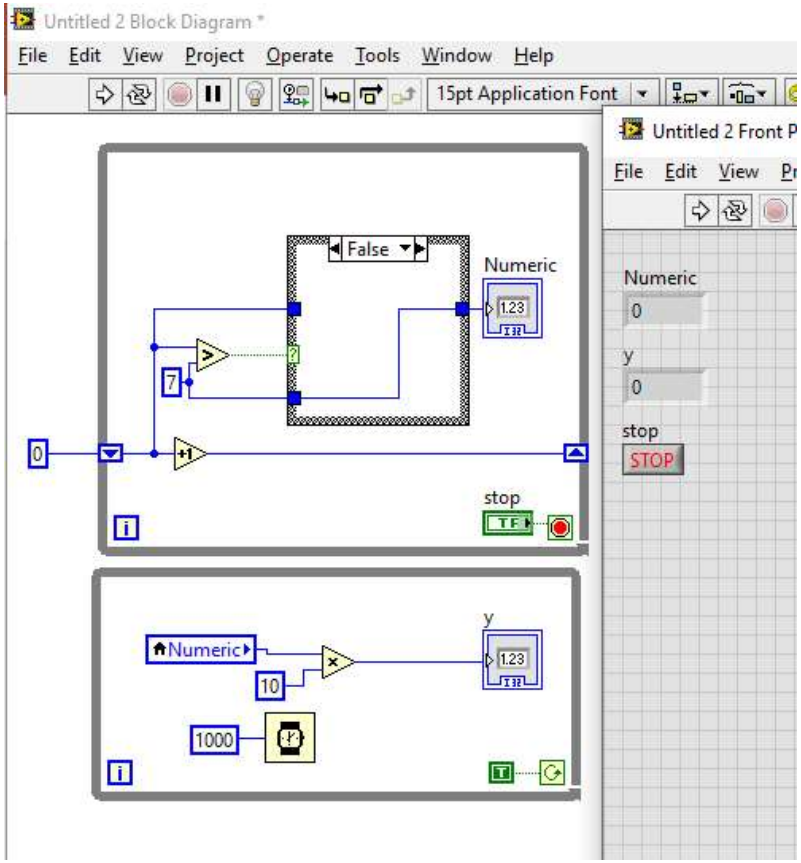

Comparison
Search
Customize
Equal?
Not Equal?
Greater?
Less?
Greater Or E...
Less Or Equal?
Equal To 0?
Not Equal To...
Greater Than...
Less Than 0?
Greater Or E...
Less Or Equa...
Select
Max & Min
In Range and...
Not A Numb...
Empty Array?
Empty String...
Decimal Digit?
Hex Digit?
Octal Digit?
Printable?
White Space?
Lexical Class
Comparison
Fixed-Point ...


String
Search
Customize
String Length
Concatenate...
String Subset
Additional St...
Replace Subs...
Search and R...
Match Pattern
Match Regul...
Format Date...
String/Num...
Scan From St...
Format Into ...
Spreadsheet ...
Array To Spr...
Conversion
Build Text
Trim Whites...
To Upper Case
To Lower Case
Space Const...
String Const...
Empty String...
Carriage Ret...
Line Feed Co...
End of Line ...
Tab Constant

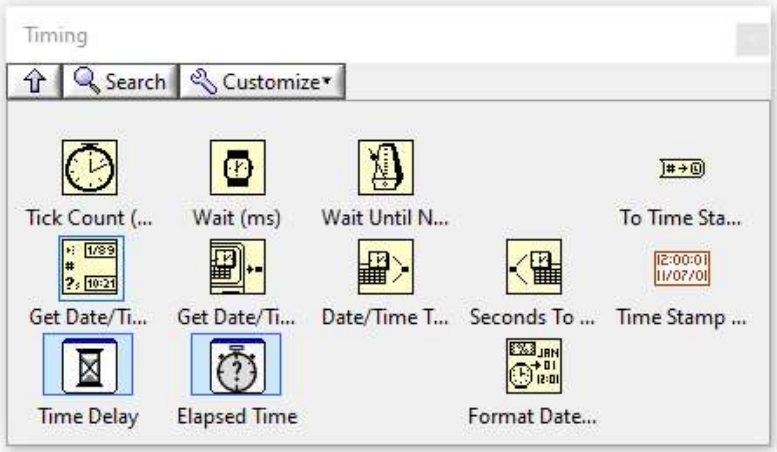
STRUCTURES

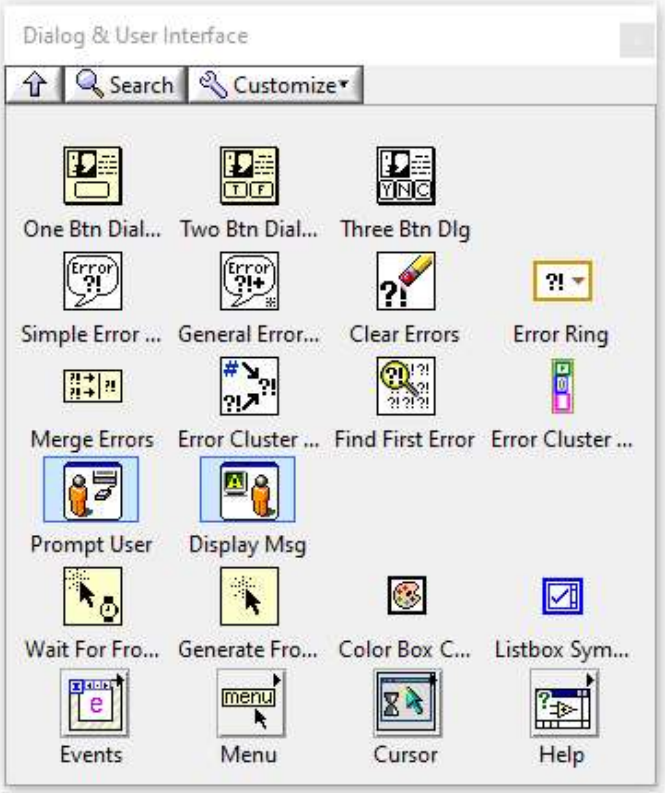

Structures
Search
Customize
For Loop
While Loop
Timed Struct...
Case Structure
Event Struct...
In Place Ele...
Flat Sequence
Stacked Seq...
Diagram Dis...
Conditional ...
Formula Node
Shared Varia...
Local Variable
Global Varia...
Decorations
Feedback No...


N
i
[0] Timeout
Type
Time
True
y = f(x)
x
y

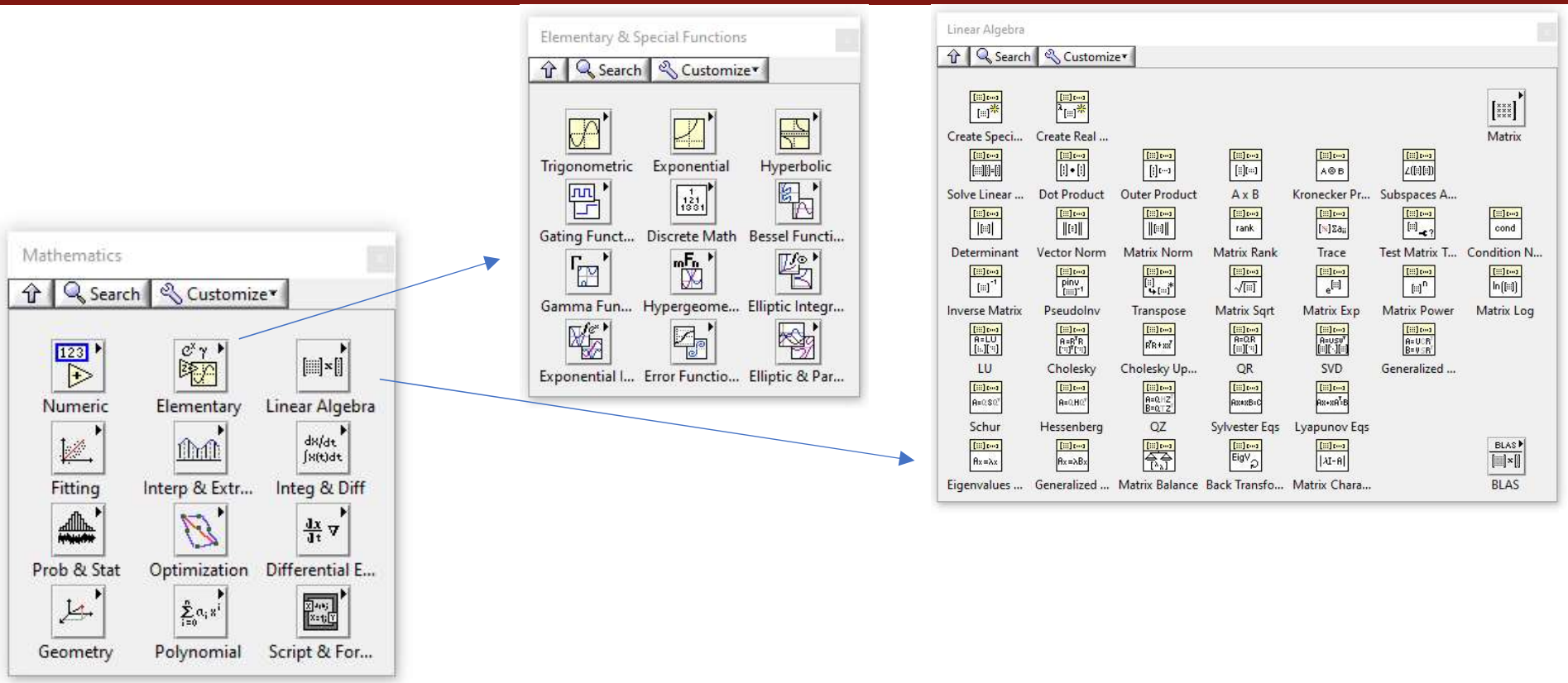

Untitled 2 Block Diagram *
File Edit View Project Operate Tools Window Help
15pt Application Font
Untitled 2 Front P
File Edit View
False
Numeric
7
0
+1
stop
Numeric
0
y
0
stop
STOP
Numeric
10
1000
y

TIMING AND USER INTERFACE

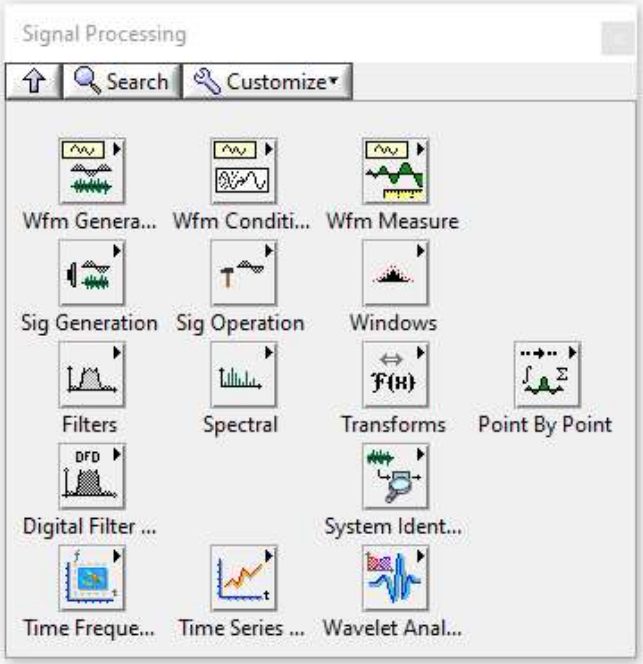


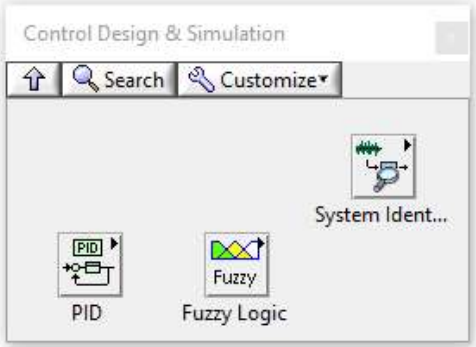


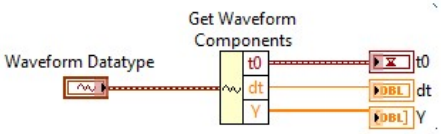
MATHEMATICS



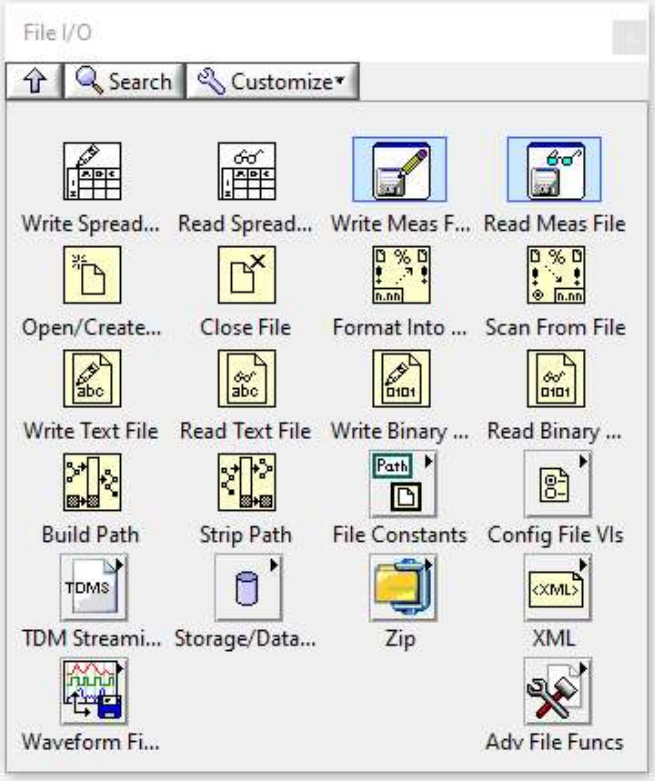
SIGNAL PROCESSING



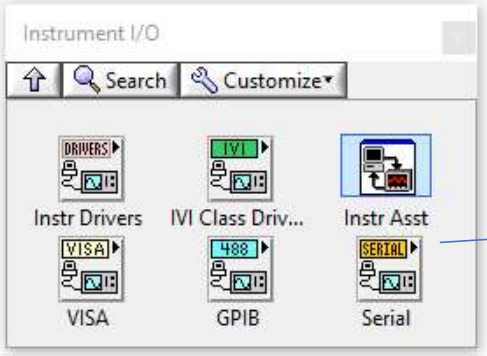


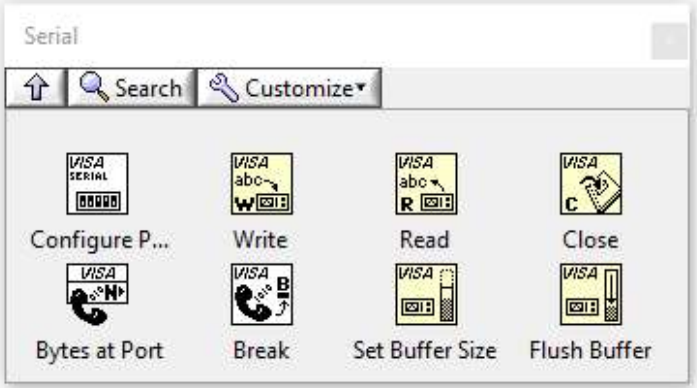


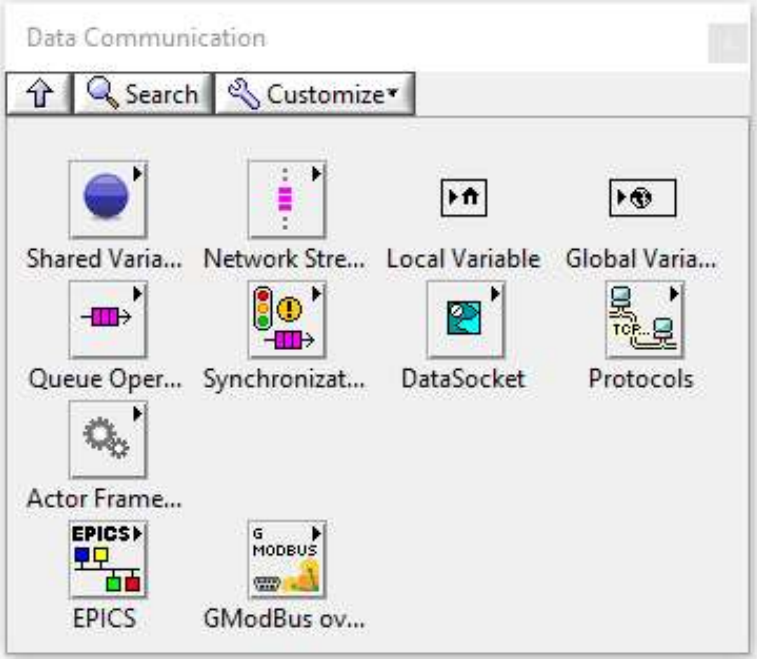
FILE I/O

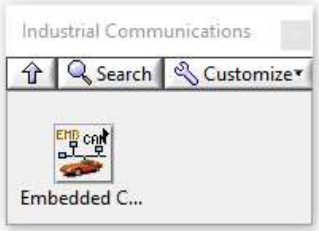

File I/O
Search
Customize
Write Spread...
Read Spread...
Write Meas F...
Read Meas File
Open/Create...
Close File
Format Into ...
Scan From File
Write Text File
Read Text File
Write Binary ...
Read Binary ...
Build Path
Strip Path
File Constants
Config File VIs
TDM Streami...
Storage/Data...
Zip
XML
Waveform Fi...
Adv File Funcs

COMMUNICATION

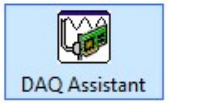


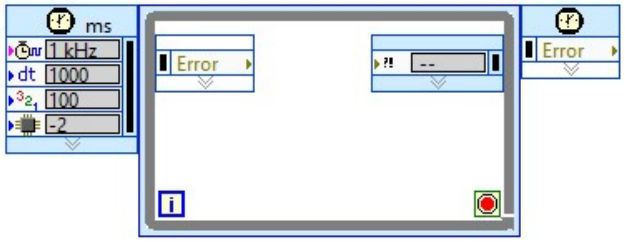


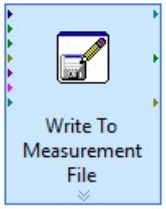


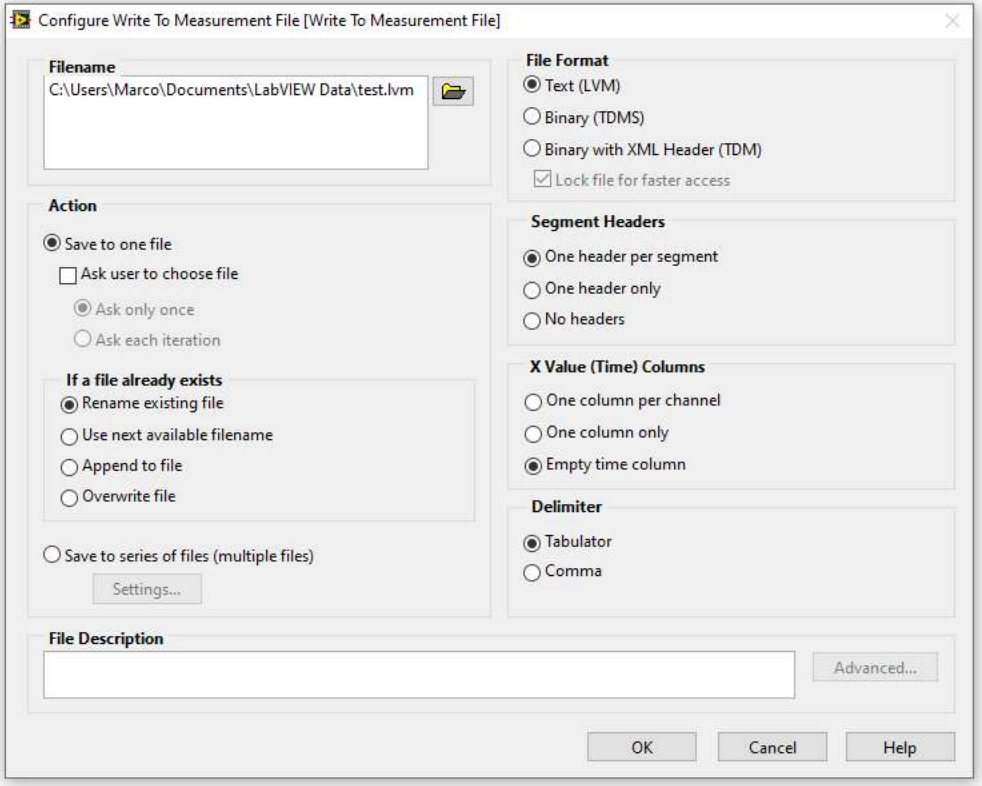


GRAPHICAL INTERFACE BASED BLOCKS

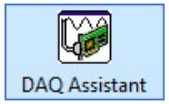


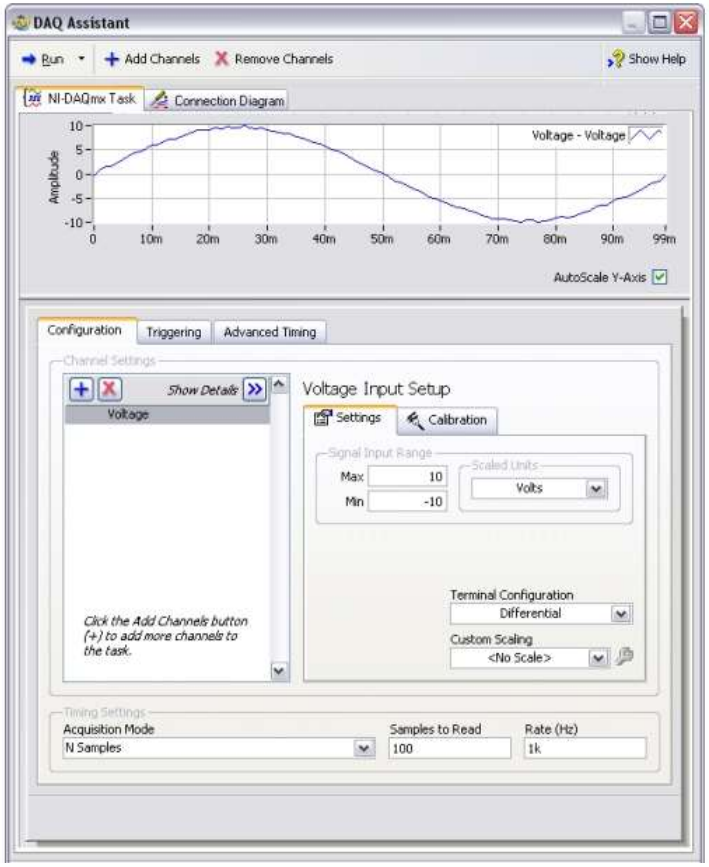




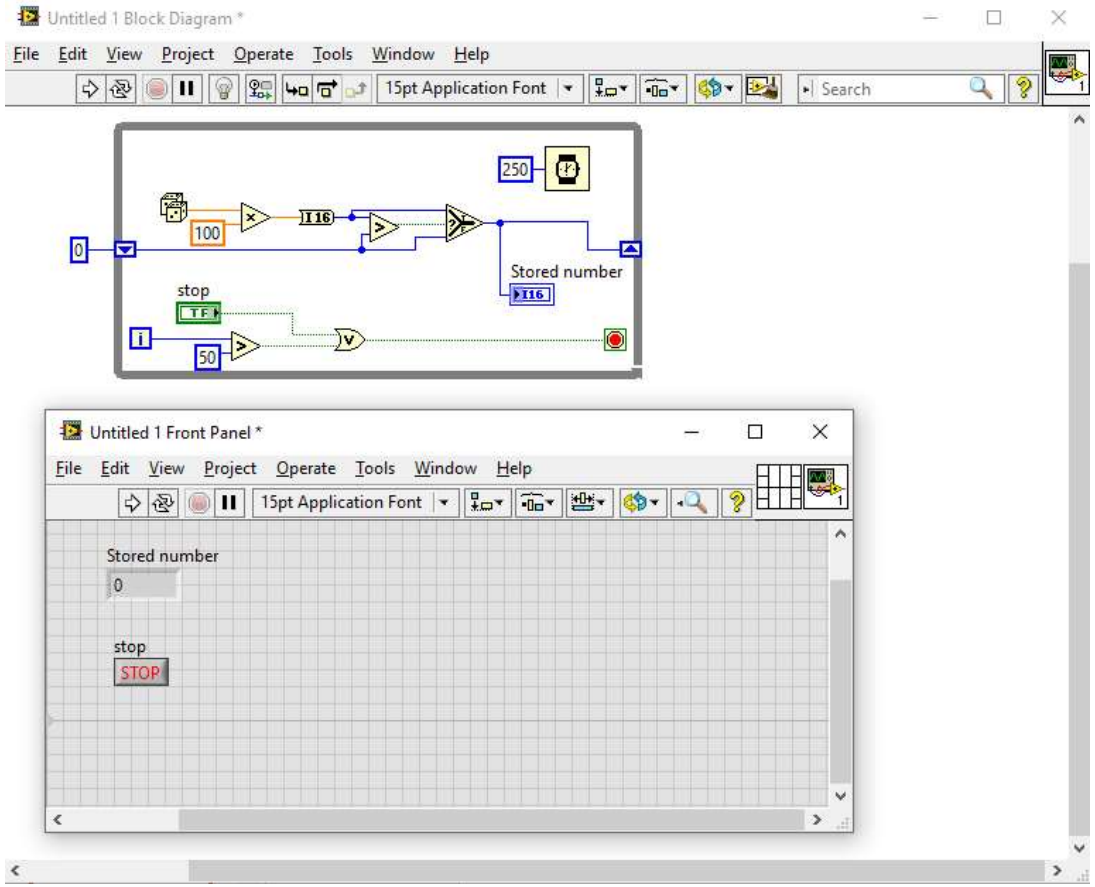


GRAPHICAL INTERFACE BASED BLOCKS



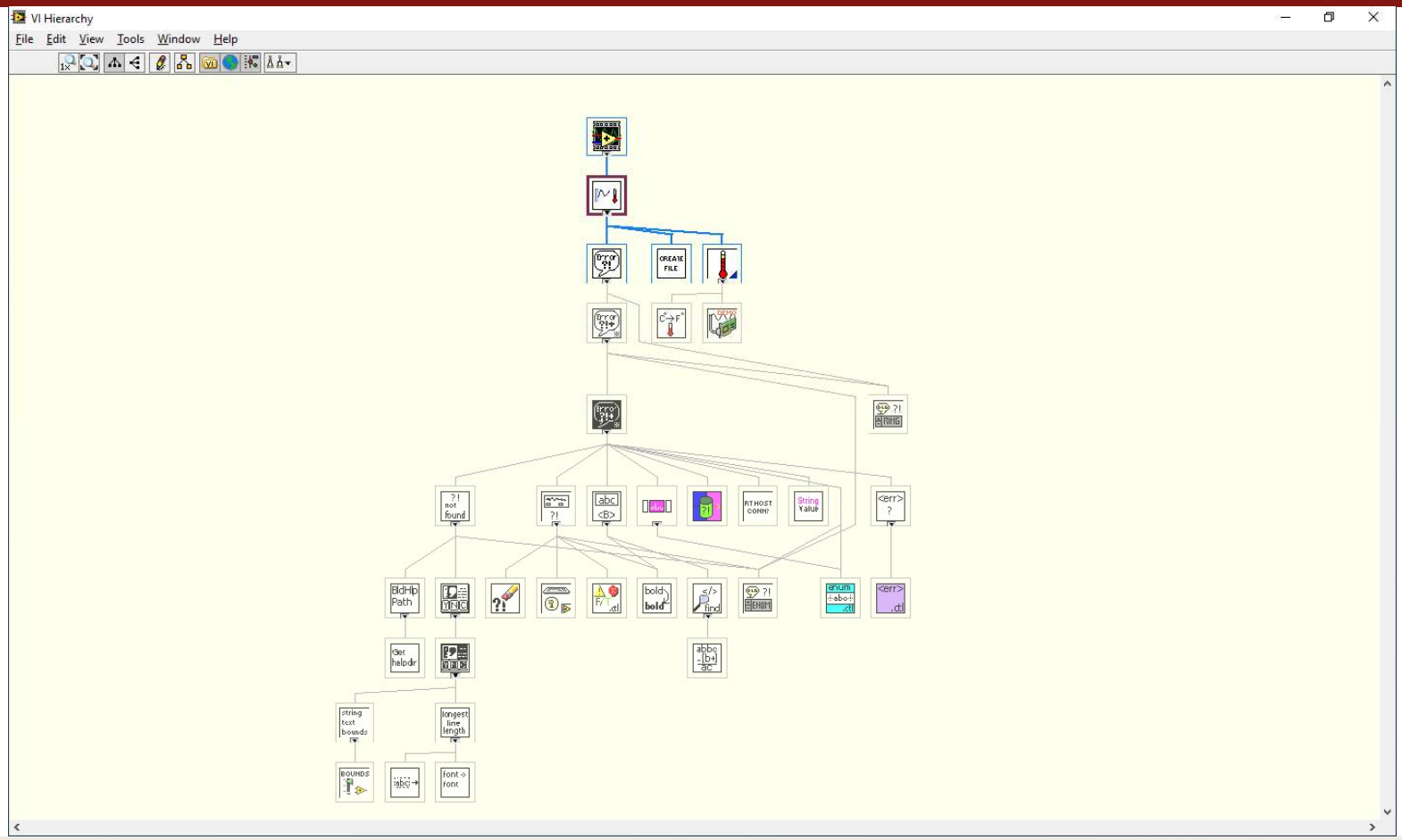


NI/ LABVIEW / VI / SOME EXAMPLES

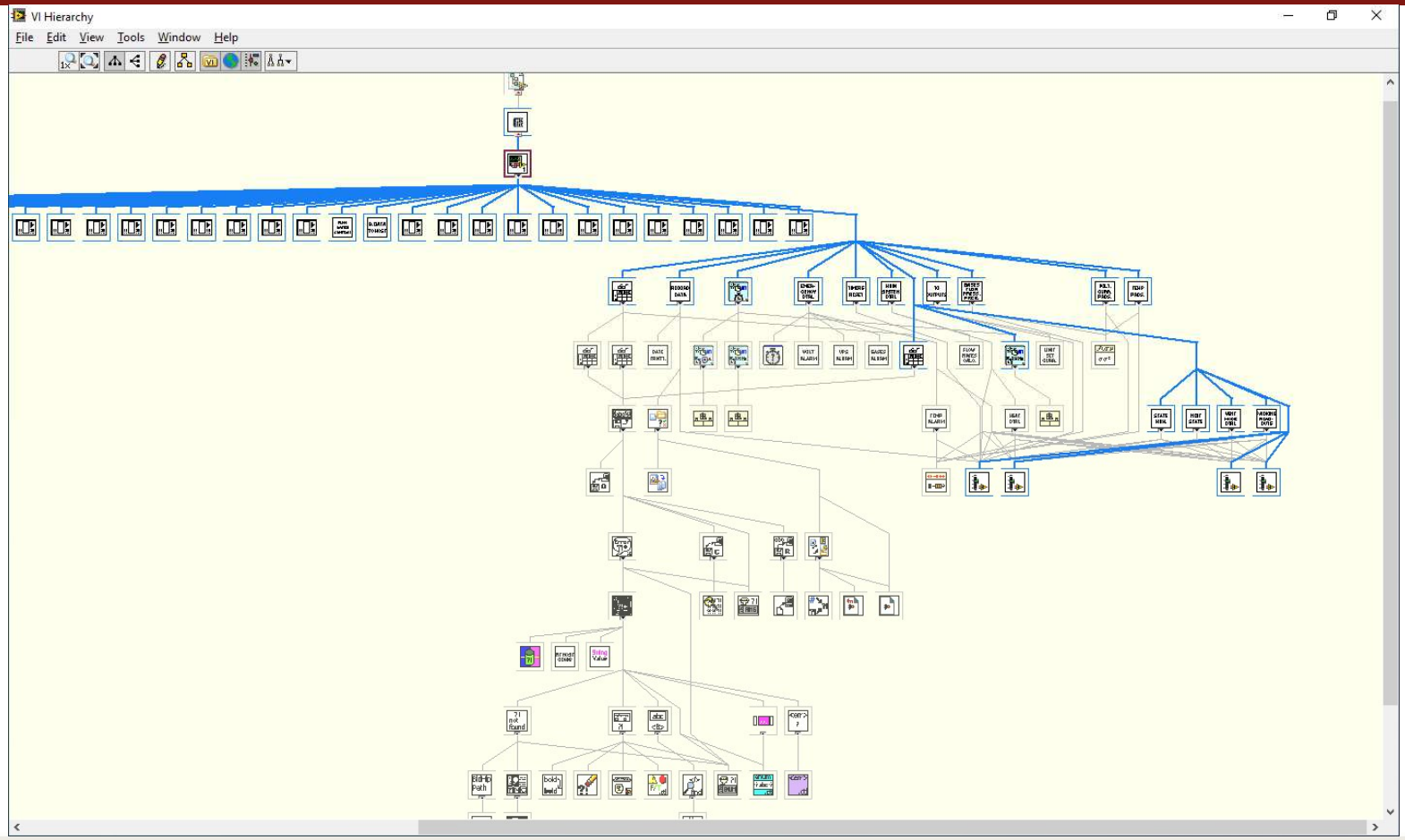


- NI Example finder / Signal Processing / Advanced Peak Detection
- NI Example finder / Level Measurement / Advanced DC-RMS Measurement

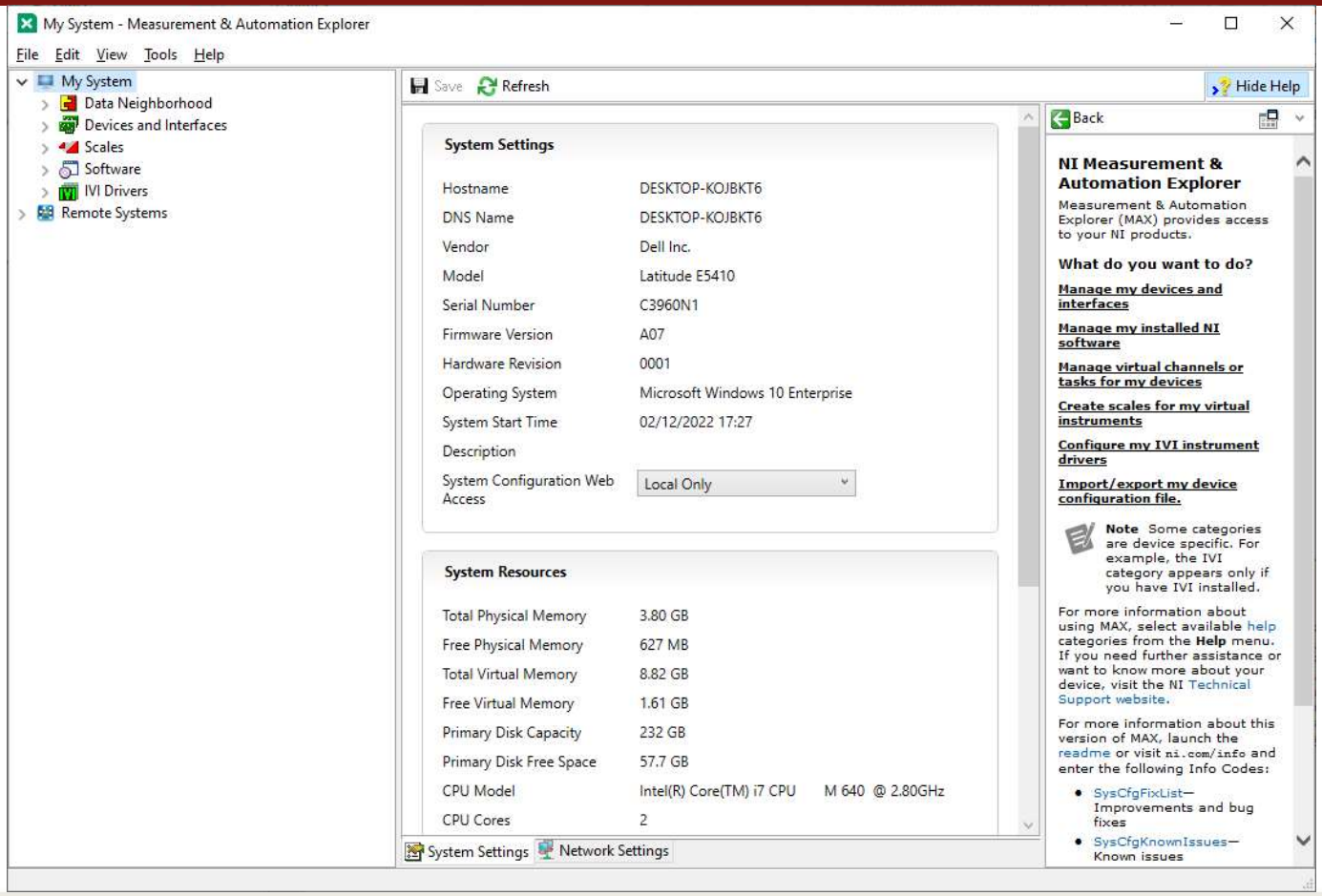
VI HIERARCHY



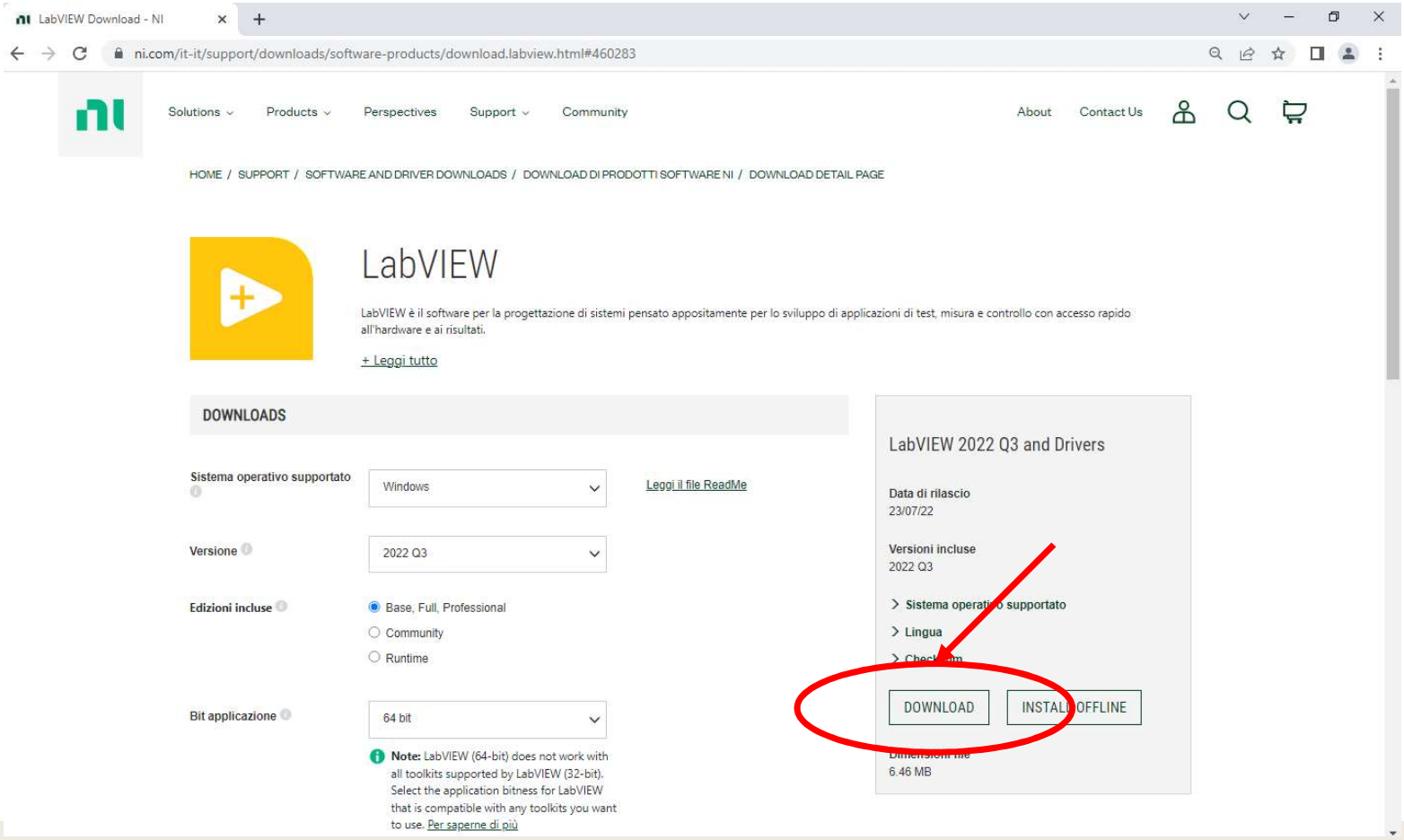
VI HIERARCHY



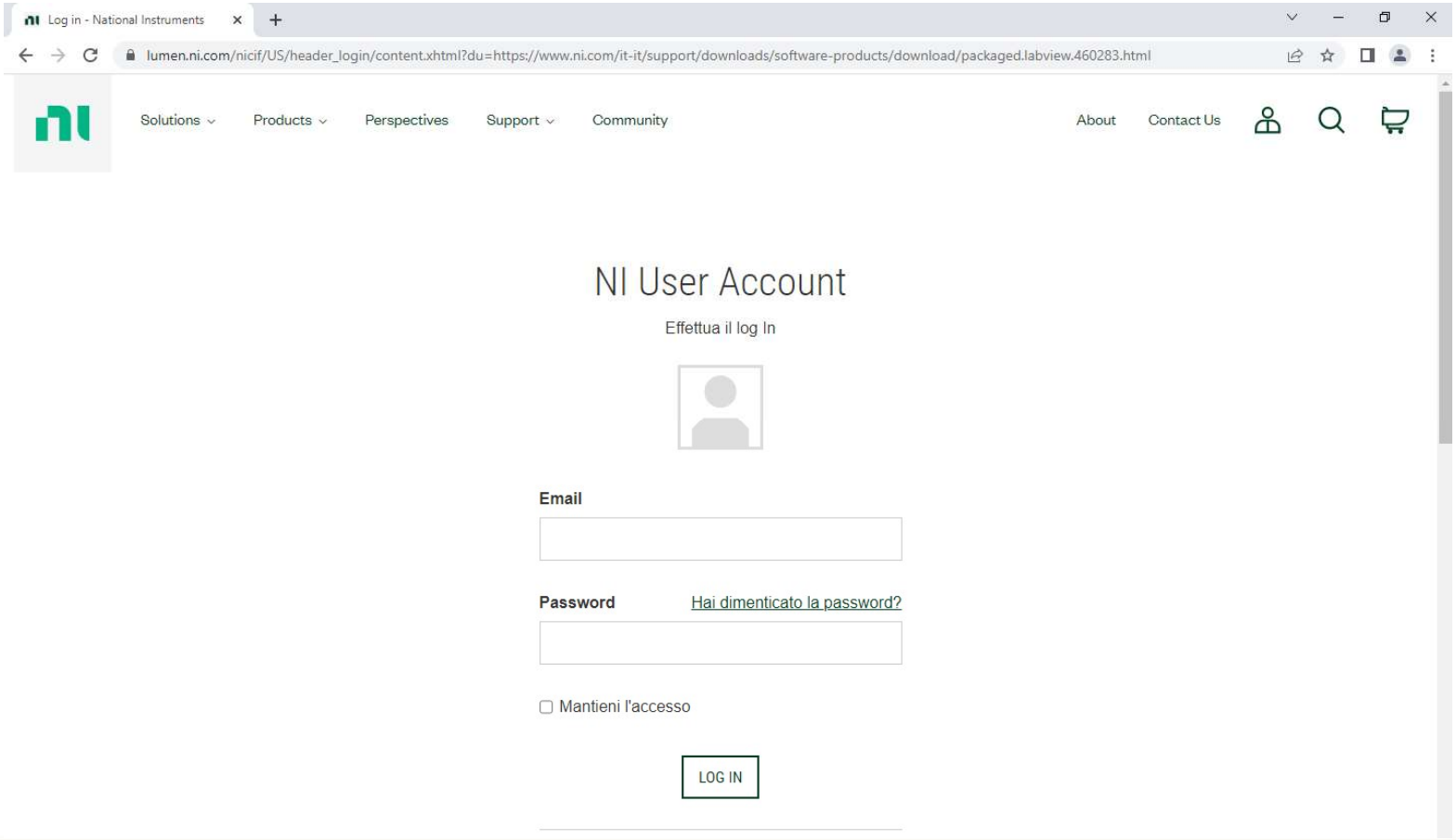
NI-MAX (MEASUREMENT &AUTOMATION EXPLORER)



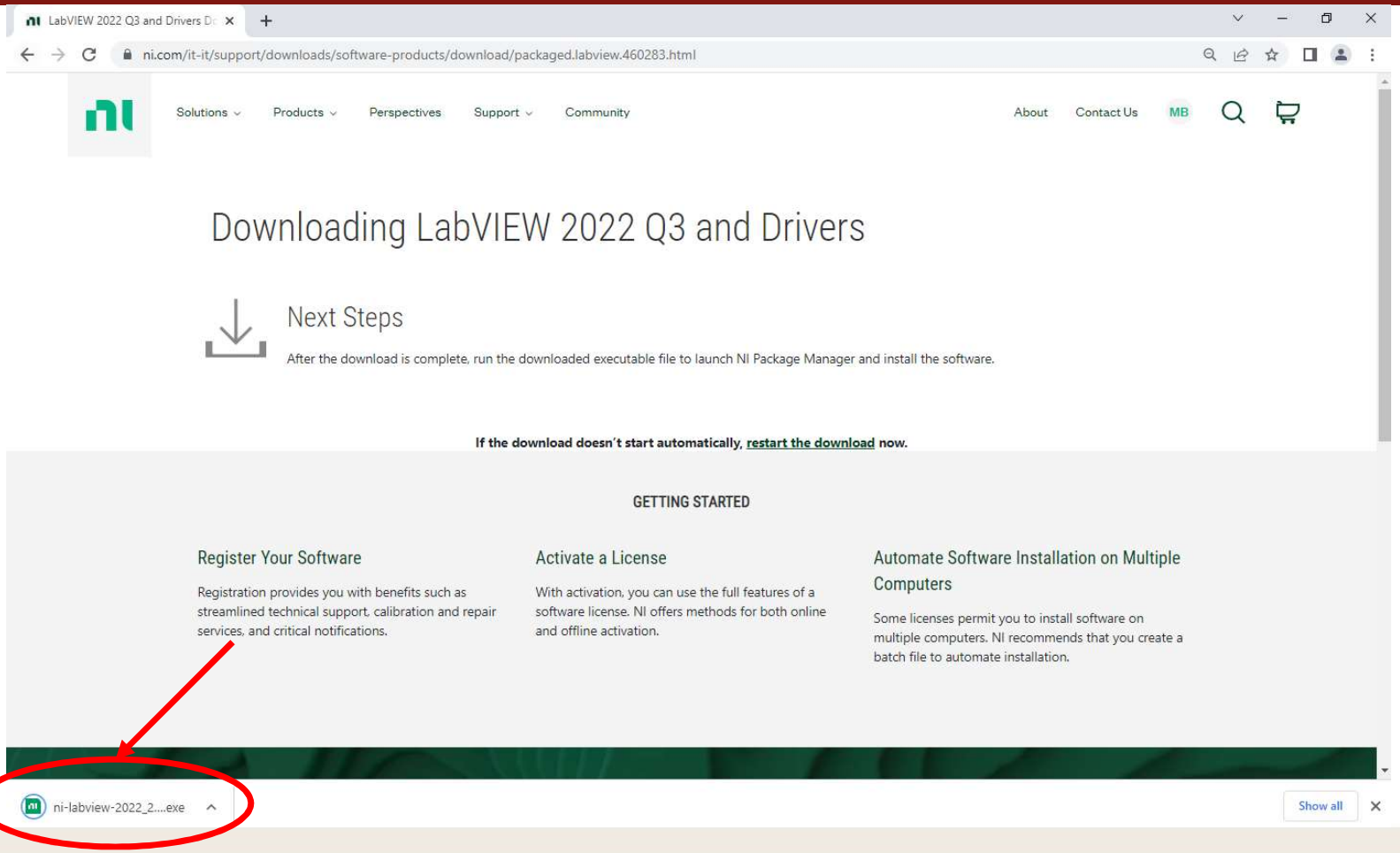
FOR NEXT TIME – LABVIEW INSTALLATION



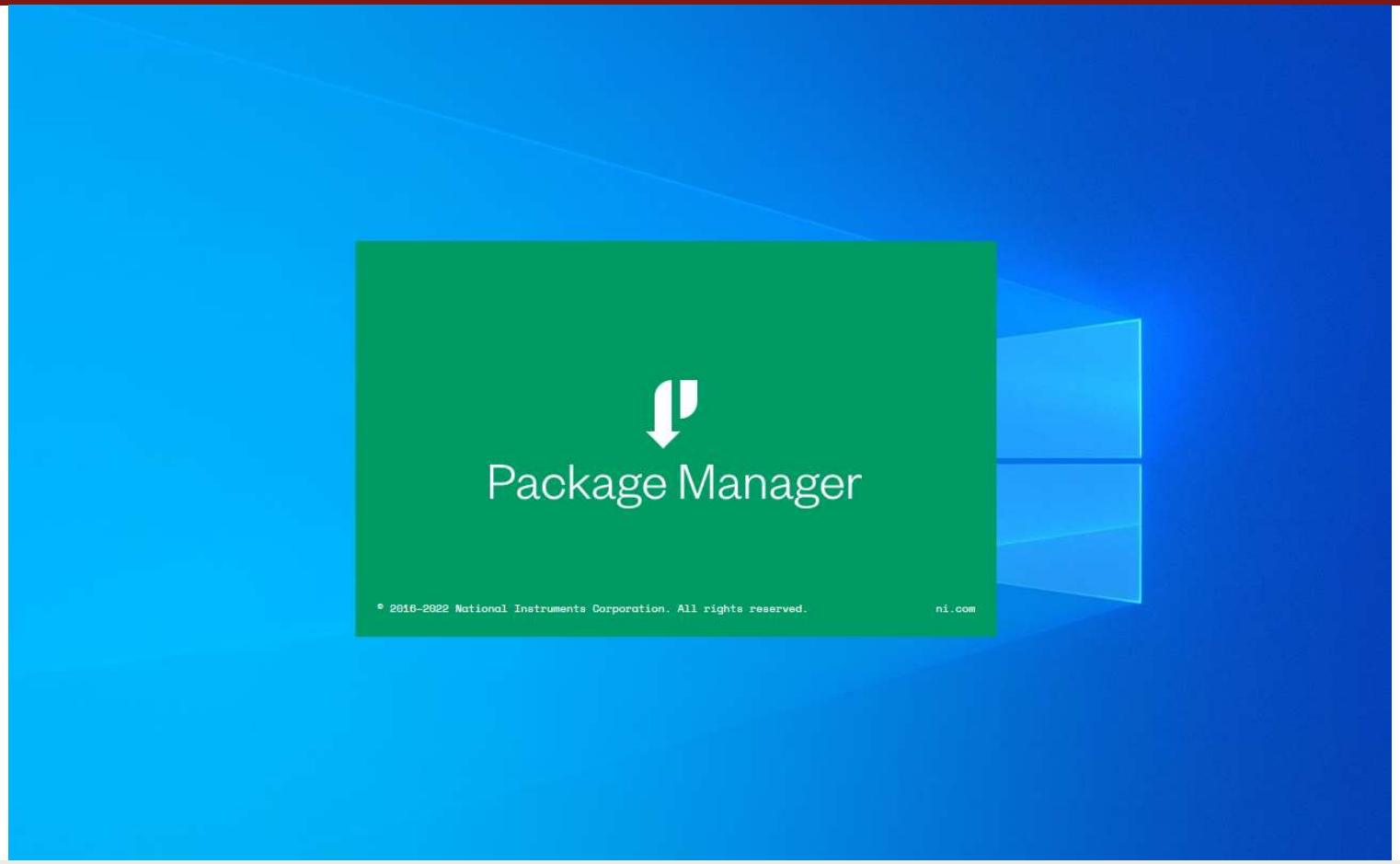
FOR NEXT TIME – LABVIEW INSTALLATION



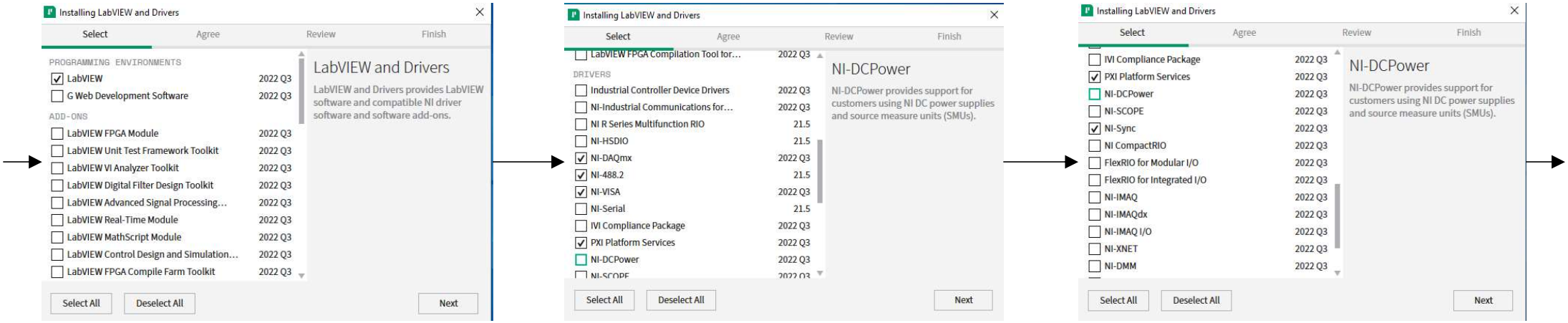
FOR NEXT TIME – LABVIEW INSTALLATION



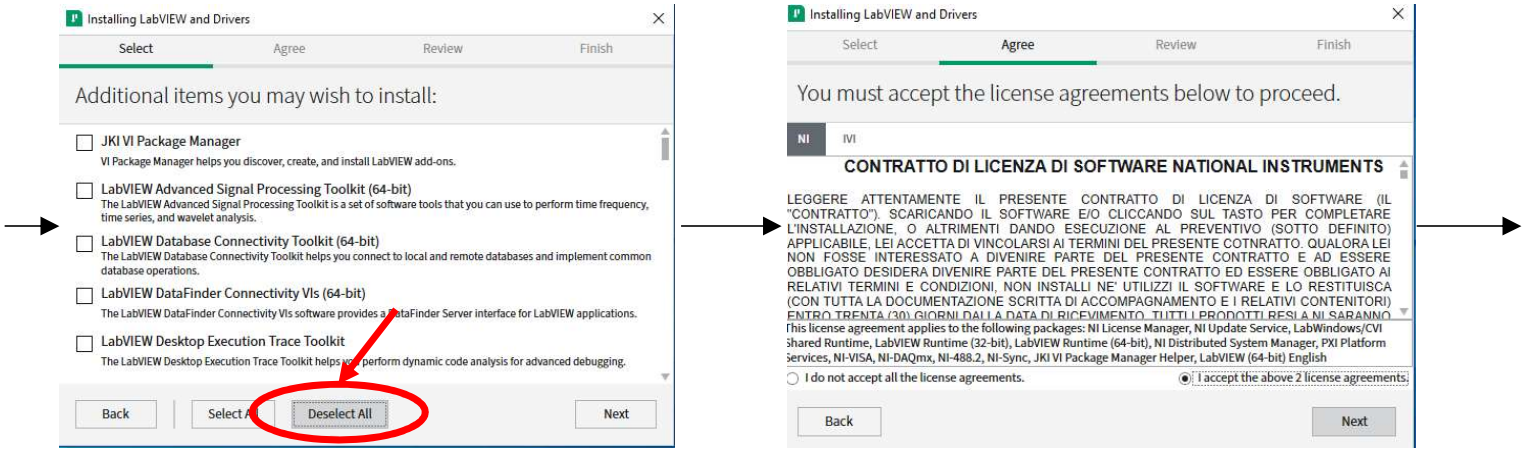
FOR NEXT TIME – LABVIEW INSTALLATION



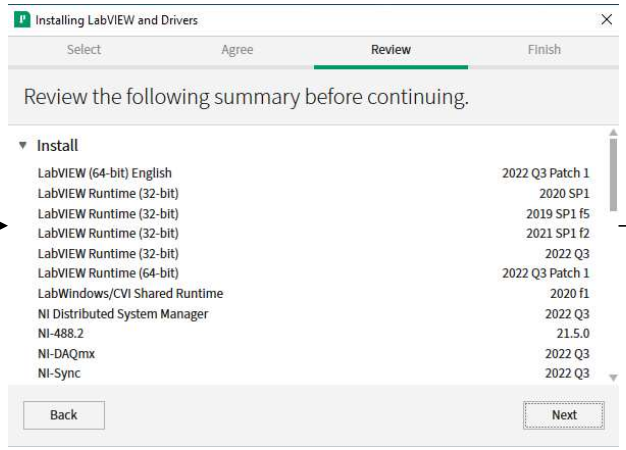
FOR NEXT TIME – LABVIEW INSTALLATION



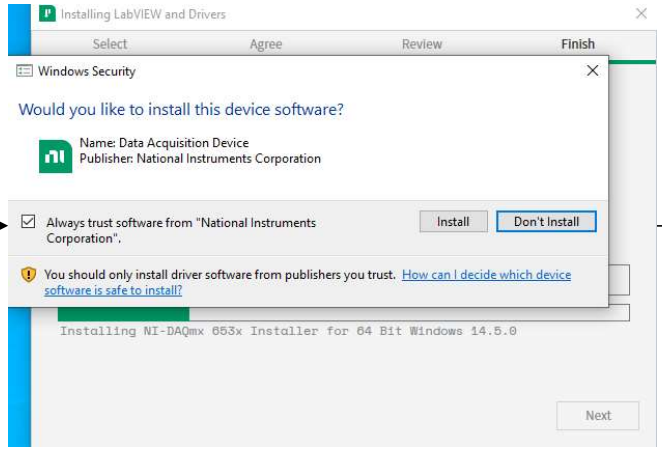
FOR NEXT TIME – LABVIEW INSTALLATION



FOR NEXT TIME – LABVIEW INSTALLATION

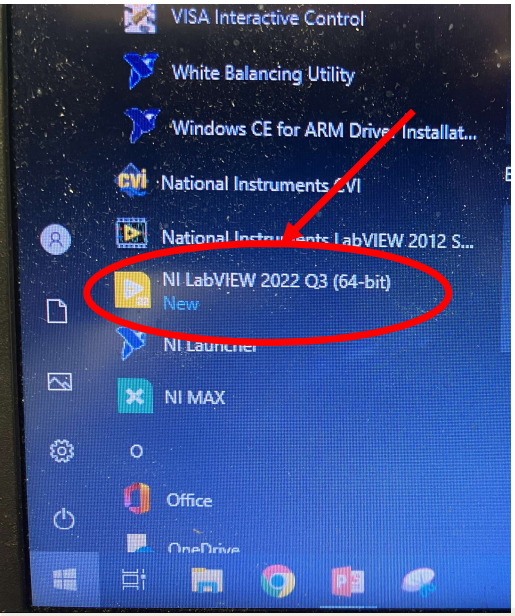


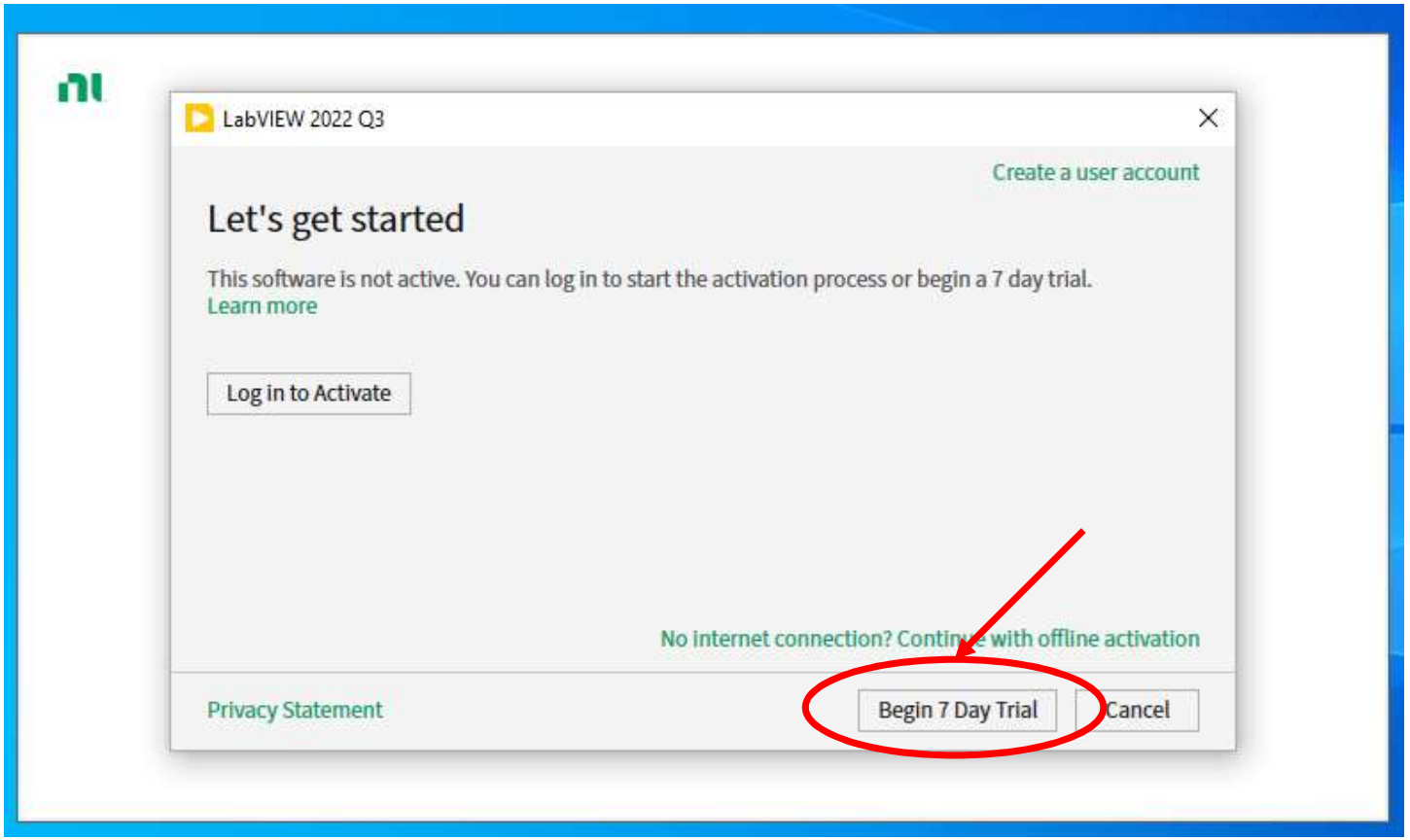
Proceed throughout the next windows until installation is ended.



Reboot

FOR NEXT TIME – LABVIEW INSTALLATION





UNIVERSITÀ
DEGLI STUDI
DI TRIESTE

Dipartimento di

Ingegneria
e Architettura