UNIVERSITÀ DEGLI STUDI DI TRIESTE

Dipartimento di Ingegneria e Architettura

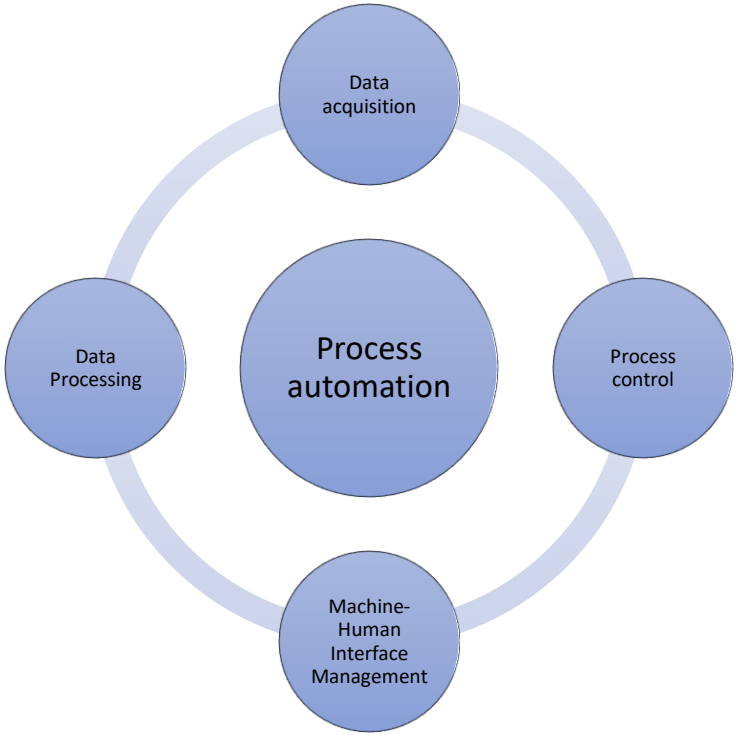
LABVIEW

AN INTRODUCTION

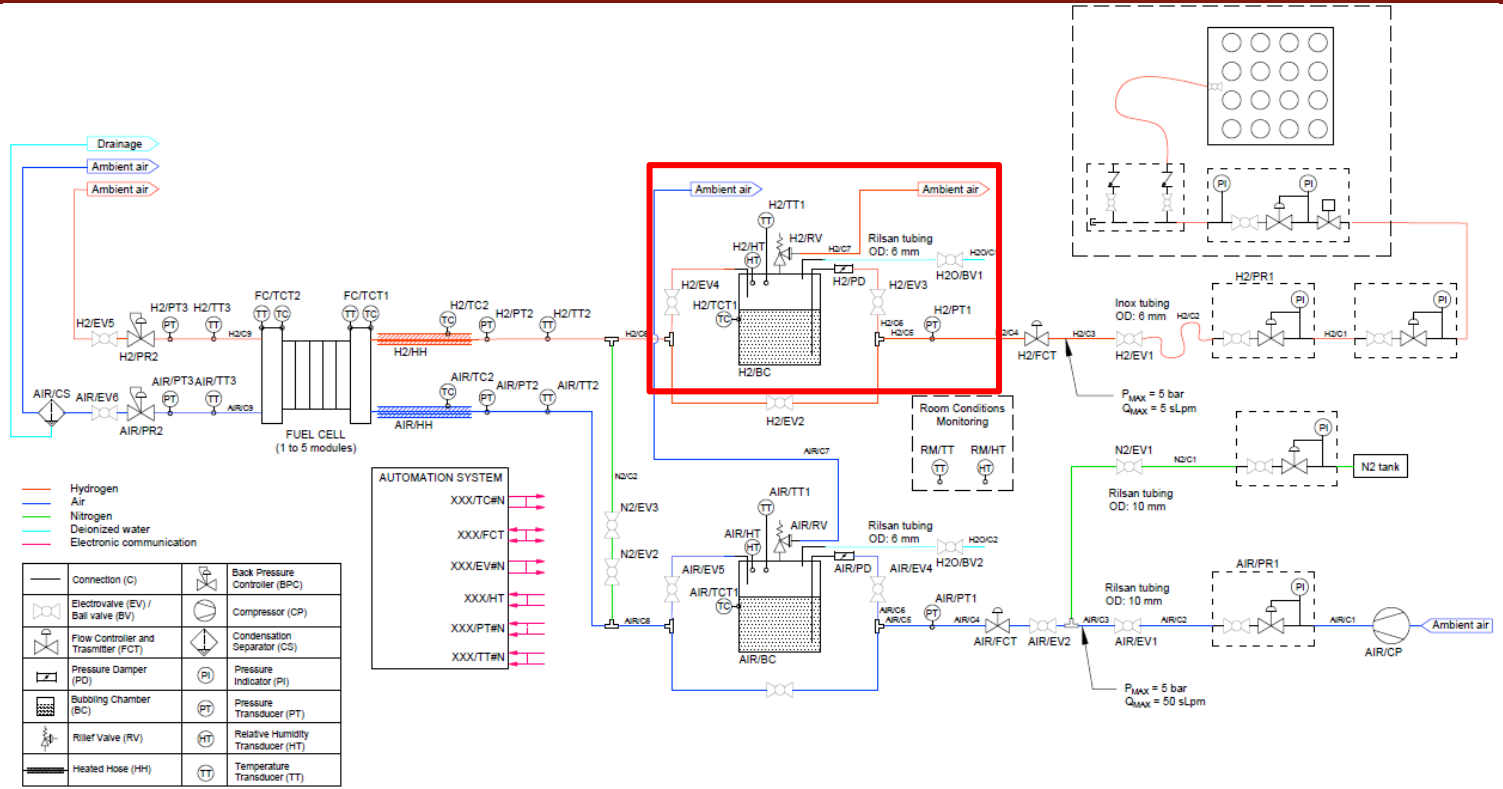
Prof. Marco Bogar

A.A. 2024-2025

INTRODUCTION



PLANT DESIGN AND DATA ACQUISITION



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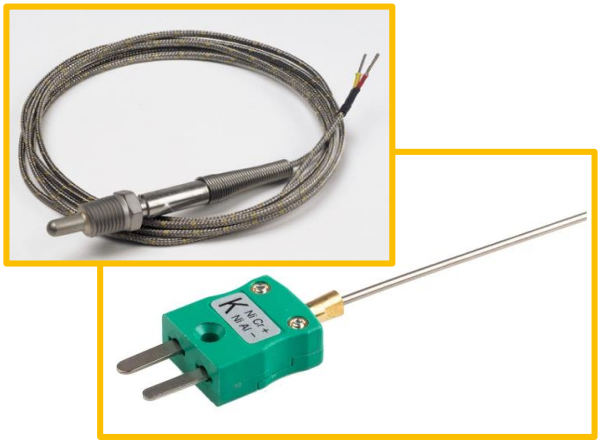

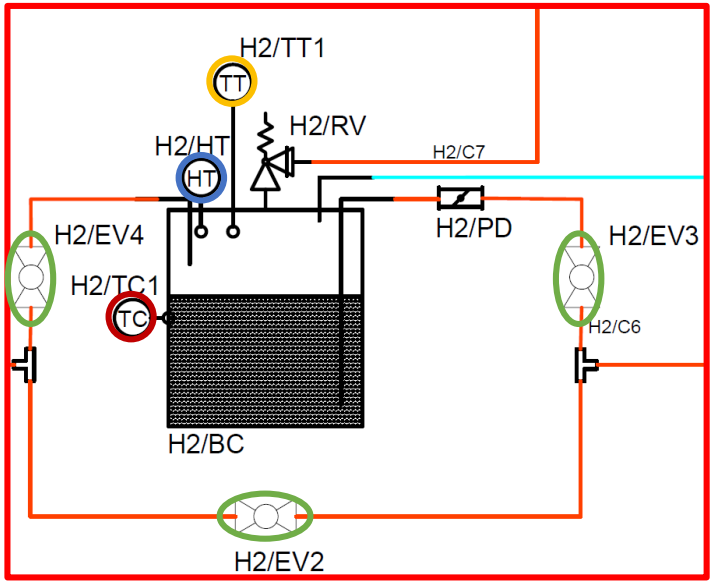

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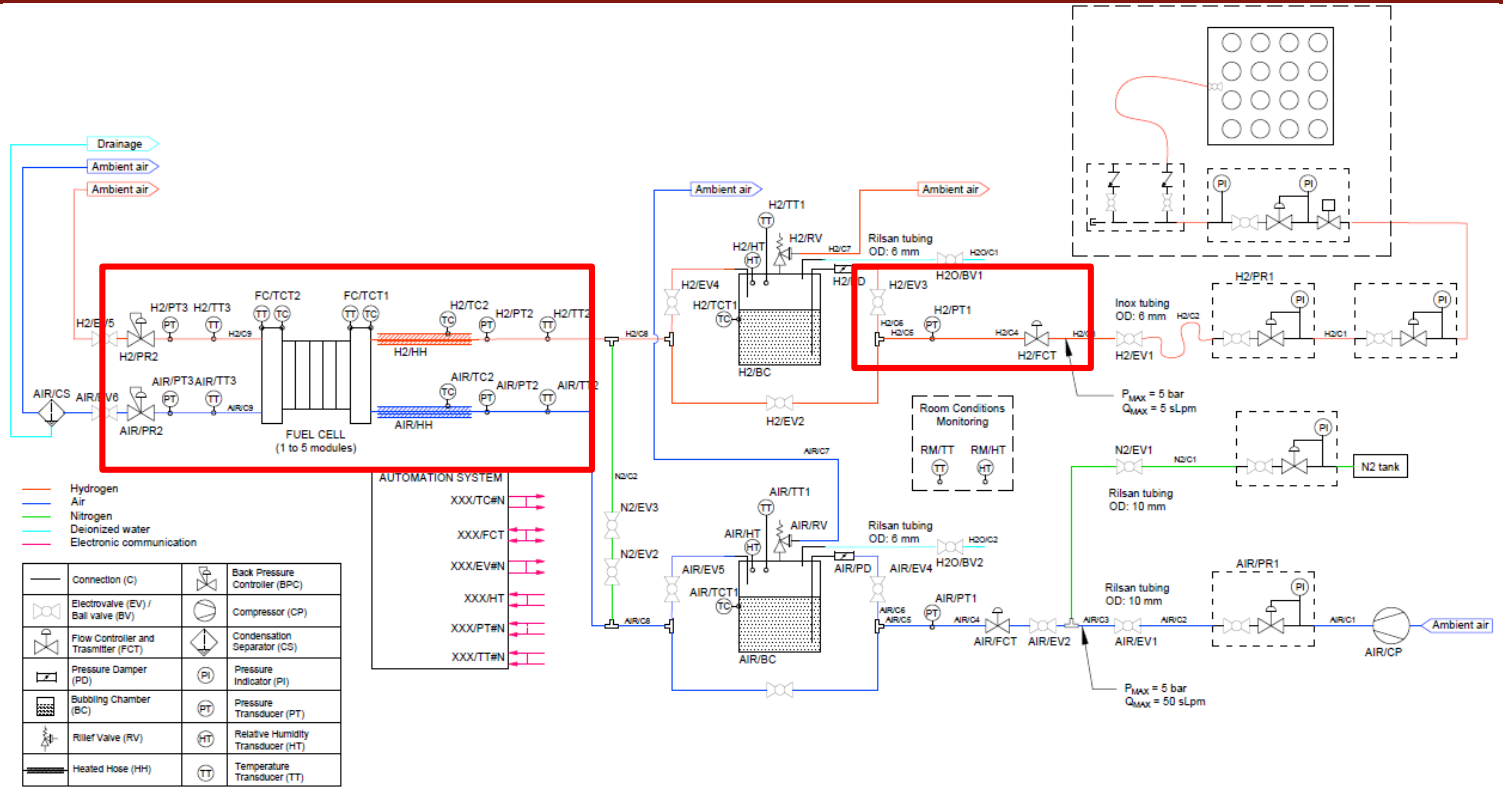

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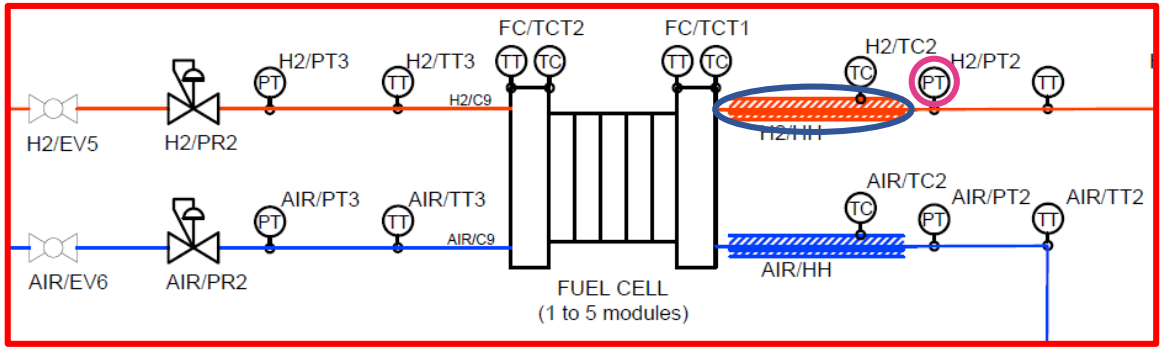

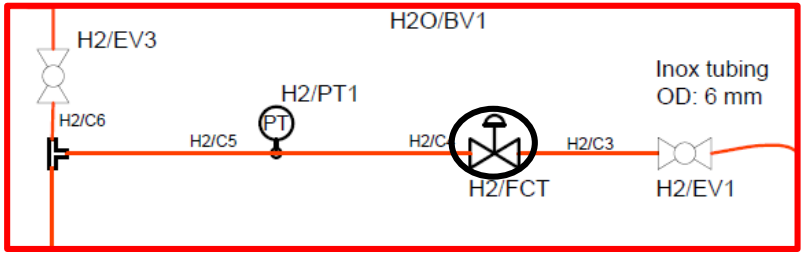

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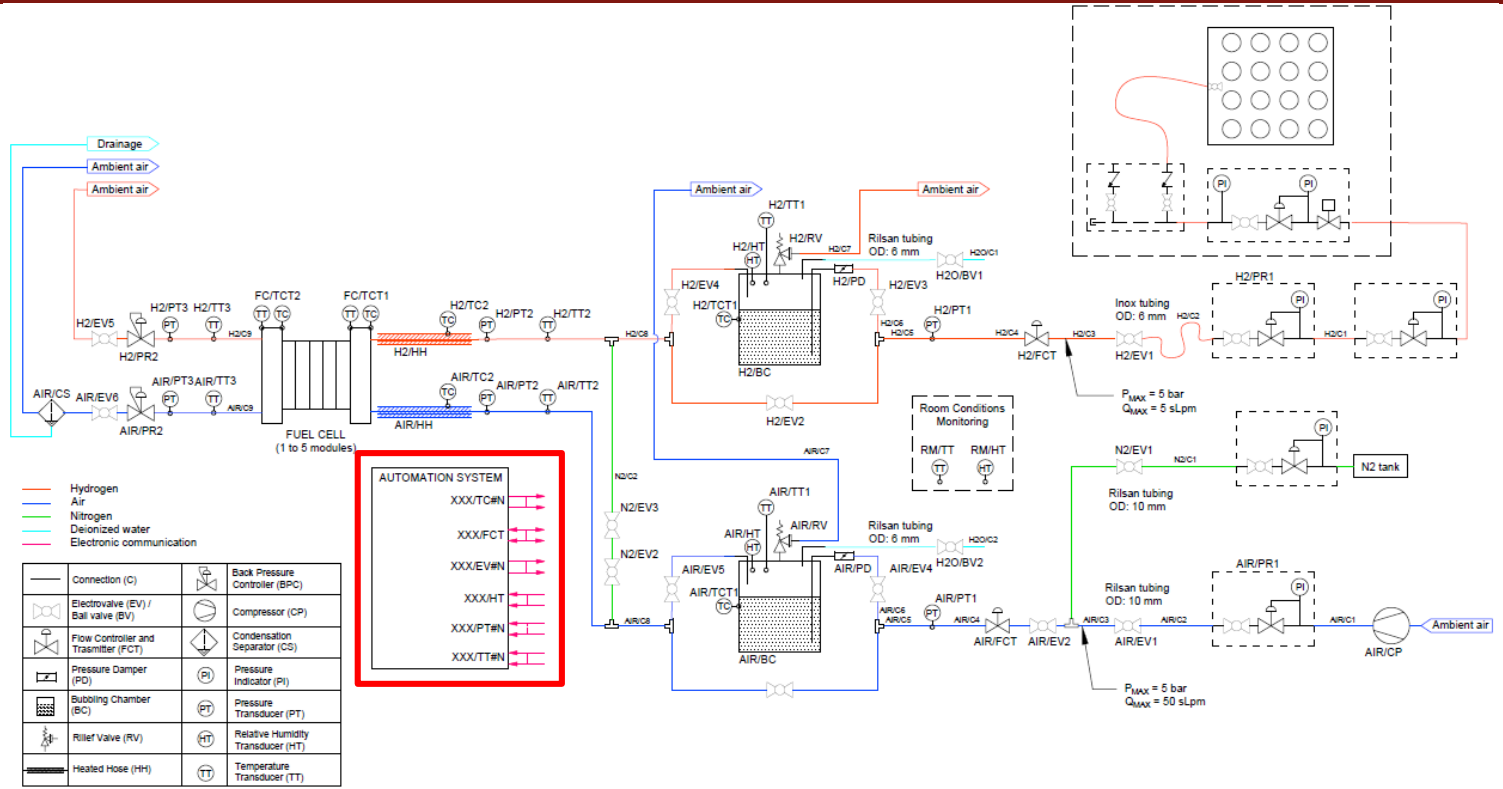

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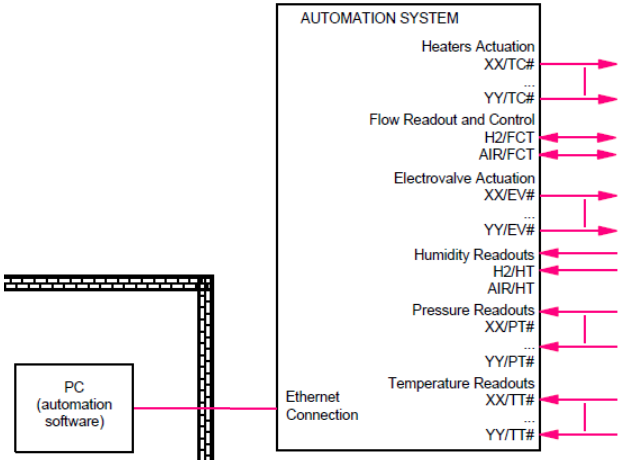


To relays

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

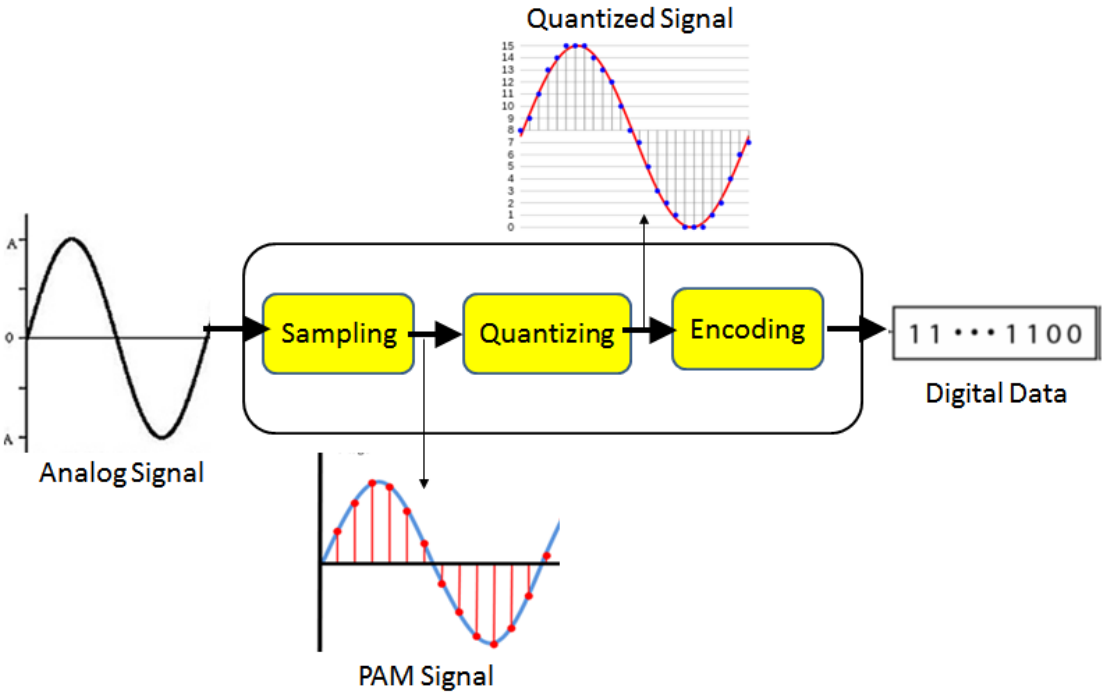
Digital output

Analogue voltage input

Analogue current input (power supply to be externally provided)

Differential voltage input

DATA ACQUISITION / ADC

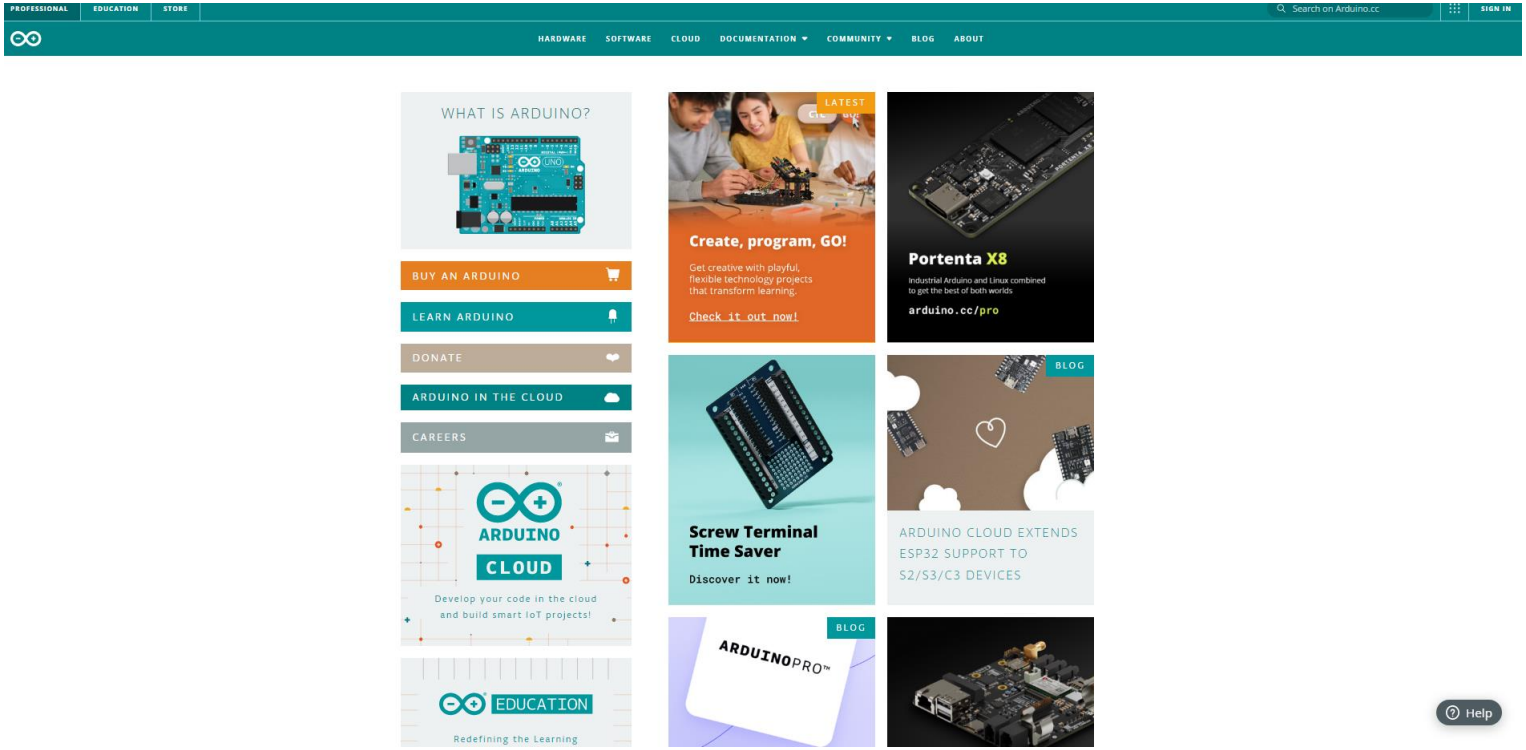


PLC

Programmable Logic Controller

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

ARDUINO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Help

ARDUINO

Boards

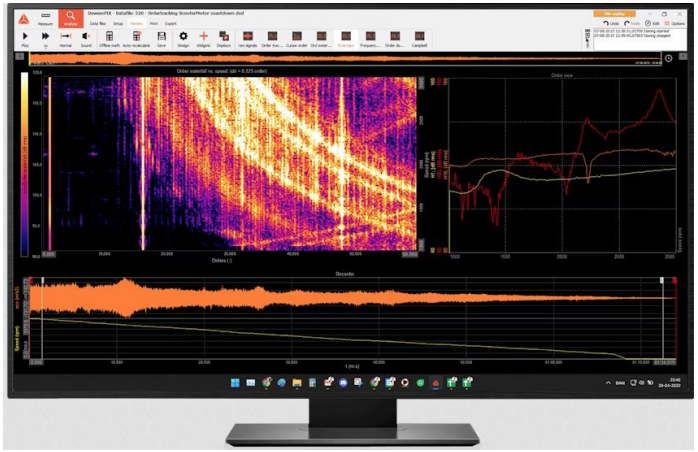
			
Arduino UNO R3	Arduino Mega 2560 Rev3	Arduino Leonardo	Arduino UNO Mini Limited Edition
			
Arduino Due	Arduino Micro	Arduino Zero	Arduino UNO WiFi Rev2

Shields

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

DEWESOFT

DEWESoft®
measurement innovation



IEPE — IEPE
Carica
Tensione
Alta Tensione
Corrente
Sforzo e Stress
Ponte intero
Mezzo ponte
Quarto di ponte
LVDT — LVDT
Termocoppie
PT100 — RTD
Resistenza
CNT — Contatori e Encoder

Digitale
CAN — CAN bus
OBDII
J1939
Compatibile DSI
TEDS — Compatibile con TEDS
Uscite analogiche
Isolamento galvanico ±1000 V
USB 2.0
EtherCAT
IP50
-10°C a +50°C
50 g — Resistenza shock 50g

DEWESOFT

Sistemi di Acquisizione

I sistemi DAQ (acquisizione dati) di Dewesoft sono robusti, modulari e facili da usare. I nostri condizionatori di segnale supportano praticamente qualsiasi sensore, ma possono anche registrare video, CAN BUS, GPS, Ethernet e molti altri formati di dati digitali, tutti in modo sincrono! Collegate i nostri dispositivi con EtherCAT o USB per estenderli. Il software DewesoftX è da tempo riconosciuto come il più versatile e facile da usare al mondo e include aggiornamenti gratuiti per tutta la durata del sistema. Rivolgetevi a Dewesoft per avere la migliore tecnologia, la massima qualità e prezzi competitivi... e una garanzia di 7 anni leader del settore.

Sistemi DAQ modulari

I sistemi DAQ modulari di Dewesoft offrono un modo comodo e flessibile per creare il sistema DAQ ideale per la vostra applicazione. Iniziate con un modulo a canale singolo e poi aggiungete tutti i moduli singoli o multicanale di cui avete bisogno. Possono essere facilmente collegati a margherita. Grazie alla connettività EtherCAT, i moduli possono essere collocati a una distanza massima di 100 m l'uno dall'altro. Un unico cavo trasmette alimentazione, dati e sincronizzazione. I moduli IOLITE sono ideali per le applicazioni industriali, mentre i moduli KRYPTON sono progettati per l'uso all'aperto, le vibrazioni elevate e gli ambienti difficili. Tutti i sistemi Dewesoft includono il software DewesoftX, che viene aggiornato gratuitamente per tutta la durata del sistema.

Sistemi DAQ portatili

I sistemi di acquisizione dati portatili sono dispositivi di acquisizione e visualizzazione dati completamente integrati, con archiviazione dati sicura e incorporata, batterie per un funzionamento completamente autonomo e connettività di rete avanzata. Le potenti funzioni di condizionamento ed elaborazione del segnale assicurano che le nostre unità portatili siano adatte ad applicazioni di test e misura sul campo, nell'industria o in laboratorio. L'elevato isolamento galvanico degli amplificatori analogici e dei circuiti di alimentazione protegge le unità dai loop di massa e mantiene la qualità del segnale ai massimi livelli.

Sistemi DAQ Rugged

I robusti registratori e logger DAQ di Dewesoft sono progettati e costruiti per essere utilizzati in ambienti difficili. La protezione IP67 significa che sono resistenti all'acqua e alla polvere. I moduli KRYPTON, singoli o multicanale, possono essere collocati ovunque e collegati in serie tramite un unico cavo EtherCAT. Sono resistenti agli urti fino a 100 g e possono funzionare in un'ampia gamma di temperature, da -40° a 85 °C (da -40° a 185 °F). I modelli SIRIUS impermeabili offrono una frequenza di campionamento più elevata e una gamma dinamica più ampia, un grado di protezione IP67 e una temperatura operativa compresa tra -40 °C e 60 °C (-40 °F e 140 °F). Con questi dispositivi abbiamo unito prestazioni elevate e praticità.

DEWESOFT

Sistemi di acquisizione e controllo

Finora l'acquisizione di dati ad alta velocità e il controllo in tempo reale erano due mondi completamente diversi. I sistemi DAQ non erano dispositivi nativi in tempo reale e i PLC non avevano capacità di condizionamento del segnale e di registrazione dinamica di alto livello. Dewesoft ha cambiato tutto questo sviluppando potenti dispositivi DAQ con una o addirittura due interfacce EtherCAT ridondanti. Questi sistemi possono memorizzare centinaia di canali analogici e digitali a piena velocità e inviare simultaneamente dati in parallelo a qualsiasi controllore master EtherCAT di terze parti. I mondi della misura ad alta velocità e del controllo in tempo reale si sono finalmente uniti.

Wattemtri

Gli analizzatori di potenza Dewesoft sono strumenti all'avanguardia progettati per un'analisi precisa e completa della potenza e della qualità dell'energia in varie applicazioni industriali e di ricerca. Grazie alla tecnologia avanzata e al software intuitivo, questi analizzatori offrono precisione, flessibilità e facilità d'uso senza pari. La nostra gamma comprende tutto, dall'analizzatore di potenza trifase più piccolo al mondo agli analizzatori portatili multifase intelligenti e compatti e ai sistemi ad alto numero di canali. Che si tratti di produzione industriale, energia rinnovabile, test automobilistici, aerospaziali o di qualsiasi tipo di ricerca e sviluppo, Dewesoft offre gli strumenti necessari per un'analisi di potenza precisa ed efficiente.

Unitevi ai principali ingegneri e ricercatori che si affidano a Dewesoft per le loro esigenze di misurazione elettrica.

Data Loggers

Benvenuti nella pagina della categoria di prodotti Data Logger di Dewesoft! I nostri data logger di fascia alta sono progettati per fornire una registrazione affidabile e accurata dei dati per una vasta gamma di applicazioni. La nostra offerta comprende data logger integrati e a bassa potenza che possono essere utilizzati per misurare estensimetri, vibrazioni, tensione, corrente, temperatura, resistenza e altre misure simili. I nostri data logger sono costruiti all'insegna della precisione e della durata, per garantire la massima affidabilità dei dati raccolti. Sfogliate la nostra selezione per trovare il data logger perfetto per le vostre esigenze.

Monitoraggio e dispositivi IoT

Dewesoft produce strumenti e logger DAQ innovativi per applicazioni di monitoraggio della salute strutturale e delle condizioni delle macchine. I nostri strumenti sono abilitati all'IoT (Internet of Things). Sono completamente collegabili in rete, ma possono anche operare in modo autonomo. La nostra ampia gamma di strumenti è progettata per essere utilizzata insieme o separatamente in qualsiasi combinazione, in modo da poter risolvere qualsiasi applicazione di misura e monitoraggio. Che si tratti di semplice monitoraggio o di applicazioni di fascia alta che richiedono l'elaborazione del segnale in loco con uplink dei dati in tempo reale per la visualizzazione e la post-elaborazione nei centri di controllo, abbiamo la soluzione che fa per voi.

DEWESOFT

More insights during the seminar which will be held on 14th November

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

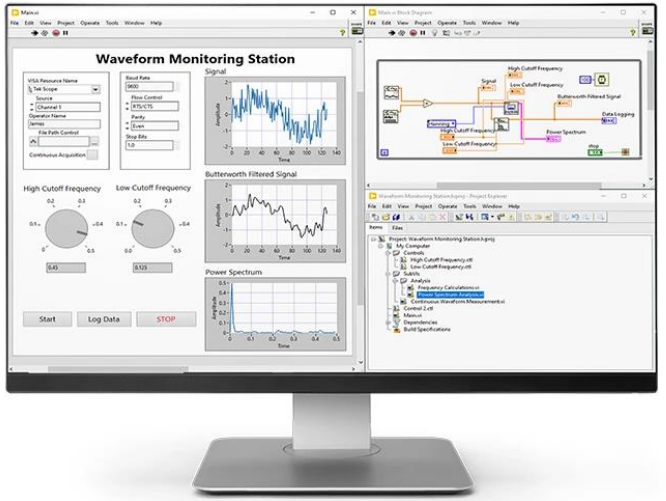
LabVIEW

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

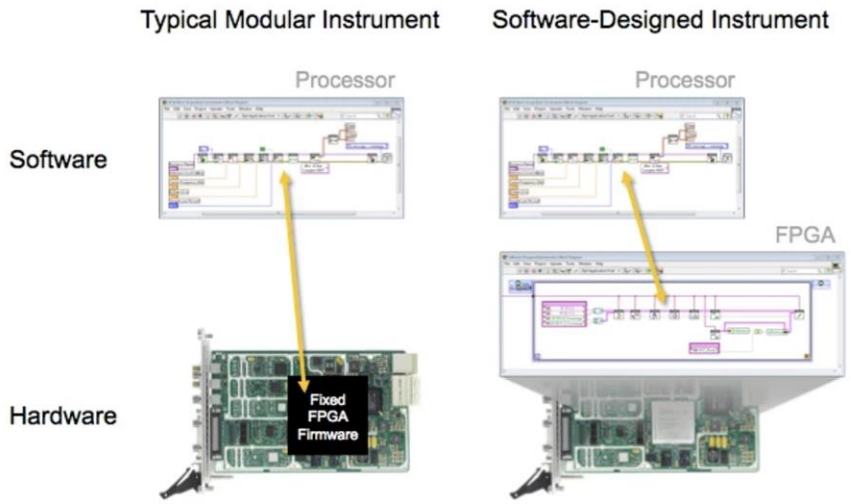
What Is LabVIEW?

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

See Pricing



SOFTWARE DESIGNED INSTRUMENTS

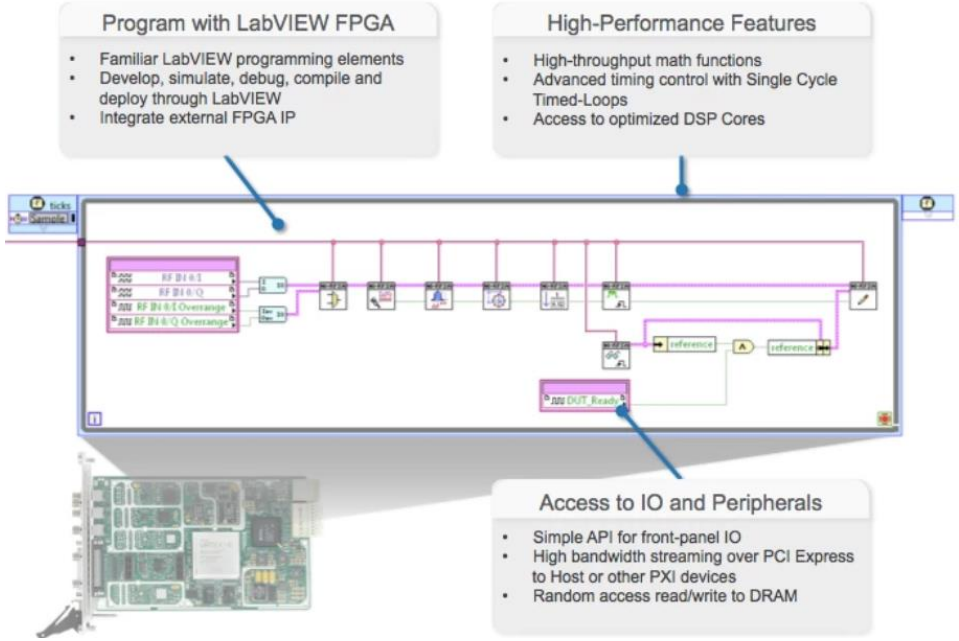


https://www.ni.com/en/shop/electronic-test-instrumentation/add-ons-for-electronic-test-and-instrumentation/what-is-labview-fpga-module/programming-options-for-ni-software-designed-instruments.html

Software-designed instruments, exploit the flexibility offered from Field Programmable Gate Arrays (FPGAs) to build software-designed modular instruments. By using high quality data acquisition systems this approach allows to build customized software according to the host processors.

This software-based approach, called virtual instrumentation, has become the de facto standard for developing automated test applications.

SOFTWARE DESIGNED INSTRUMENTS



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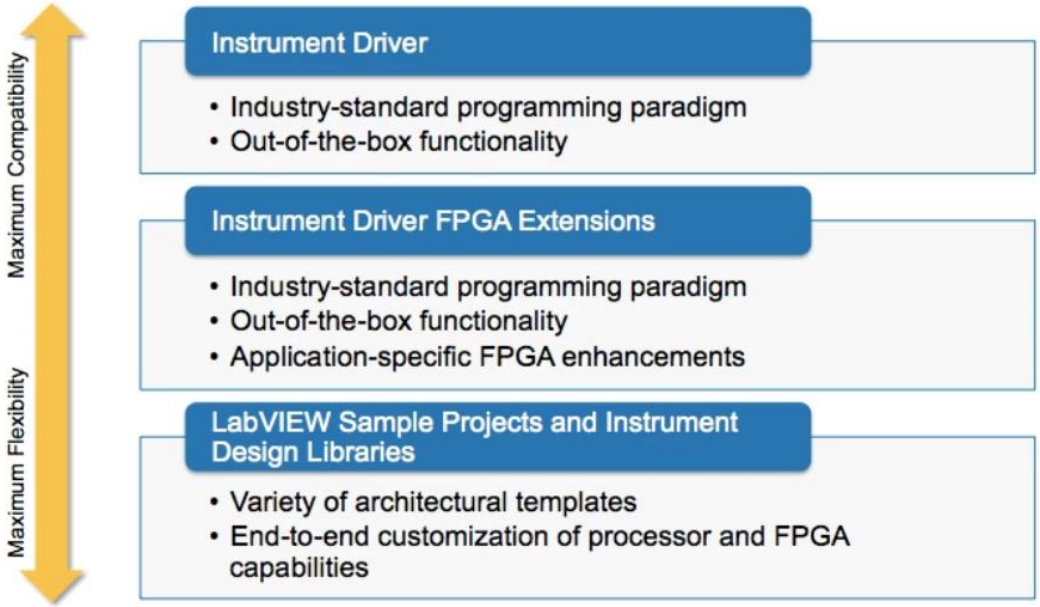
On-FPGA measurements and stimulus generation move these tasks from the host processor to the FPGA, allowing for real real-time data processing , executed continuously and virtually instantaneously. This might deliver higher test throughput by reducing the measurement computation time, or it might enable new types of tests by performing measurements continuously over an indefinite period or by generating long-duration non-repetitive waveforms (examples: RF spectral measurements, digital bit error rate calculation, phase-continuous tone generation, or intentional waveform impairments such as distortion or noise).

SOFTWARE DESIGNED INSTRUMENTS



For maximum compatibility with existing test code and testing paradigms, instrument drivers deliver industry-standard APIs that meets these needs. For maximum flexibility, NI instrument design libraries and LabVIEW Sample Projects provide lower-level building blocks and architectural templates that you can completely customize.

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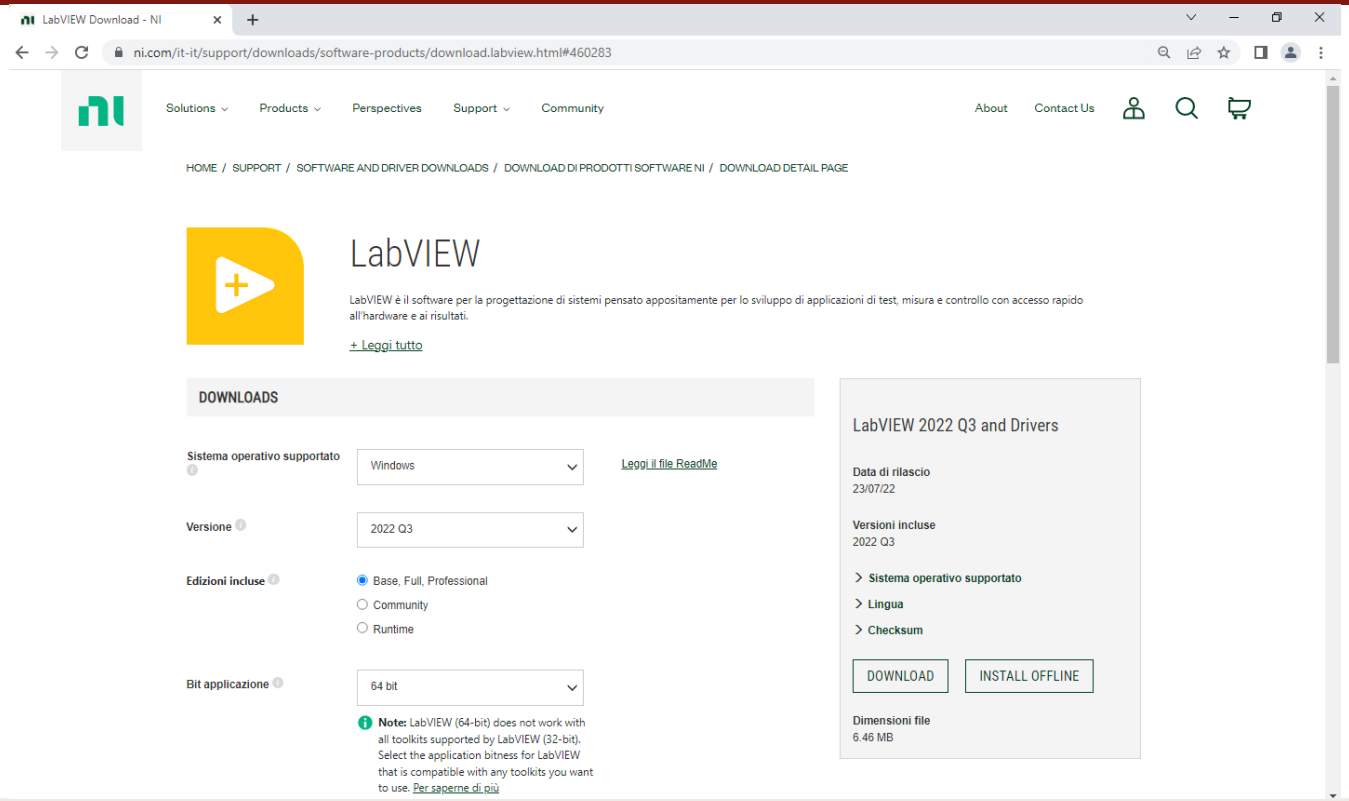
LABVIEW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LabVIEW
LabVIEW è il software per la progettazione di sistemi pensato appositamente per lo sviluppo di applicazioni di test, misura e controllo con accesso rapido all'hardware e ai risultati.
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23/07/22
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LABVIEW

LABoratory Virtual Instruments Engineering Workbench

Graphical programming language that allows for:

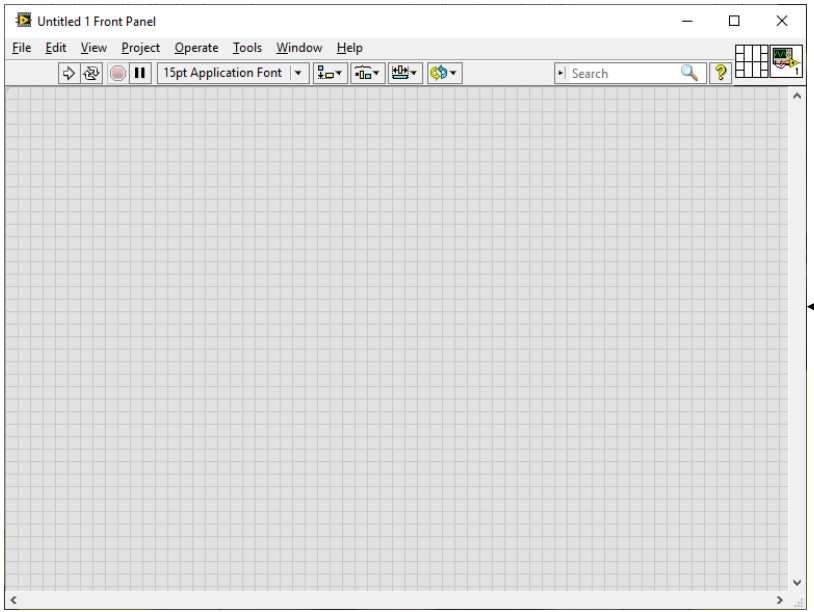
- instrument control
- data acquisition
- pre/post data processing

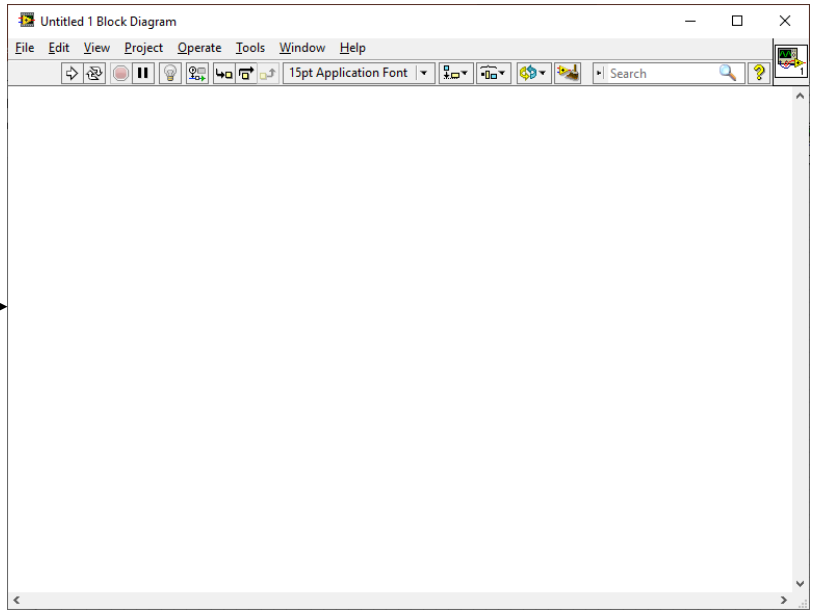
Graphical programming language: graphical symbols rather than textual language to describe programming actions

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.

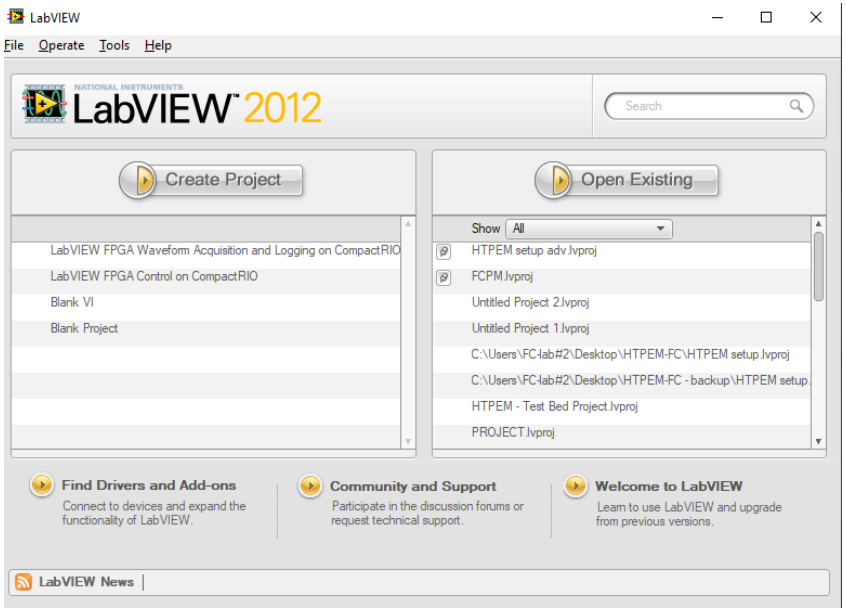
LABVIEW

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





LABVIEW


LabVIEW
File Operate Tools Help
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Create Project
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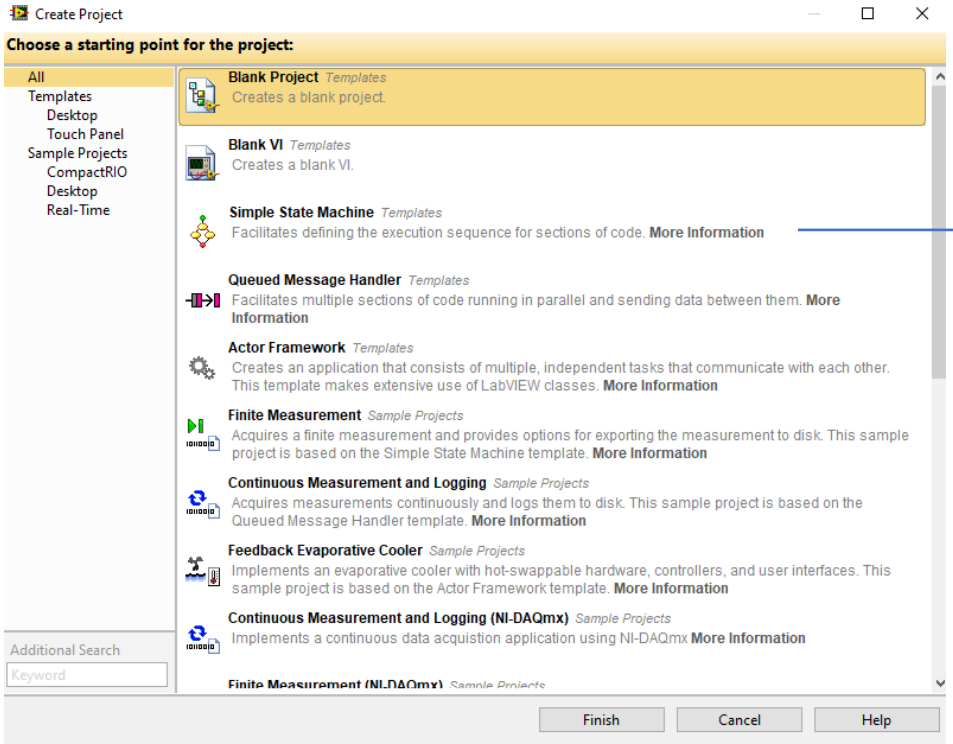
LabVIEW FPGA Control on CompactRIO
Blank VI
Blank Project
Open Existing
Show All
HTPEM setup adv.lvproj
FCPM.lvproj
Untitled Project 2.lvproj
Untitled Project 1.lvproj
C:\Users\FC-lab#2\Desktop\HTPEM-FC\HTPEM setup.lvproj
C:\Users\FC-lab#2\Desktop\HTPEM-FC - backup\HTPEM setup.
HTPEM - Test Bed Project.lvproj
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
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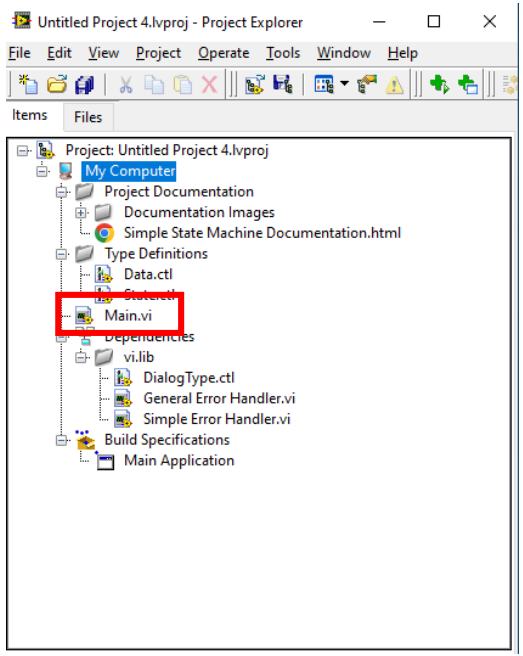
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DialogType.ctl
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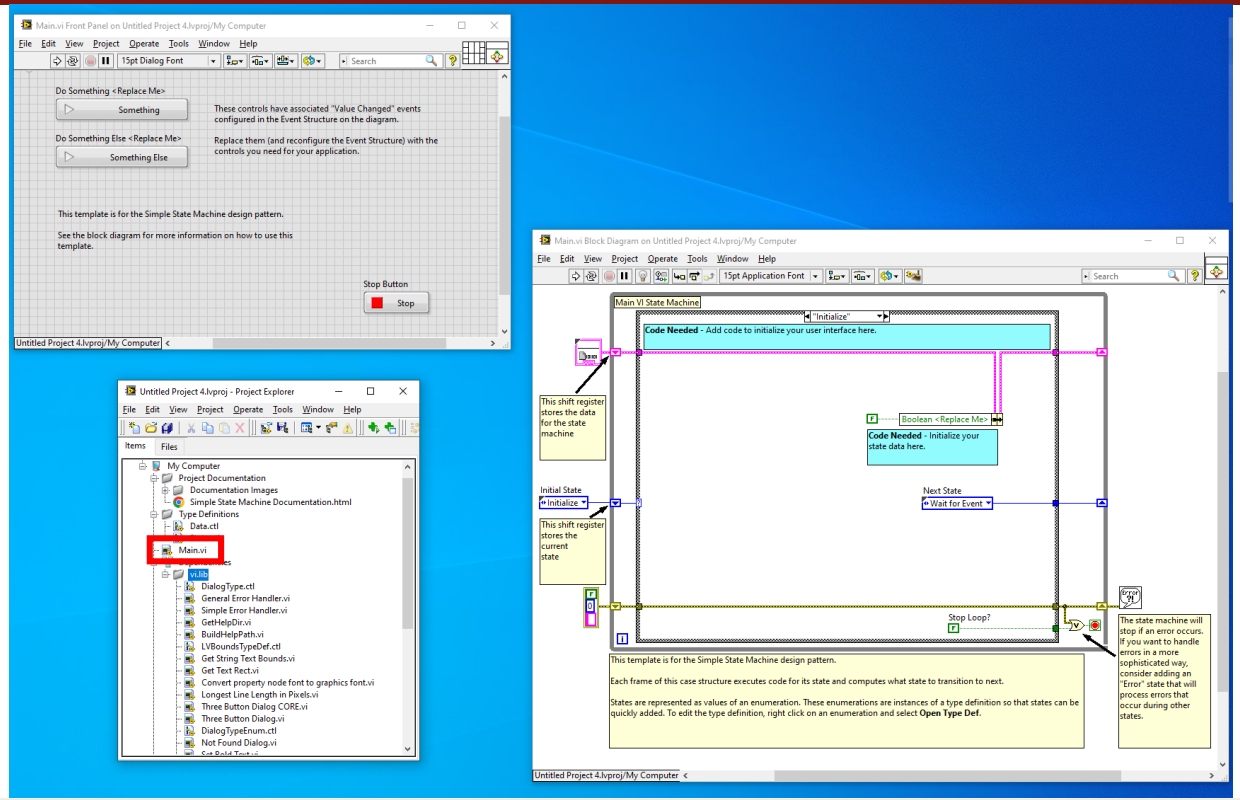
Simple Error Handler.vi
Build Specifications
Main Application

LABVIEW


Main.vi Front Panel on Untitled Project 4.lvproj/My Computer
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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
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Main.vi Block Diagram on Untitled Project 4.lvproj/My Computer
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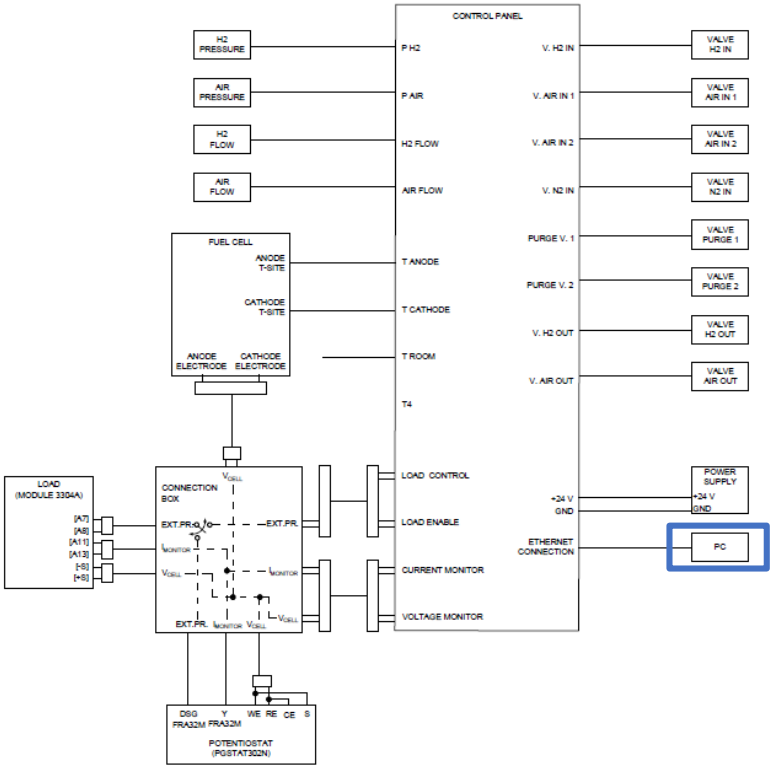
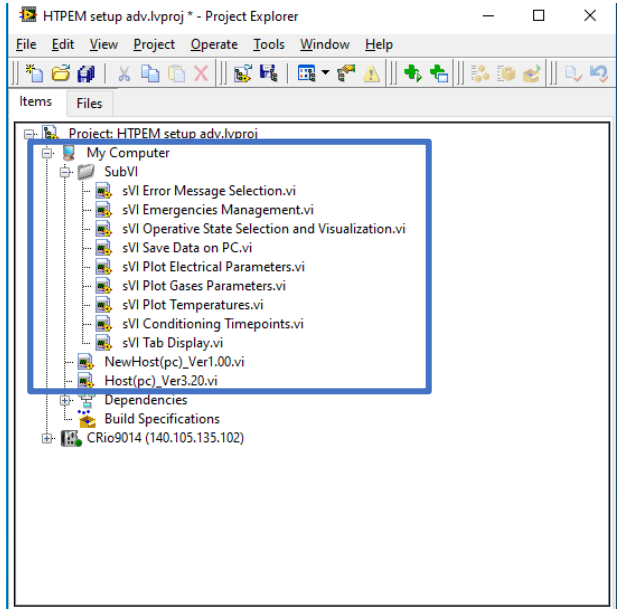
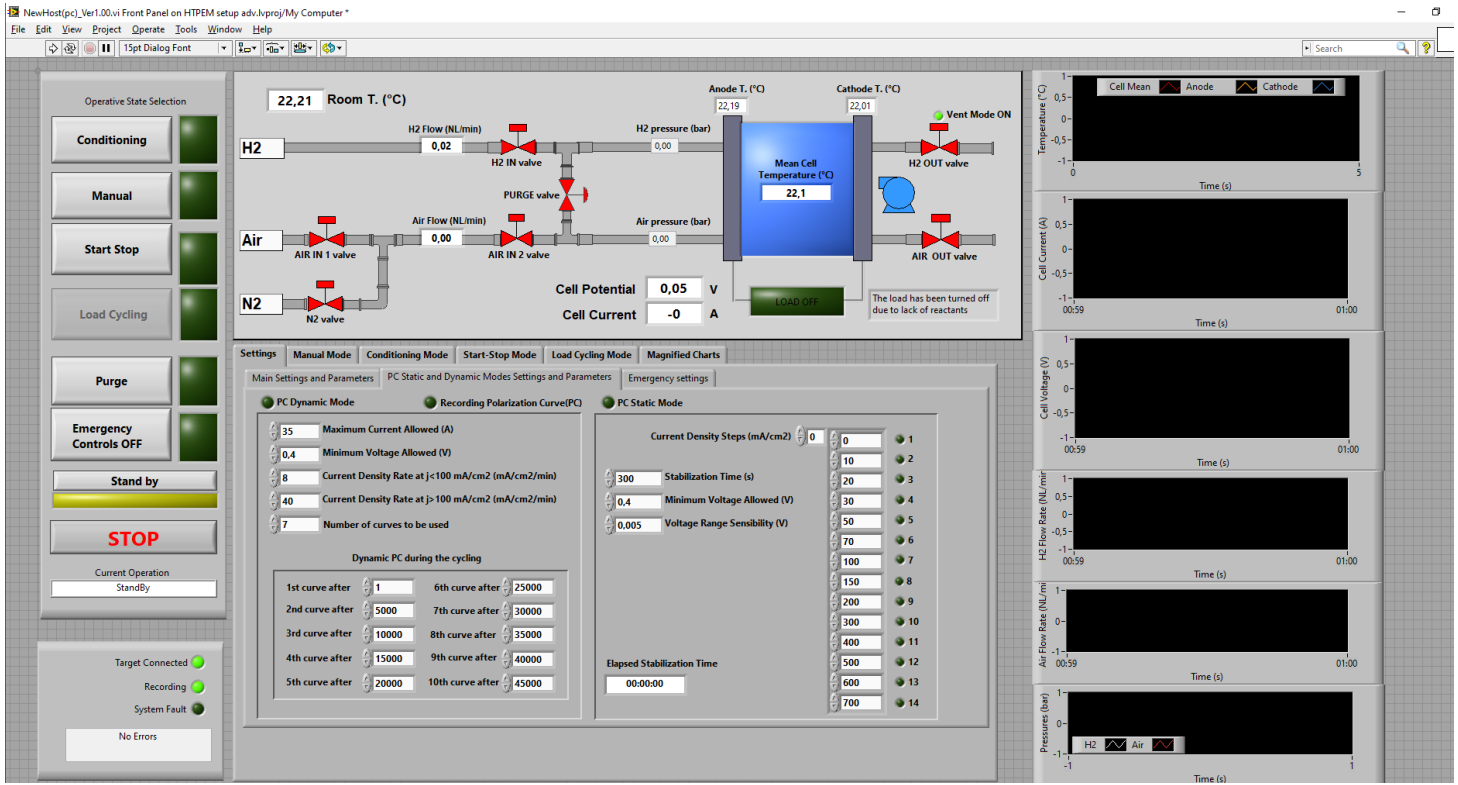
15pt Application Font
Search
Main VI State Machine
"Initialize"
Code Needed - Add code to initialize your user interface here.
This shift register stores the data for the state machine
Boolean <Replace Me>
Code Needed - Initialize your state data here.
Initial State
Initialize
Next State
Wait for Event
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

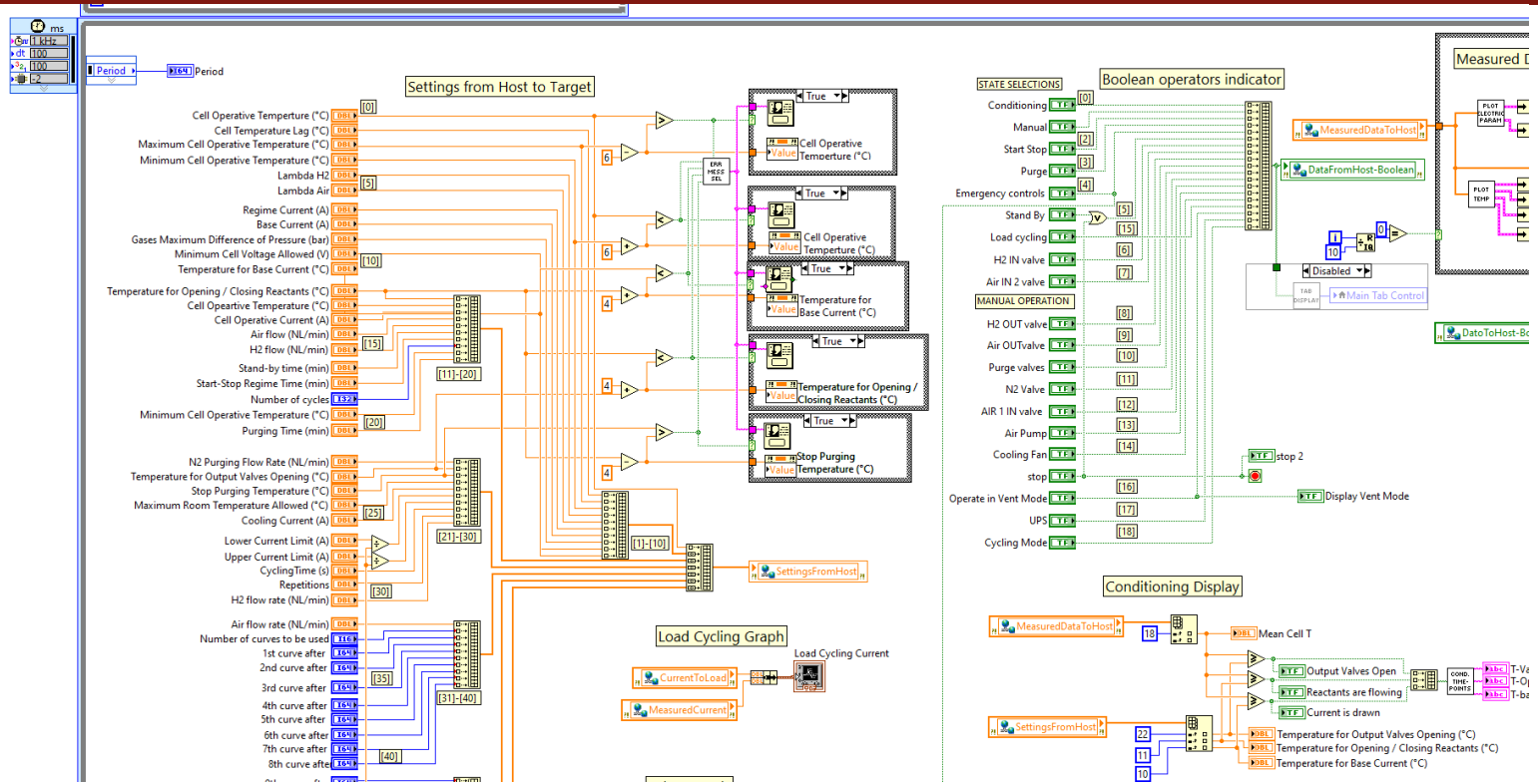




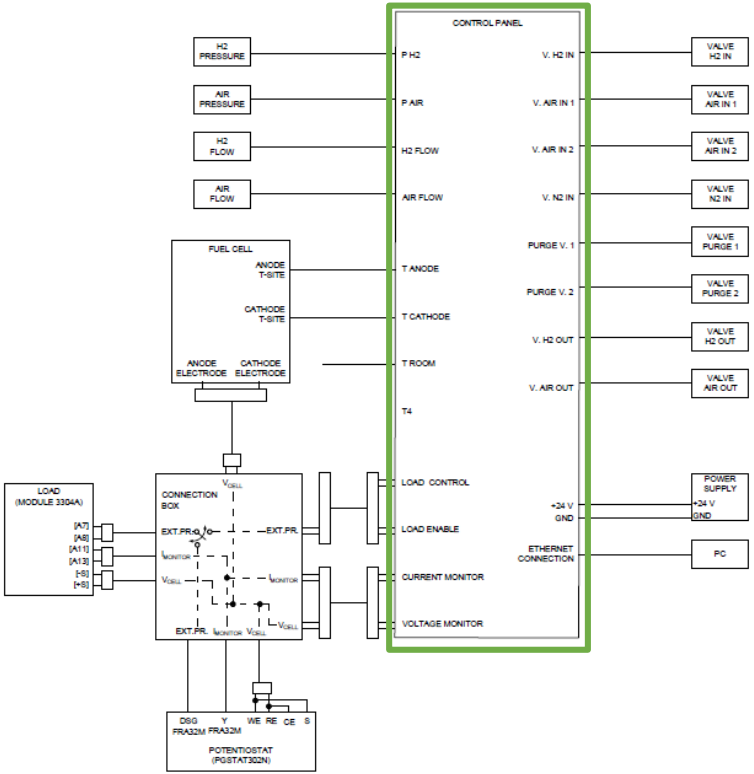
LABVIEW PROJECTS – A REAL EXAMPLE (1)



LABVIEW PROJECTS – A REAL EXAMPLE (1)



LABVIEW PROJECT – AN EXAMPLE



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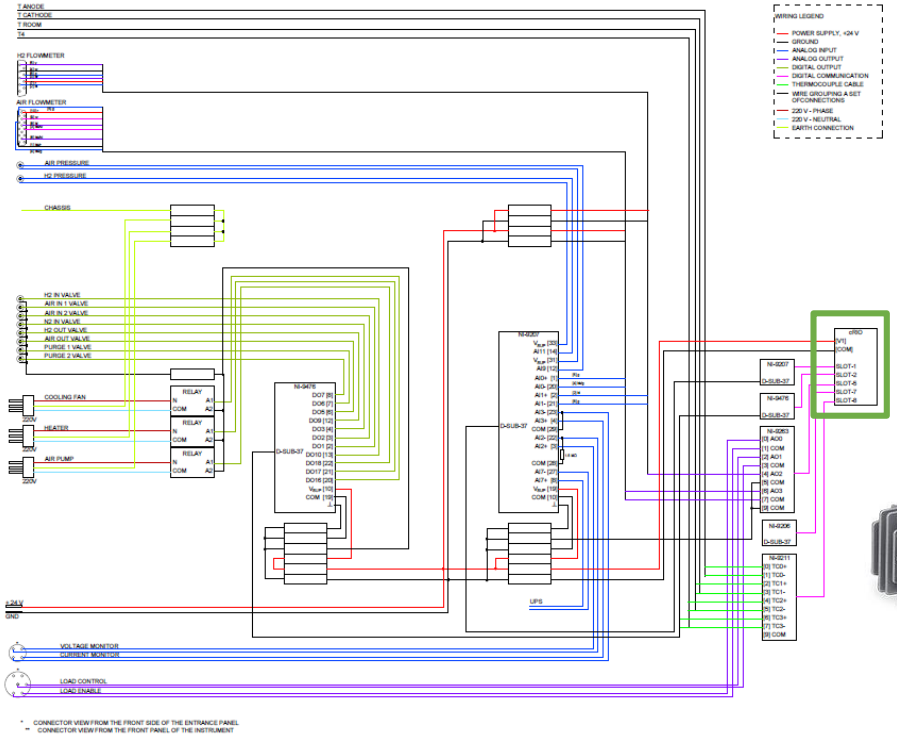

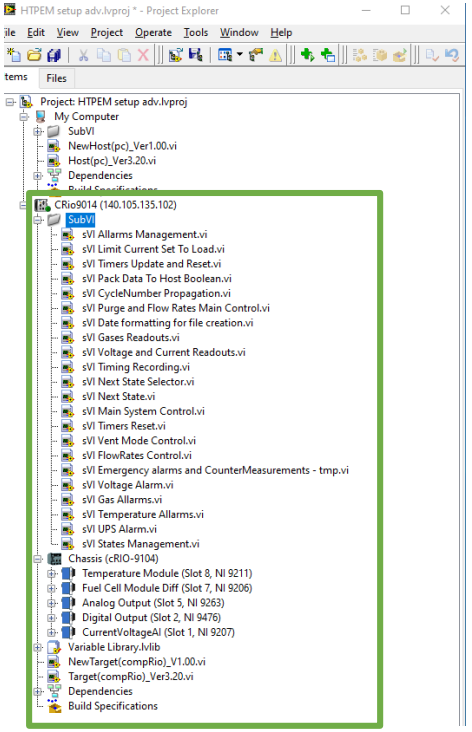

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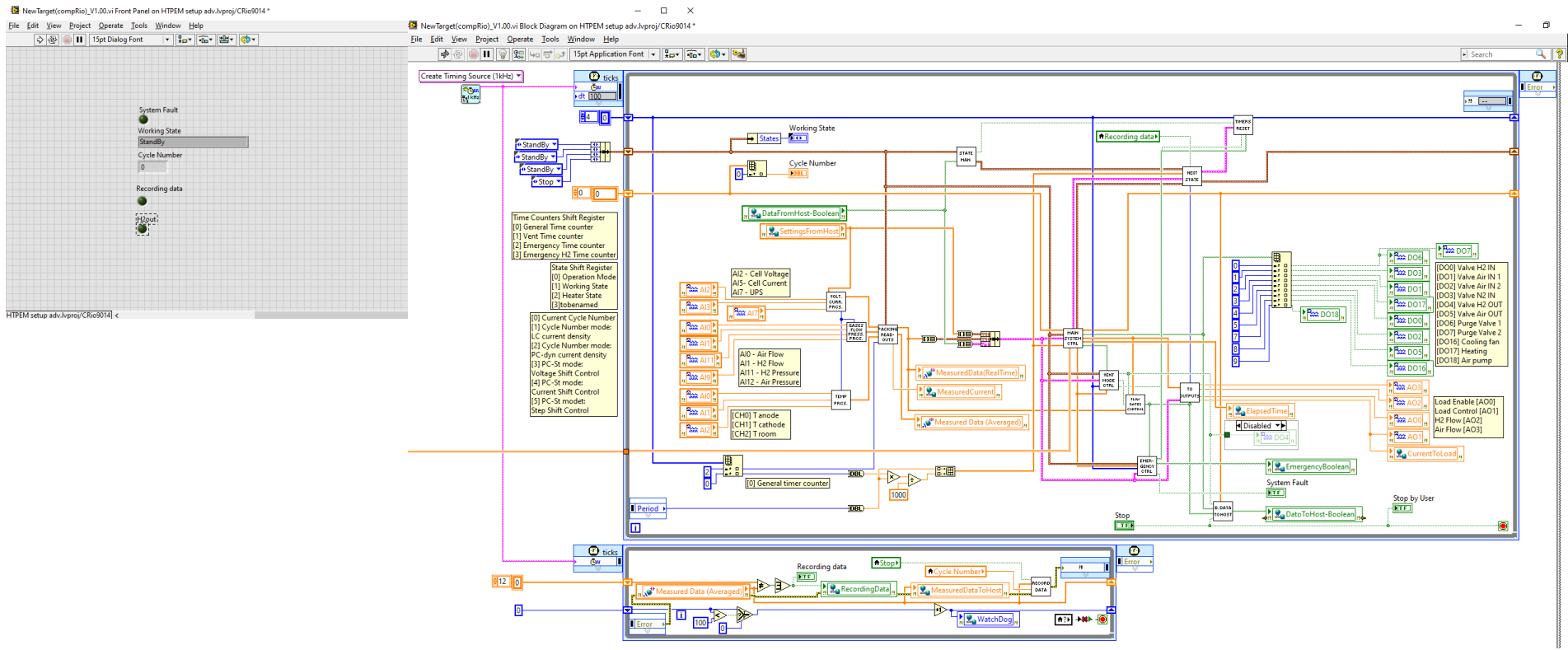
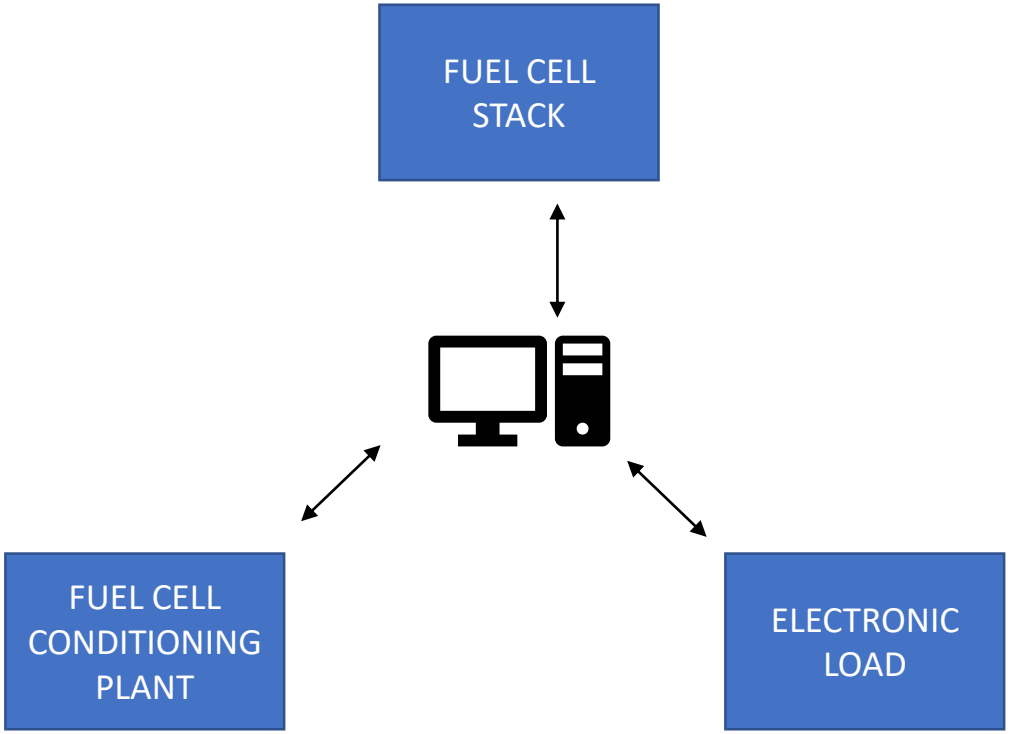


LABVIEW PROJECTS – ANOTHER EXAMPLE



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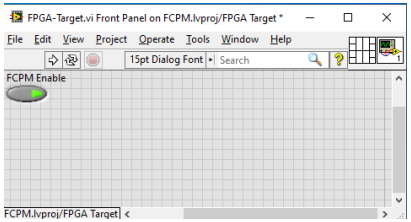

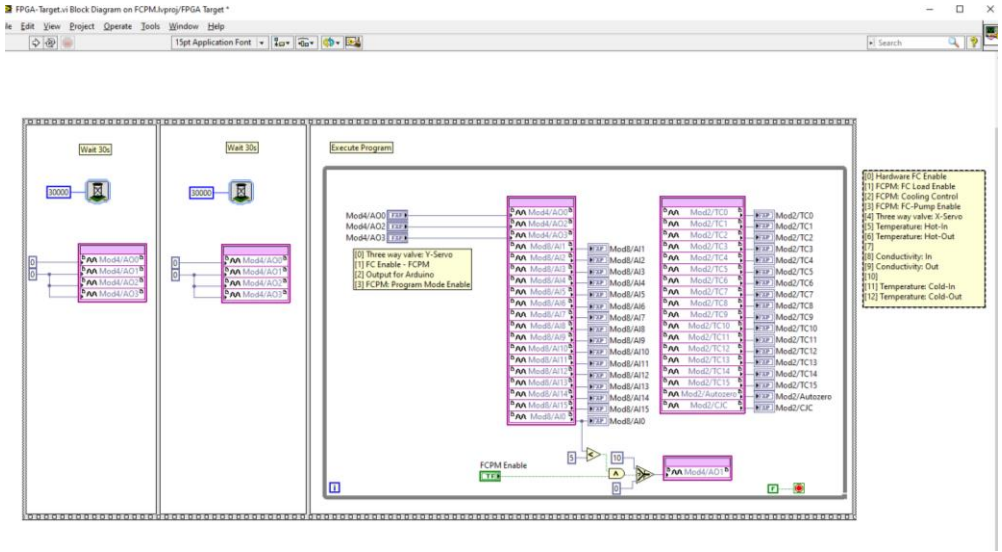

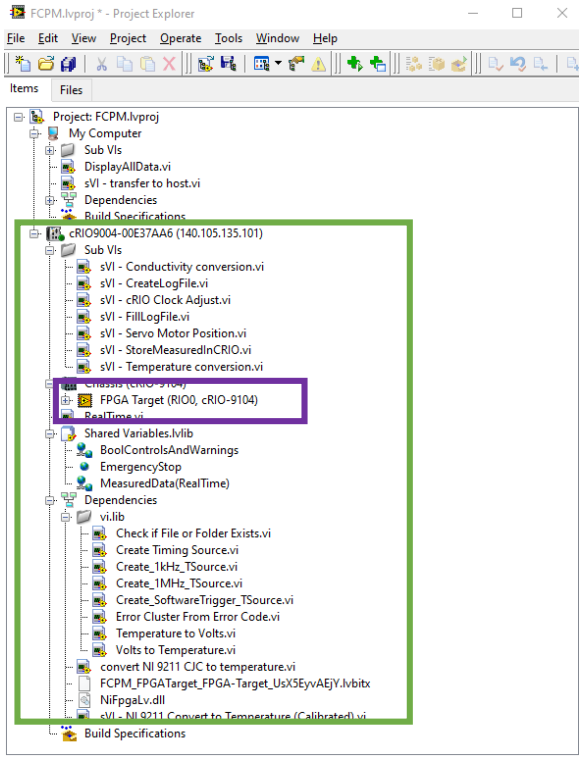

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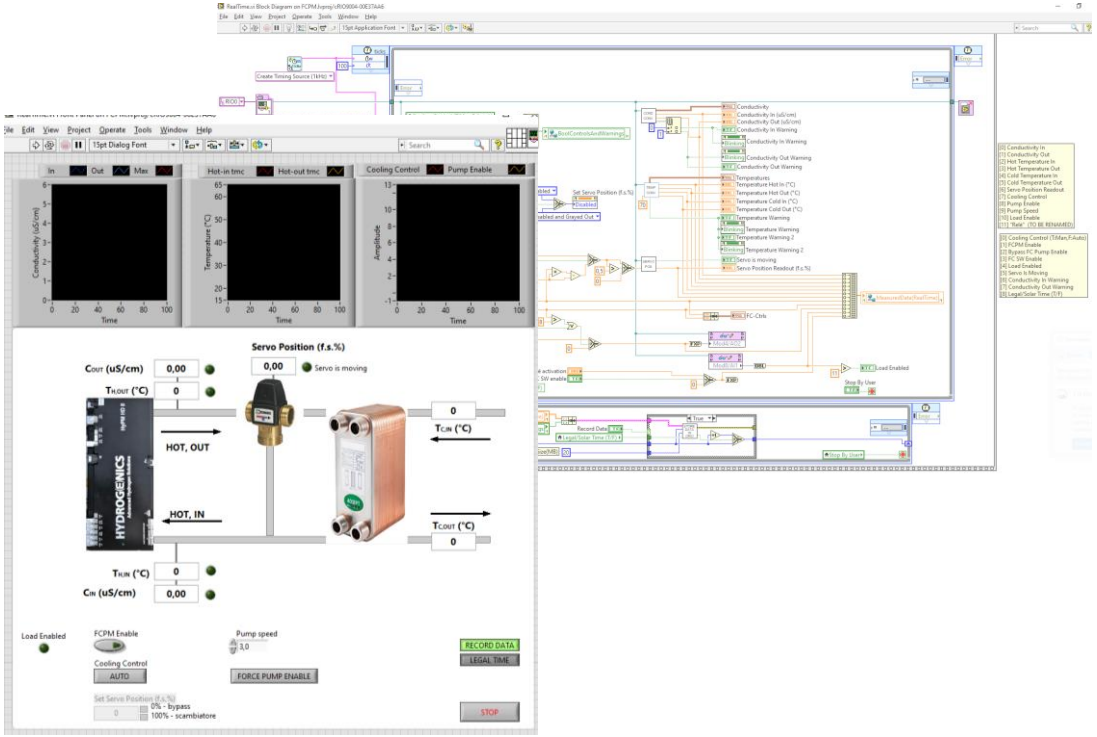

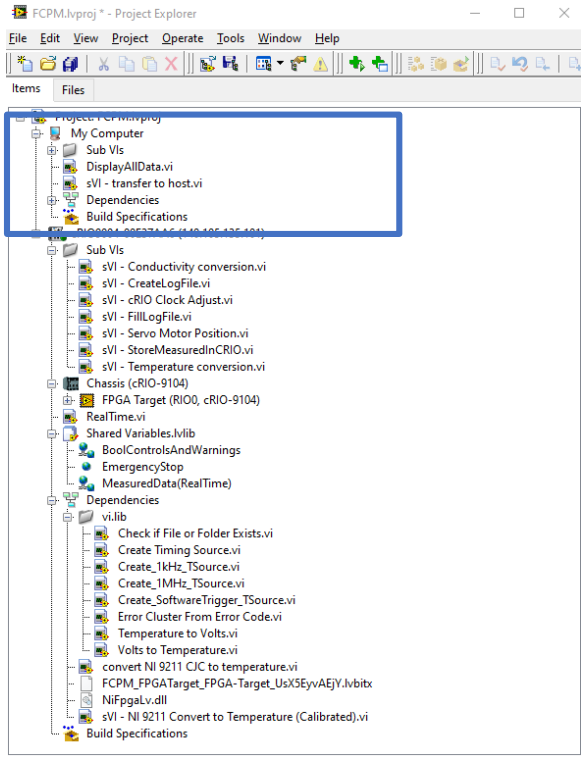

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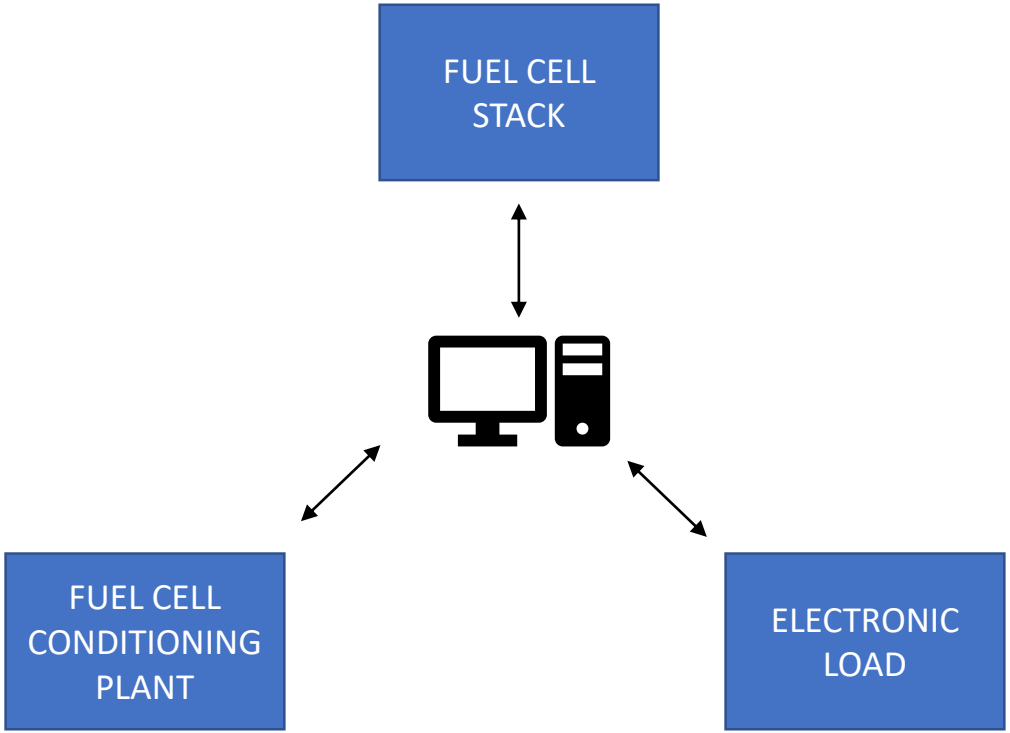

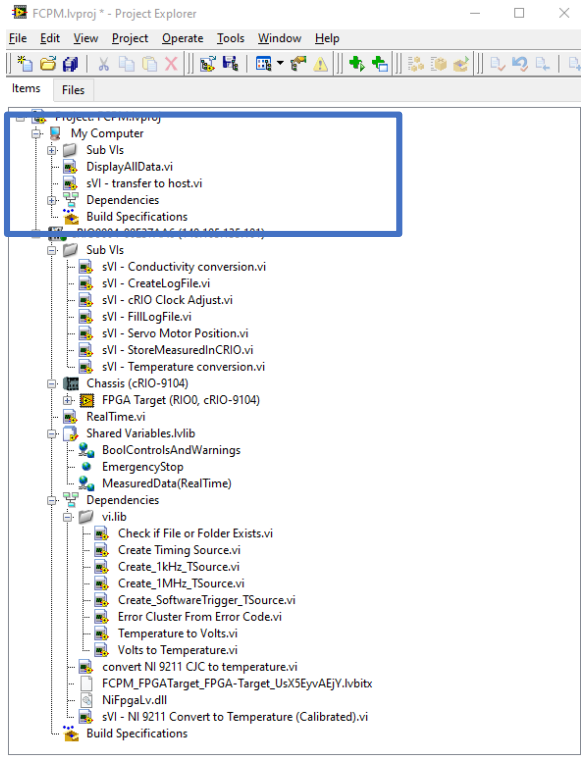

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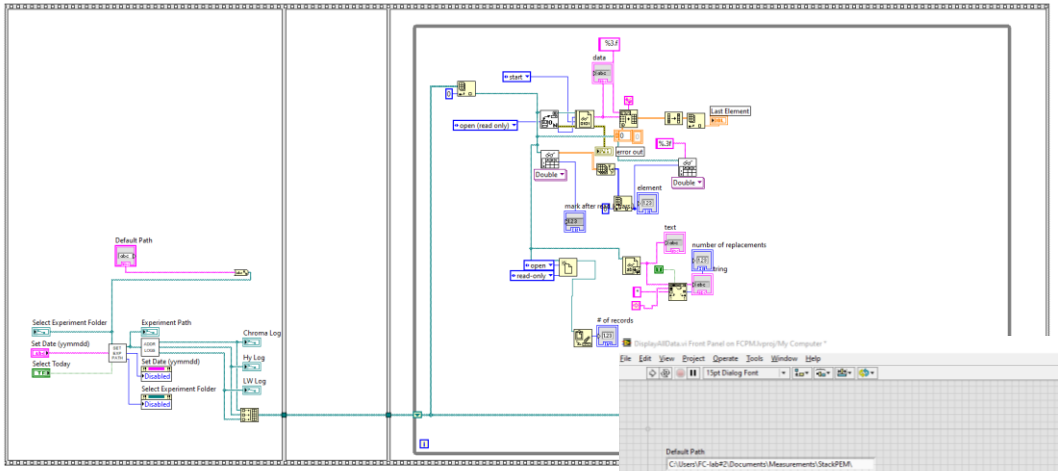
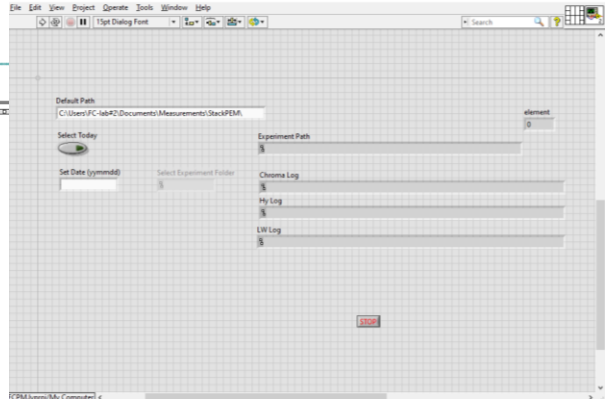
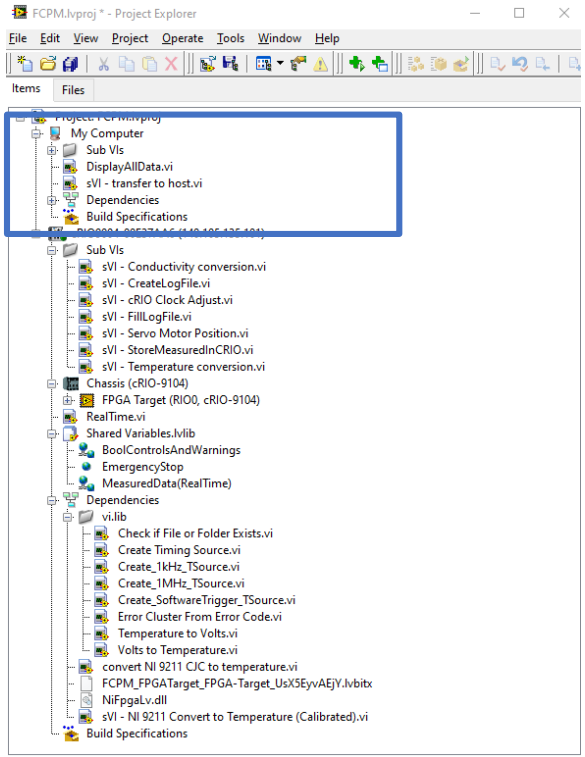
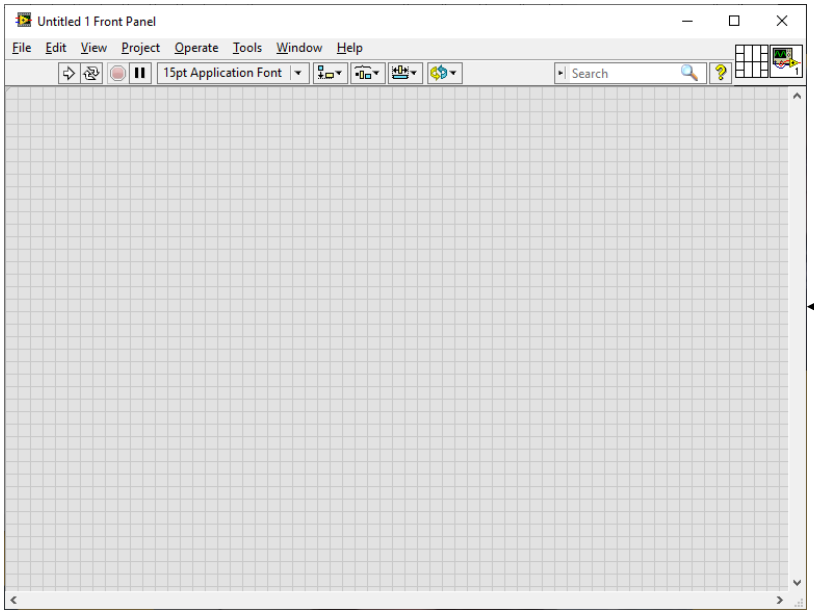


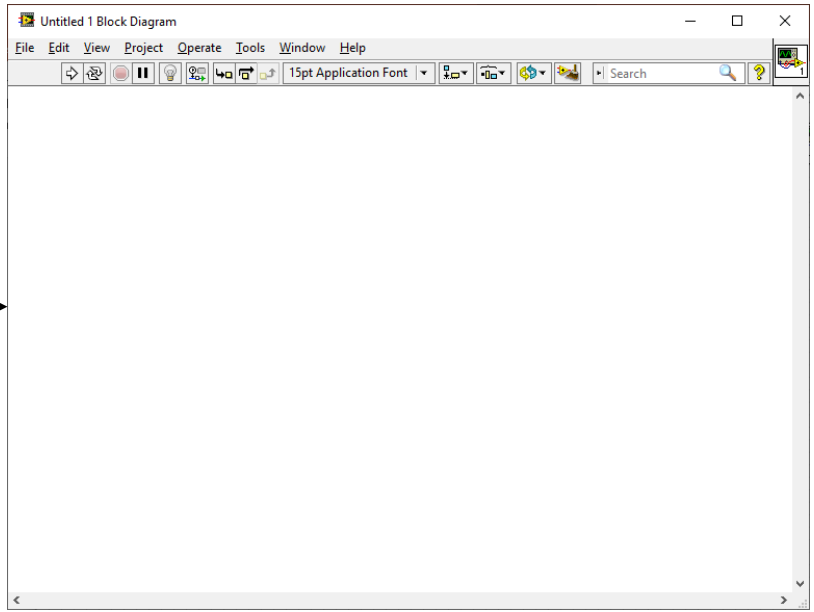




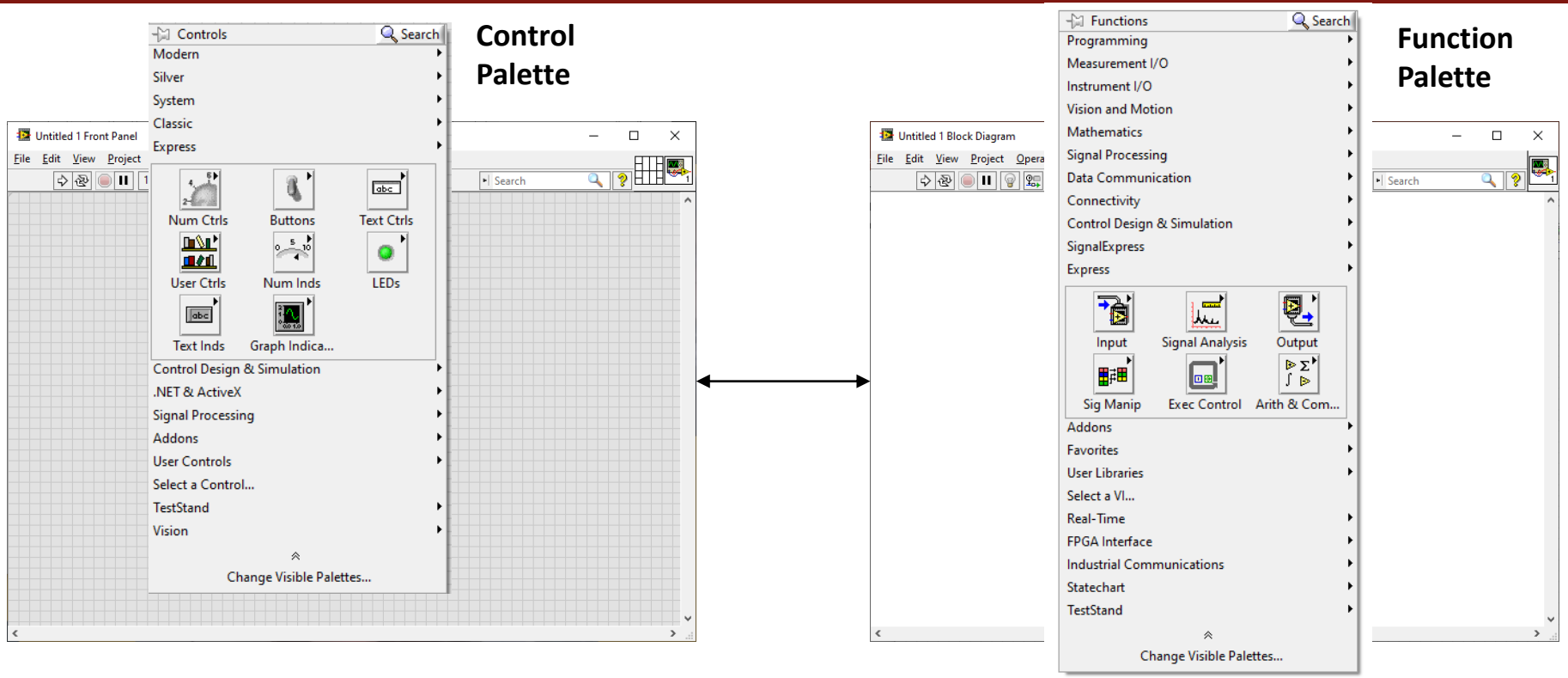
LABVIEW: INTO THE SOFTWARE

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

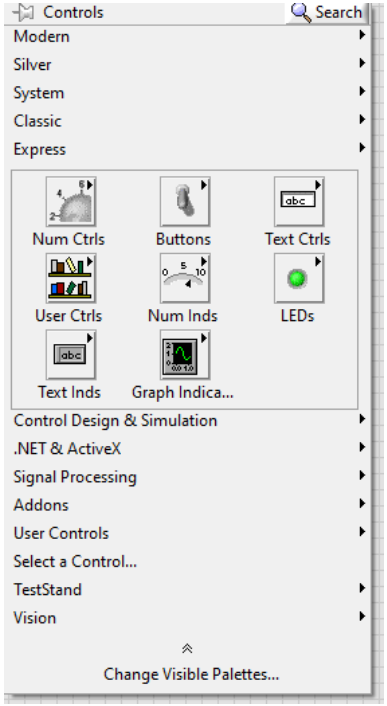




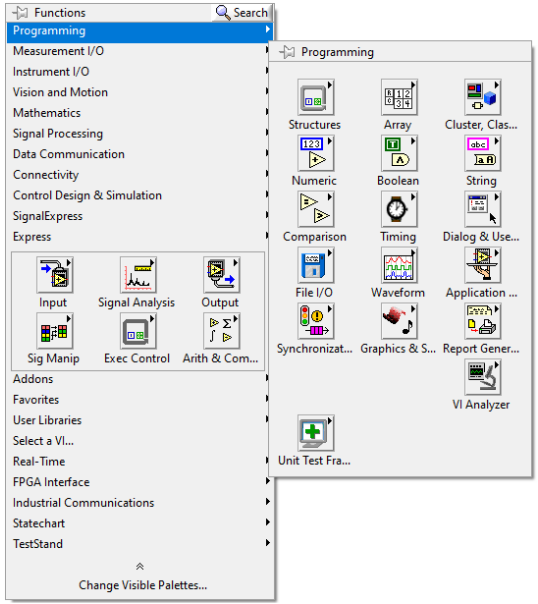
LABVIEW: INTO THE SOFTWARE

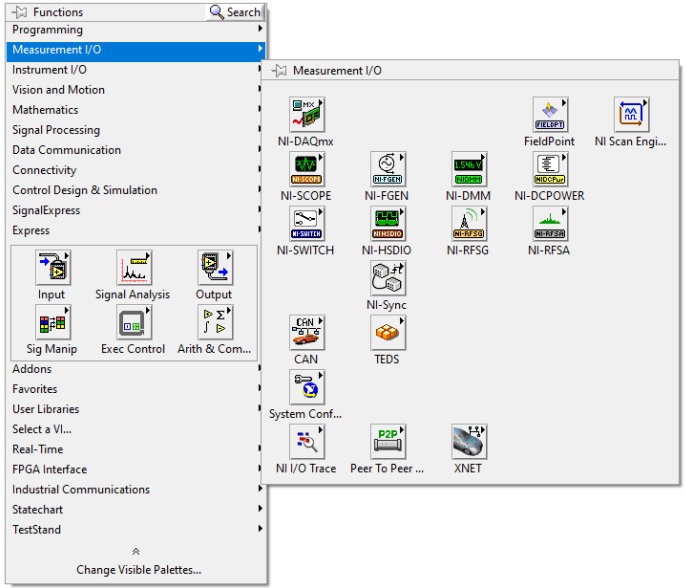


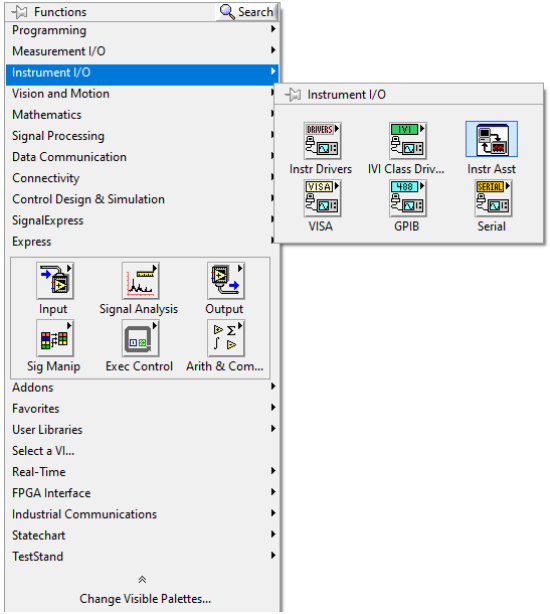
THE FRONT PANEL - THE CONTROL PALETTE



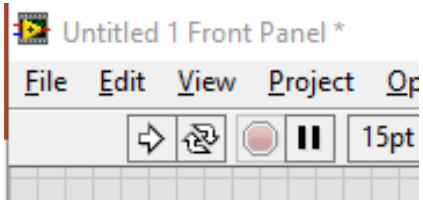
THE BLOCK DIAGRAM - THE FUNCTION PALETTE

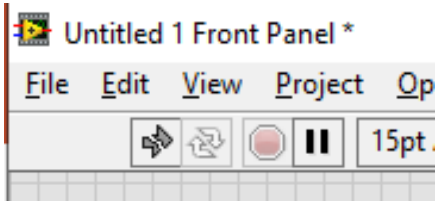


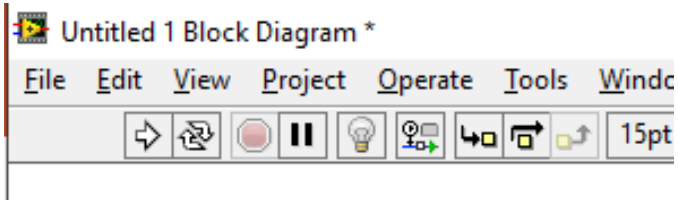


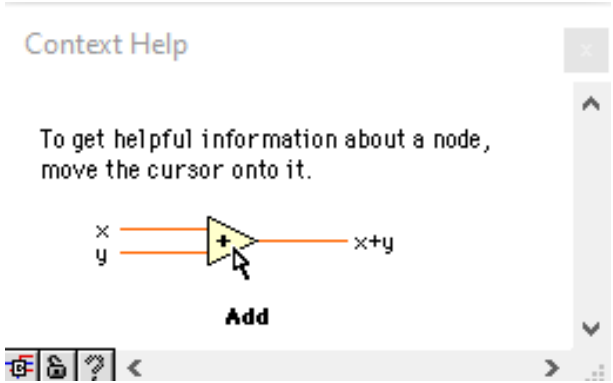


MAIN CONTROLS AND AUXILIARY TOOLS

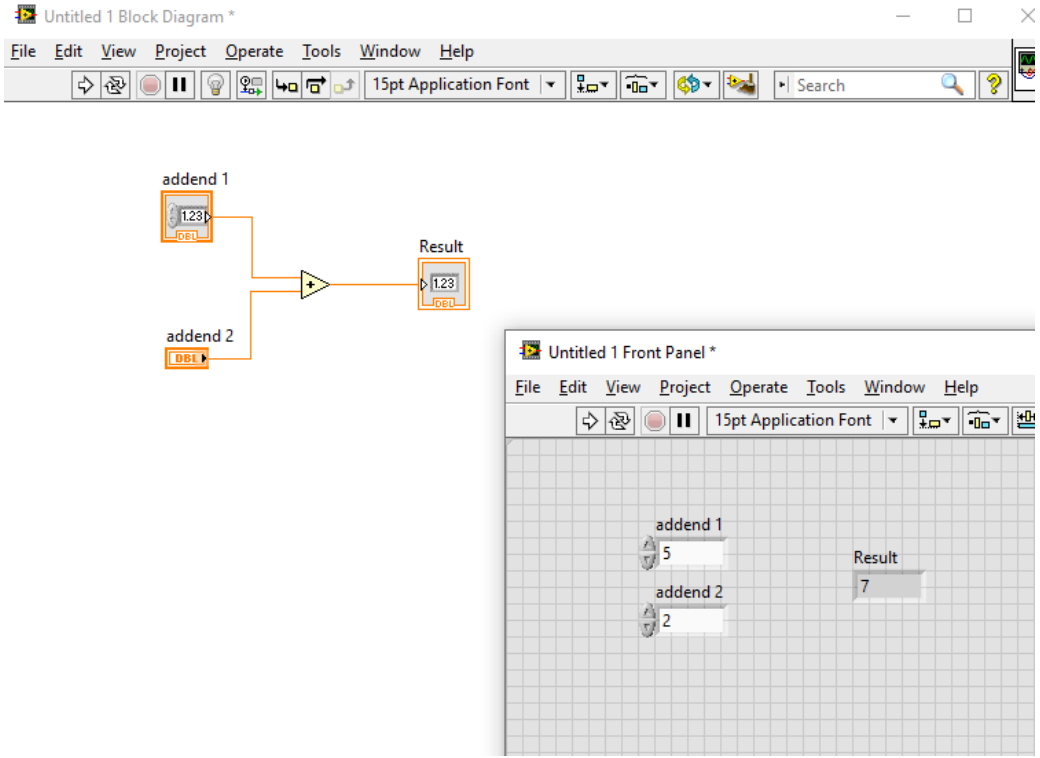




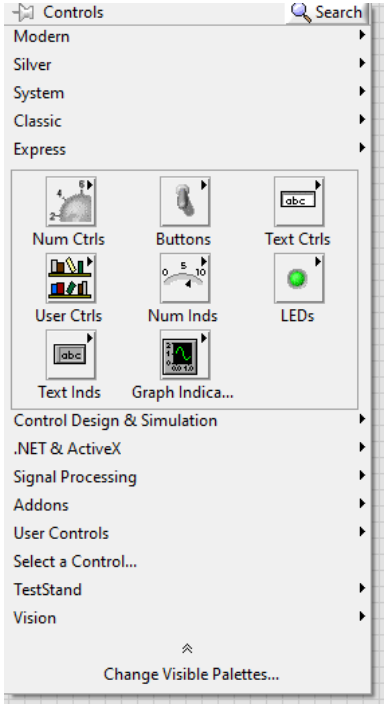




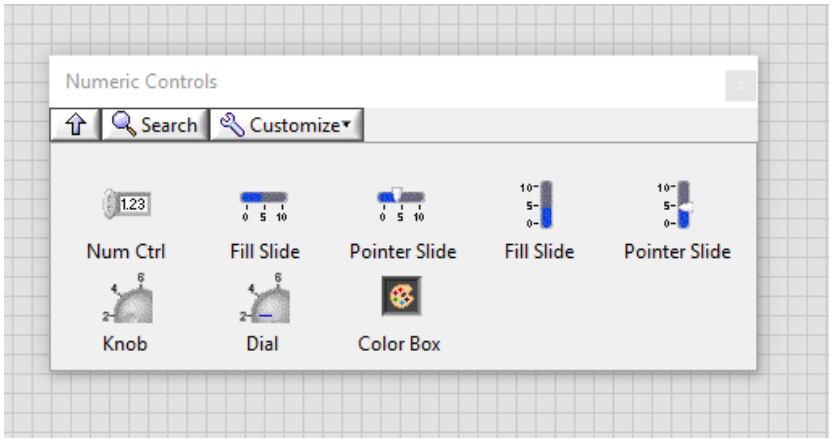
ELEMENT DUALITY

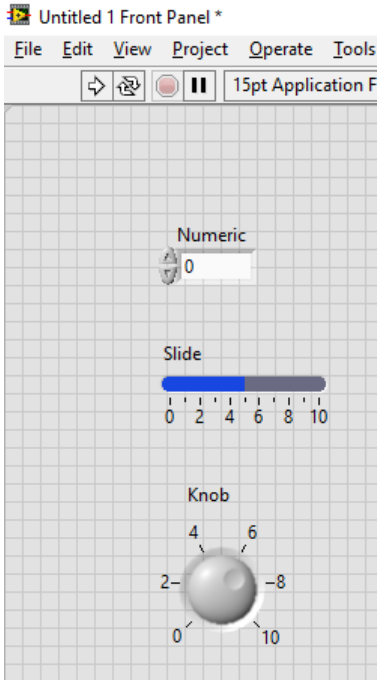


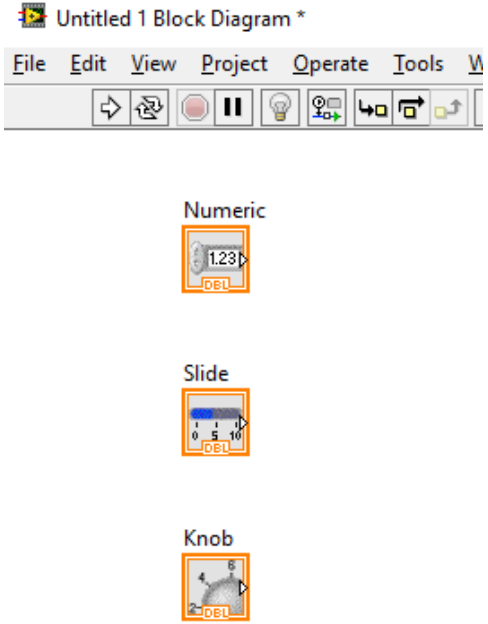
MAIN ELEMENTS FROM THE CONTROL PALETTE



NUMERIC CONTROLS







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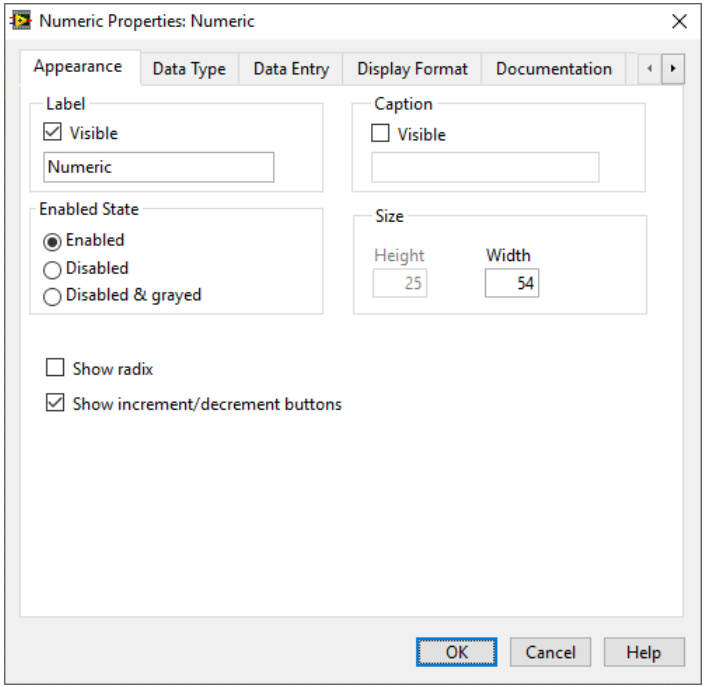
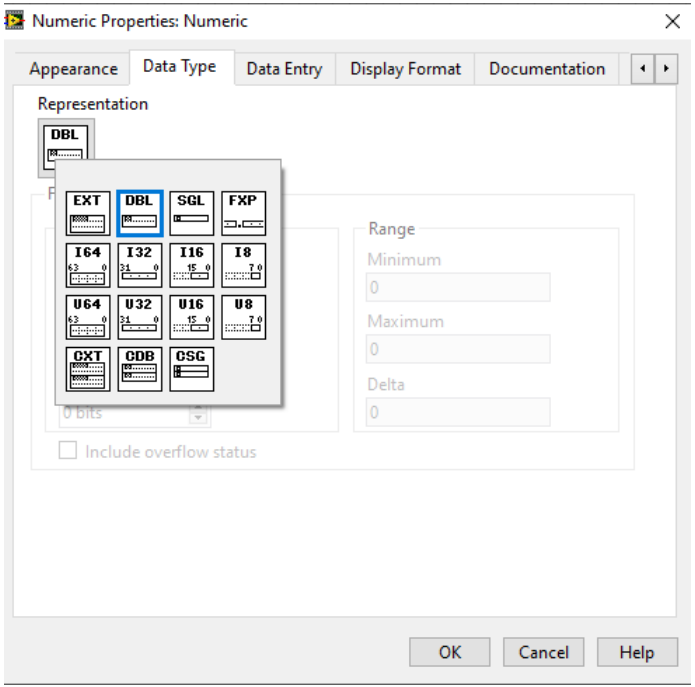
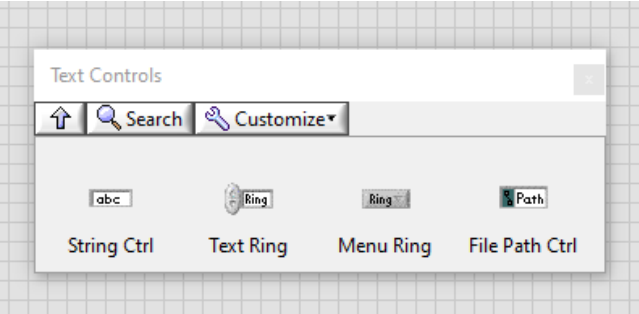
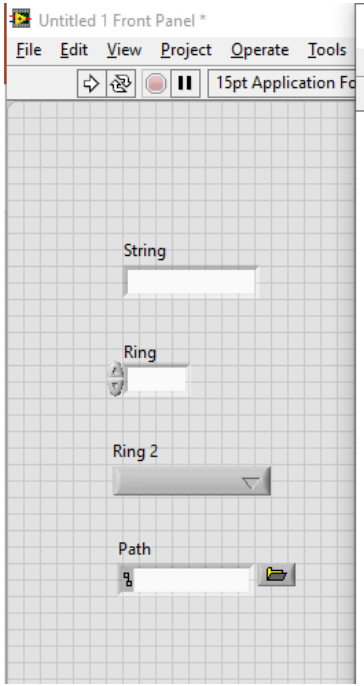
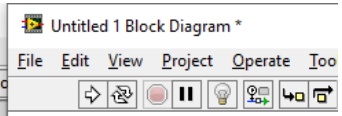


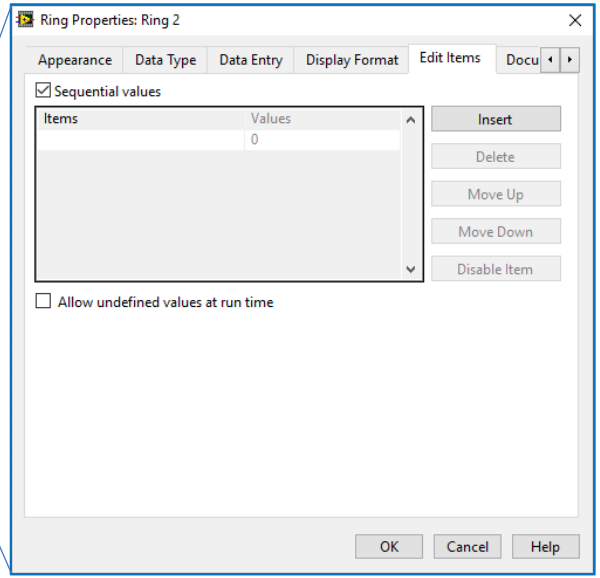


STRING CONTROLS

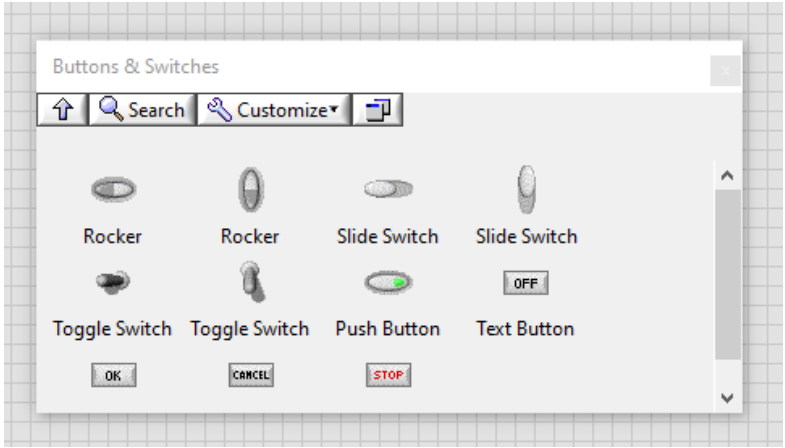


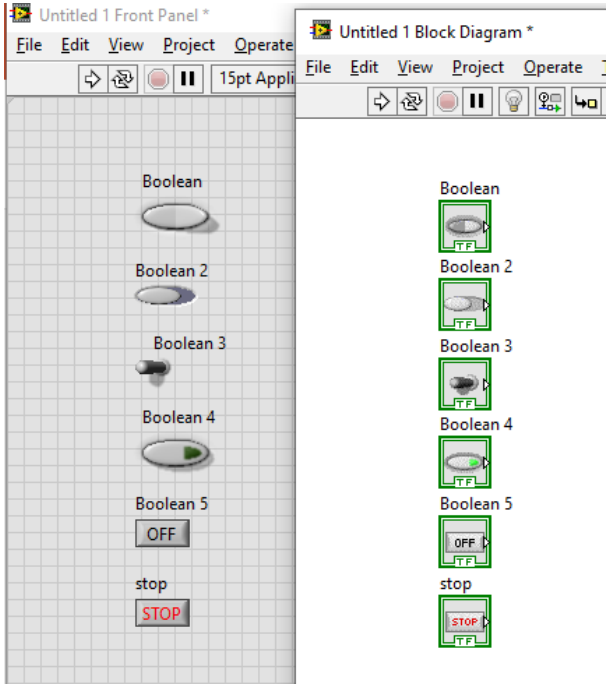






BOOLEAN CONTROLS





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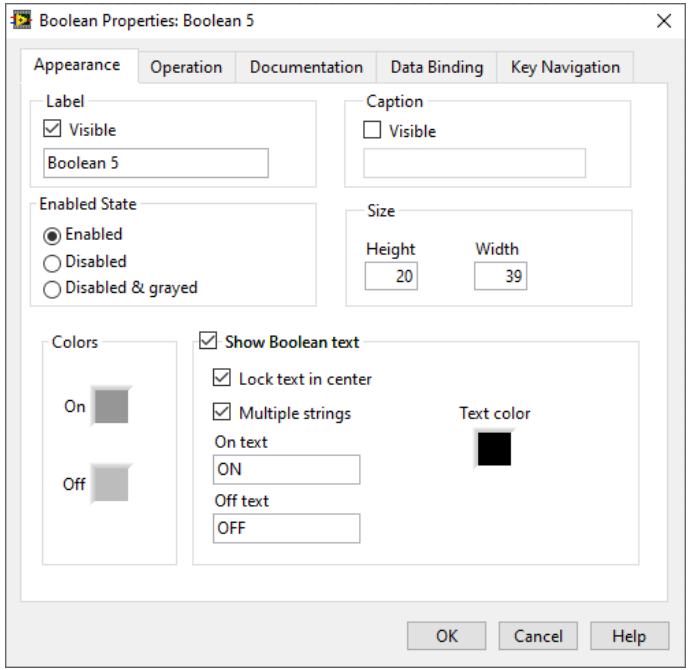

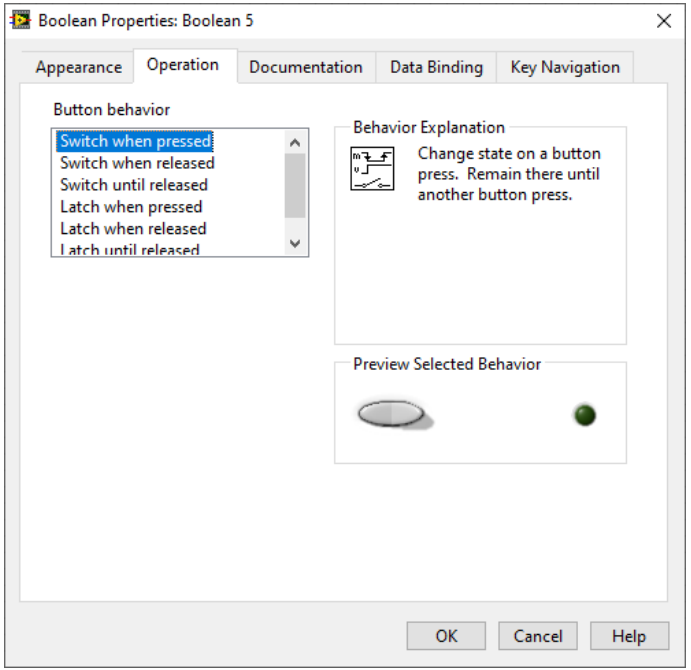

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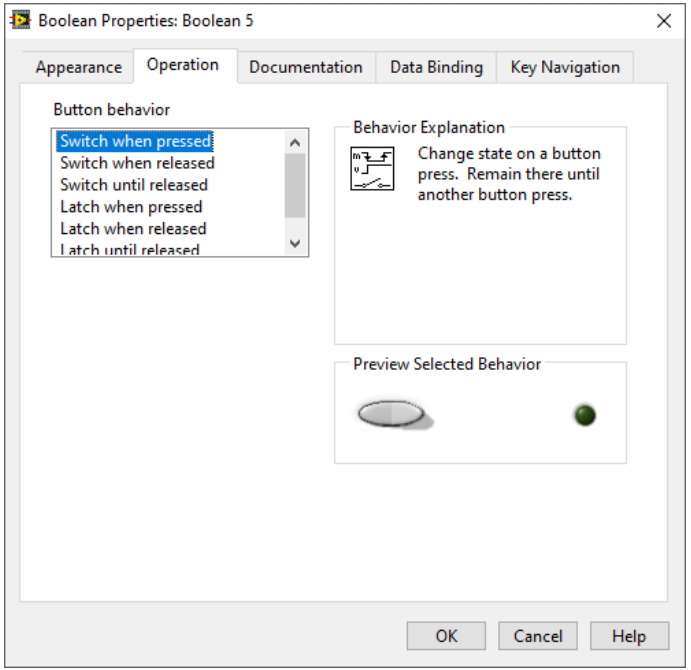

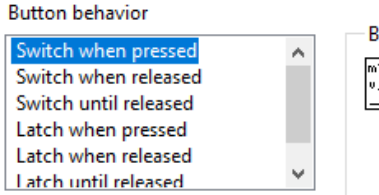

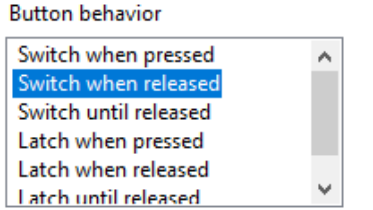

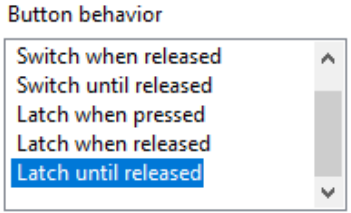

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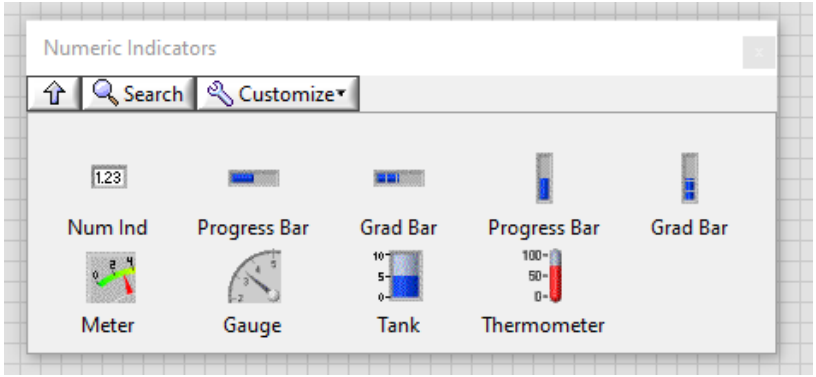
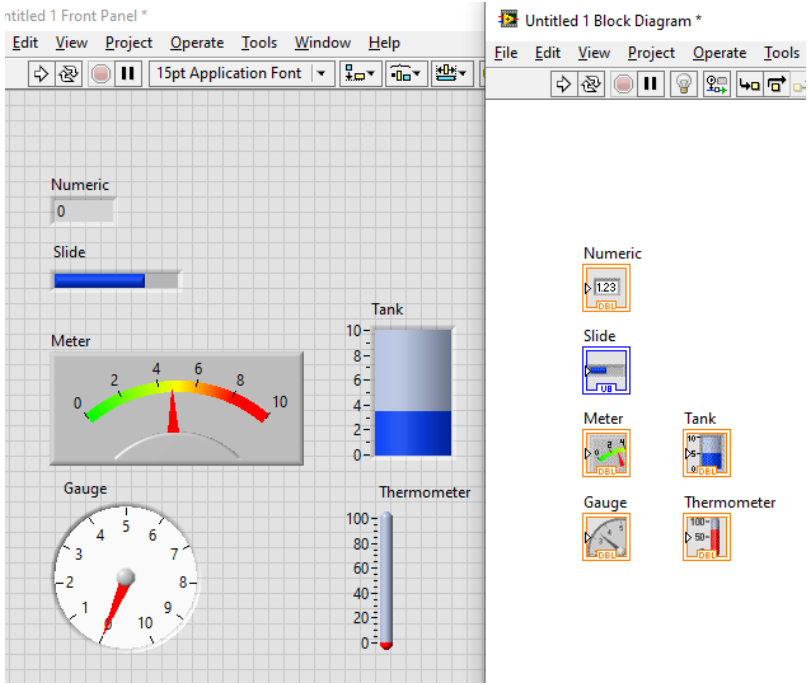
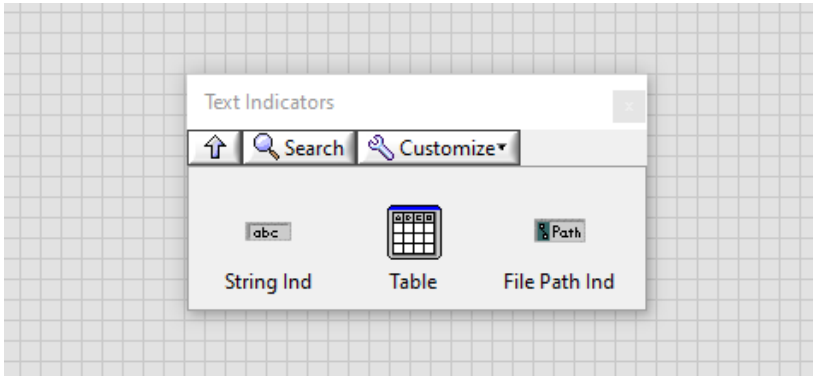
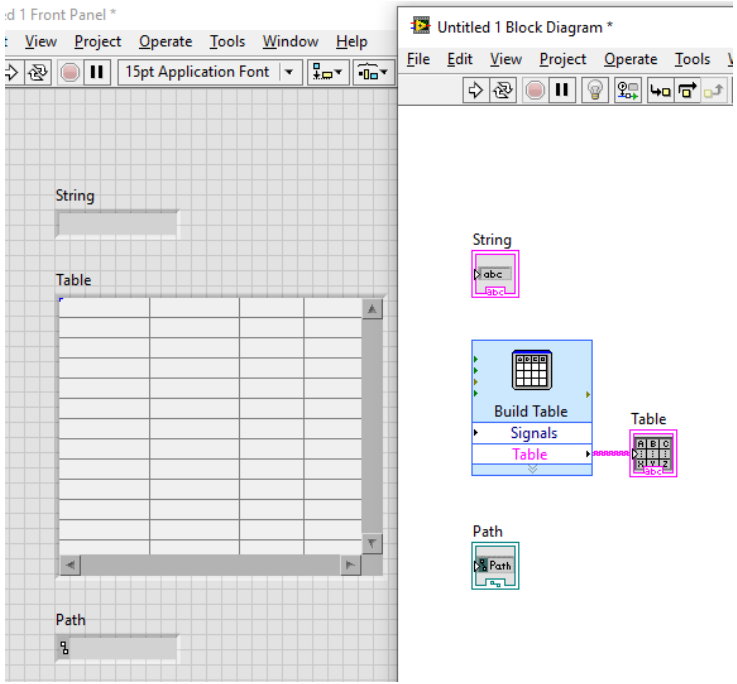




STRING INDICATORS





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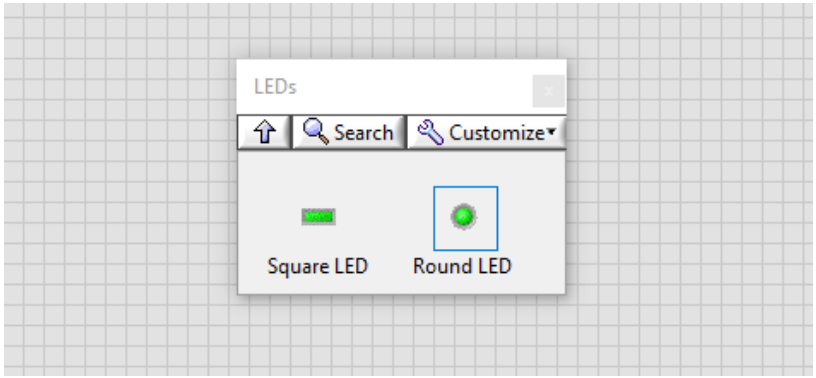

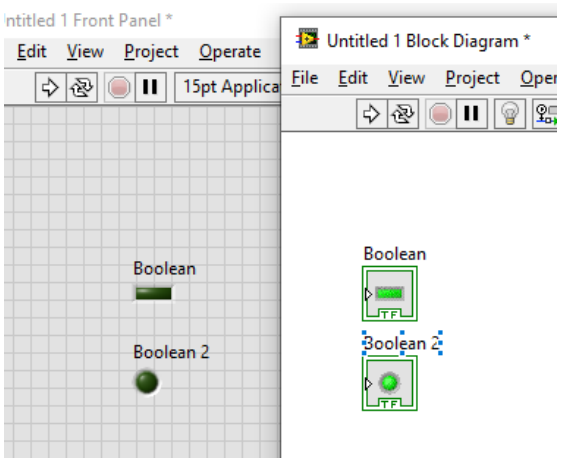

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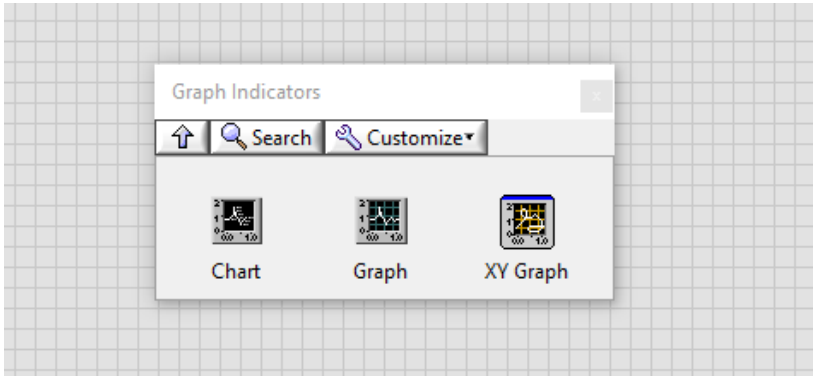
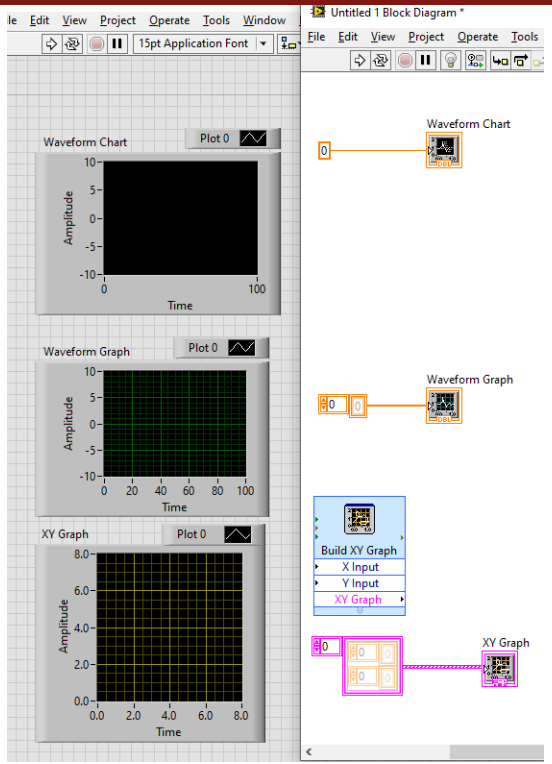
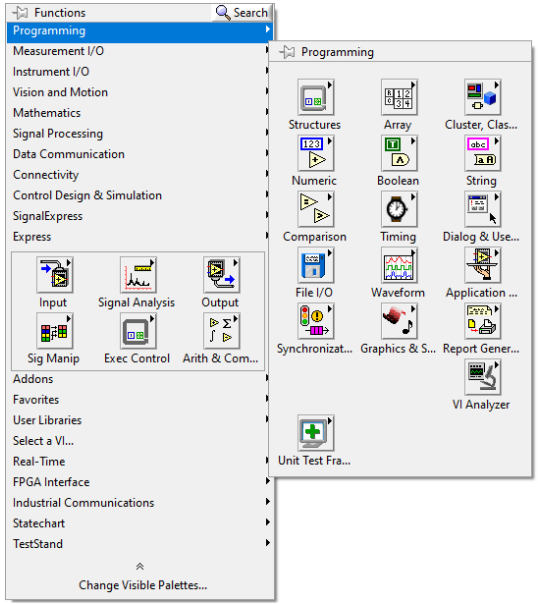
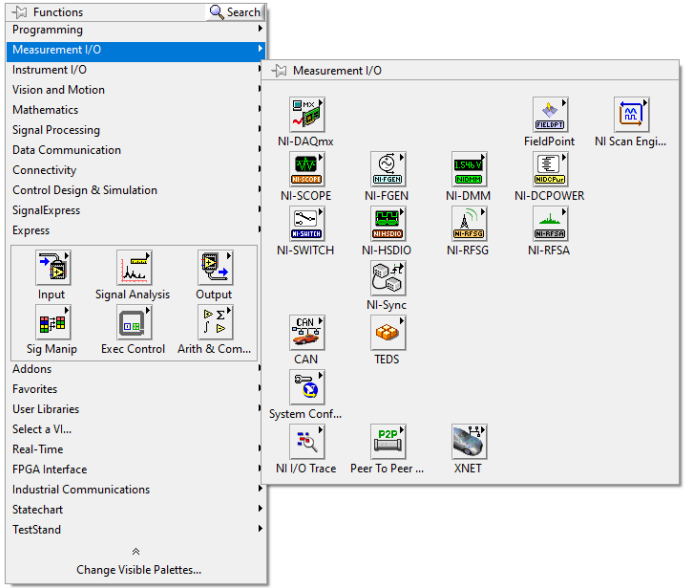
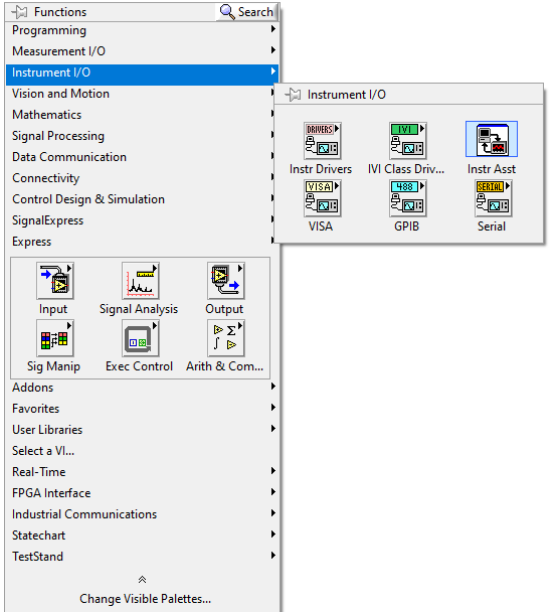




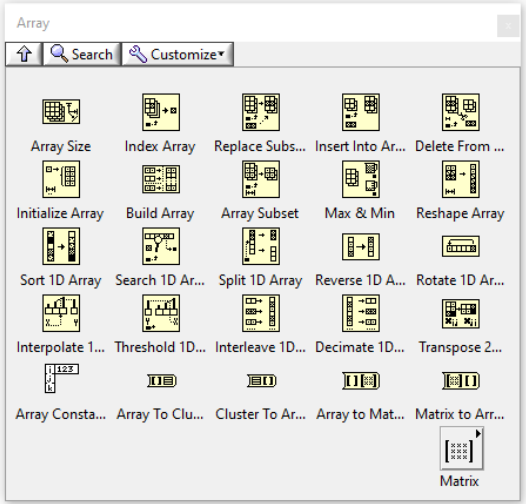
MAIN ELEMENTS FROM THE FUNCTION PALETTE







ARRAYS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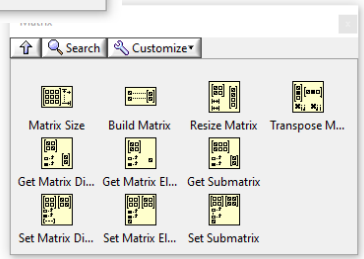
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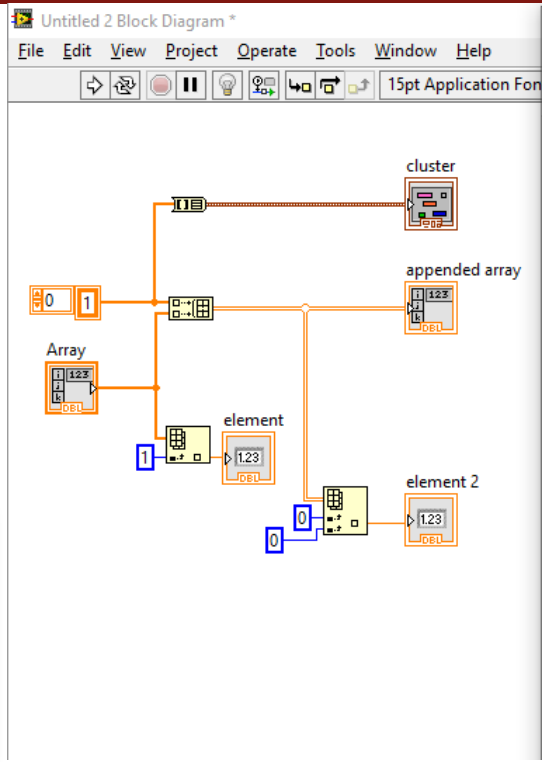
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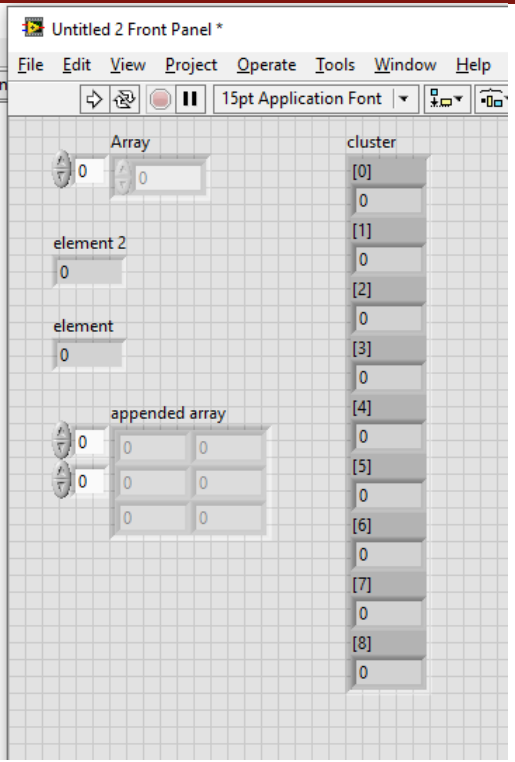
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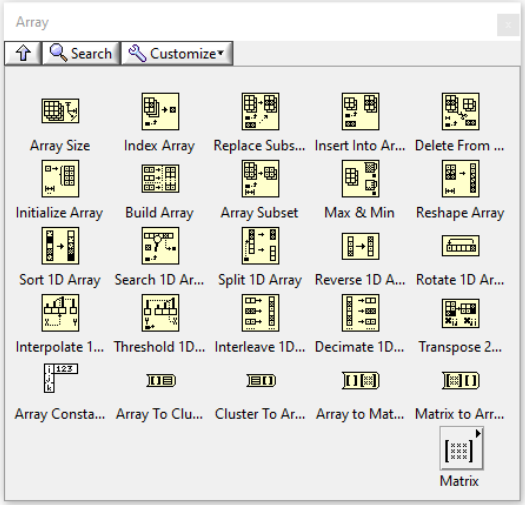
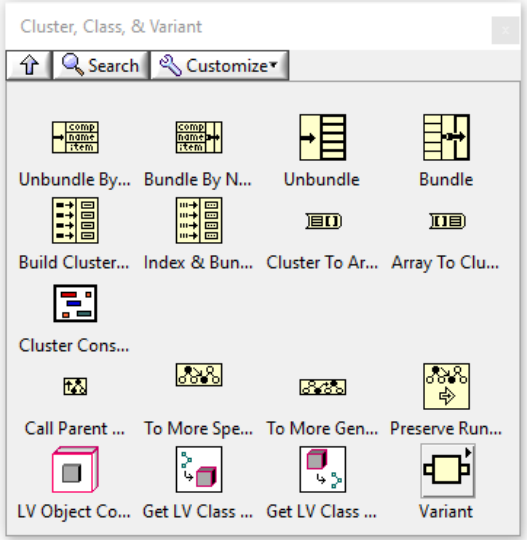
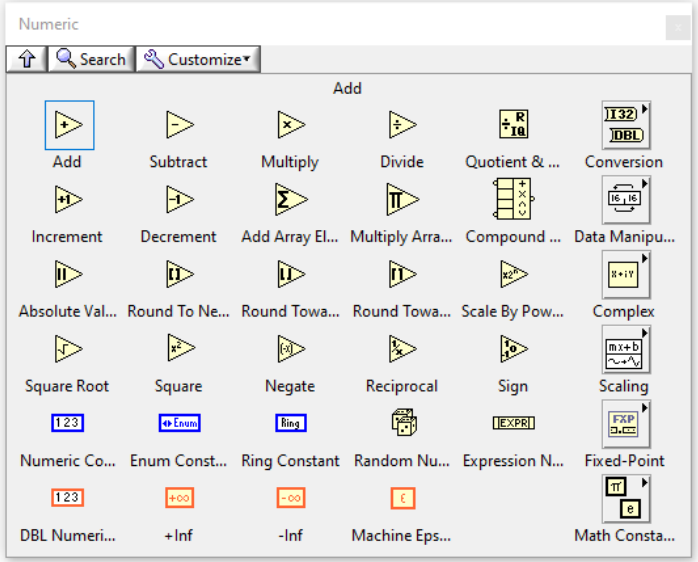
ARRAYS AND CLUSTERS





OPERATIONS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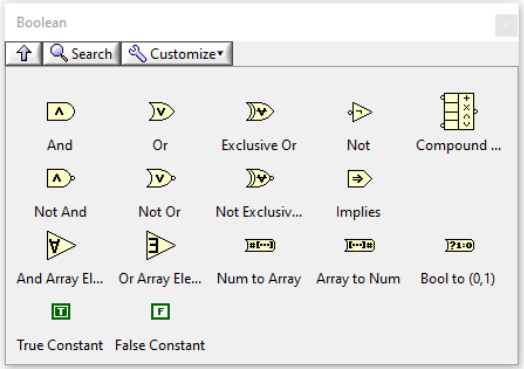
Boolean
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Exclusive Or
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Bool to (0,1)
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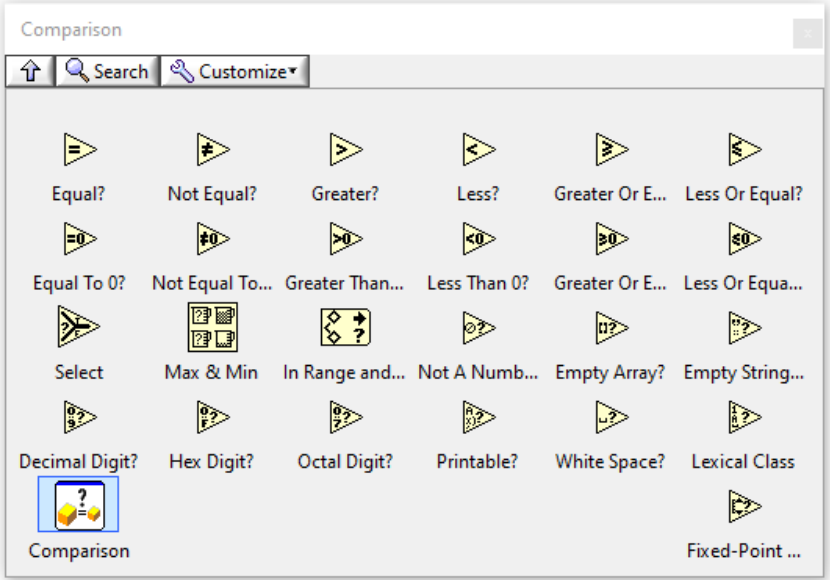
OPERATIONS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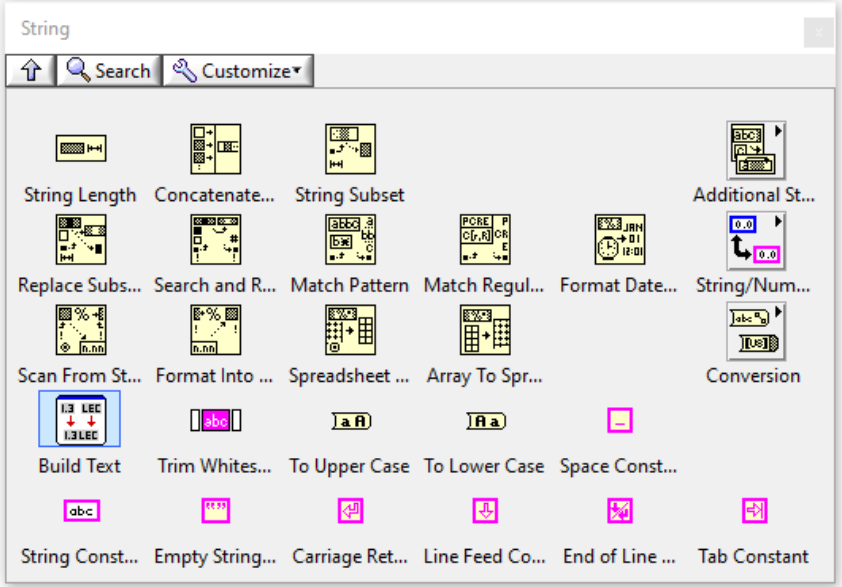
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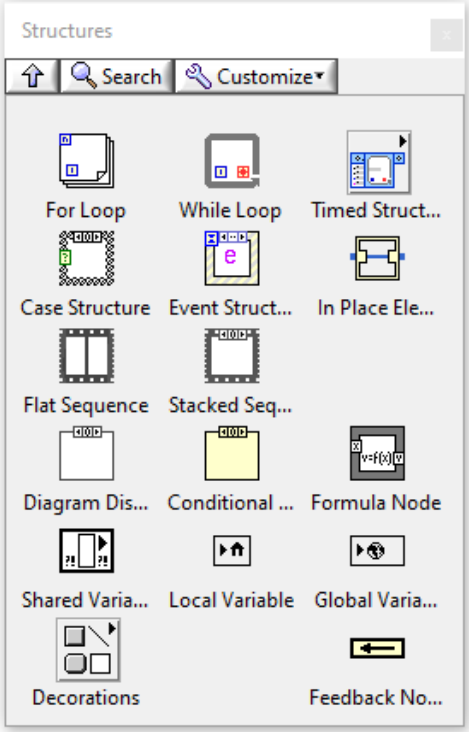
STRUCTURES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For Loop
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Case Structure
Event Struct...
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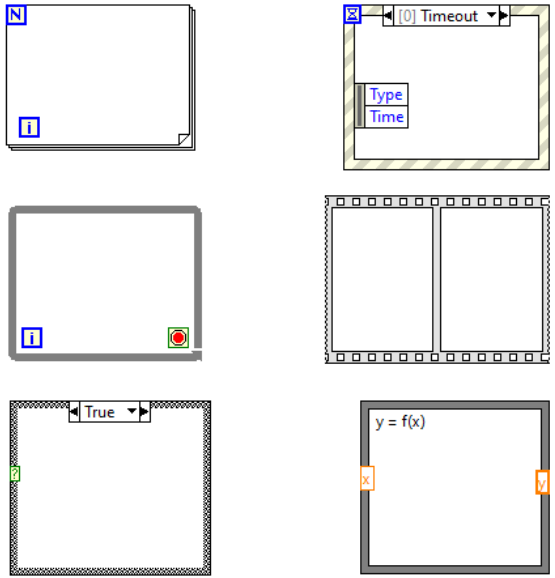
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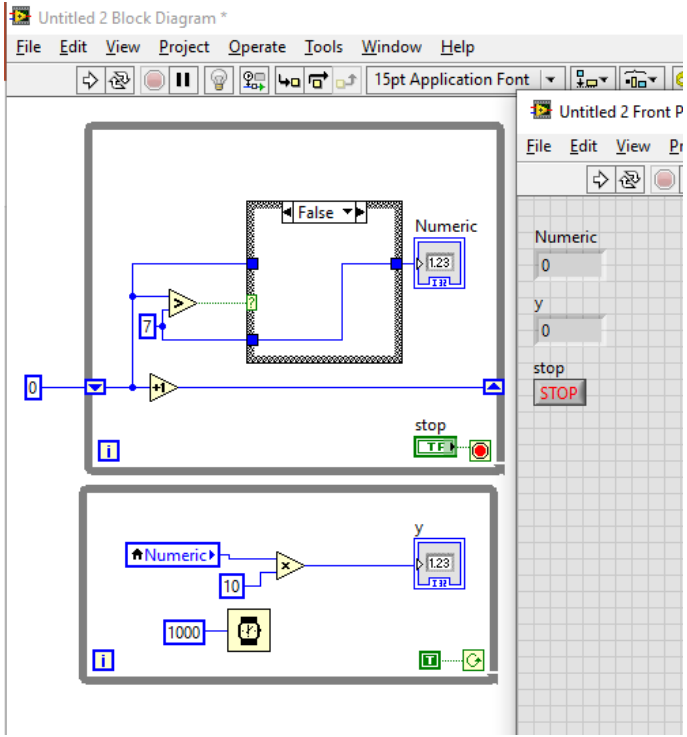
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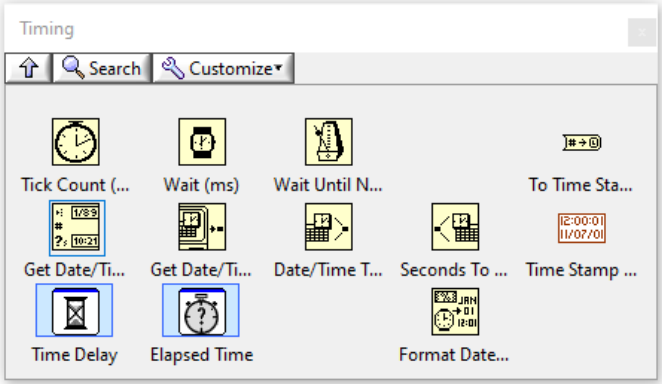
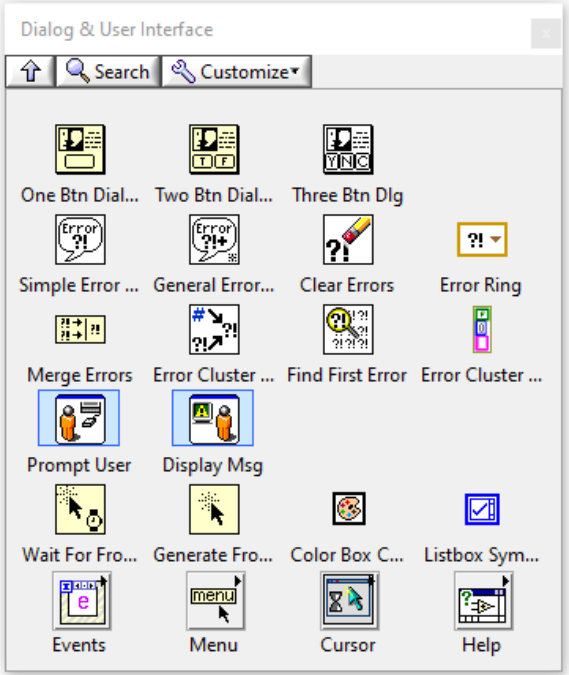
TIMING AND USER INTERFACE





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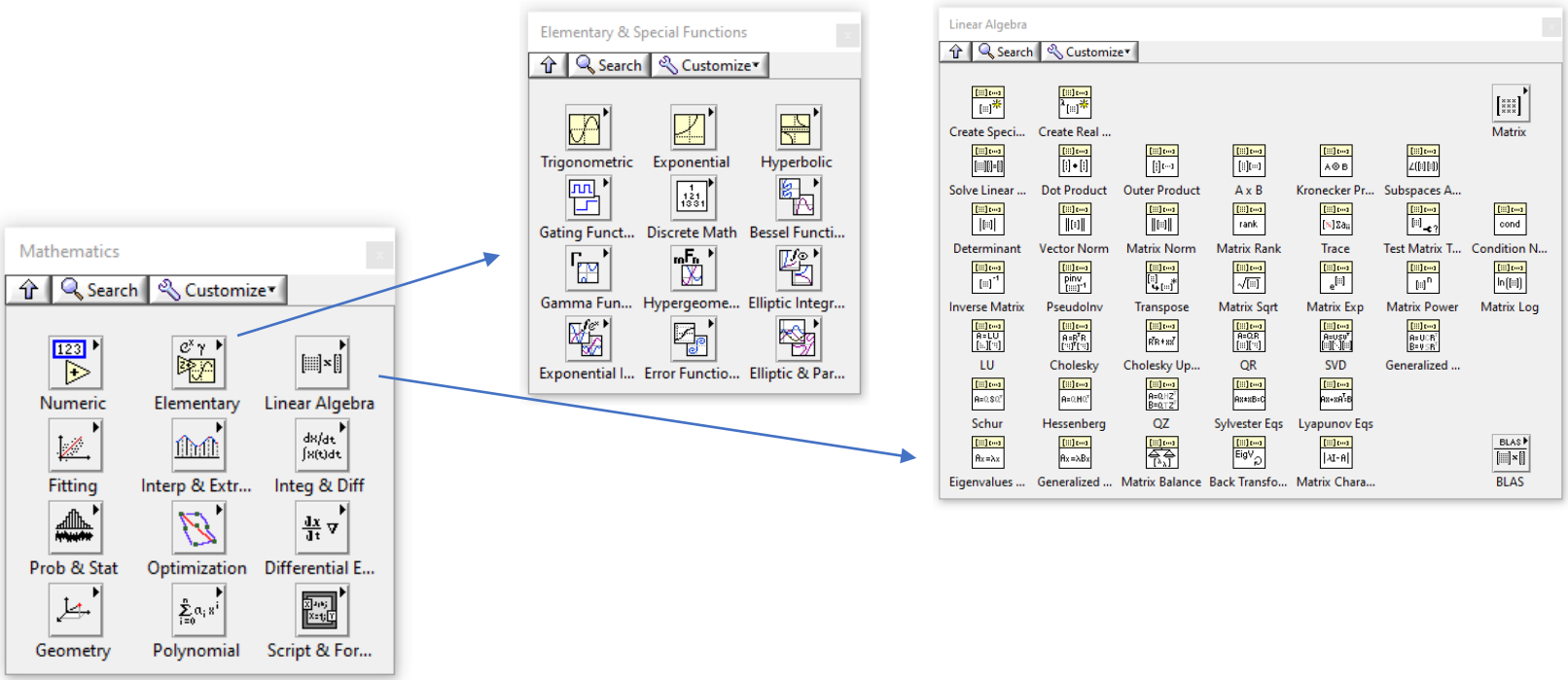

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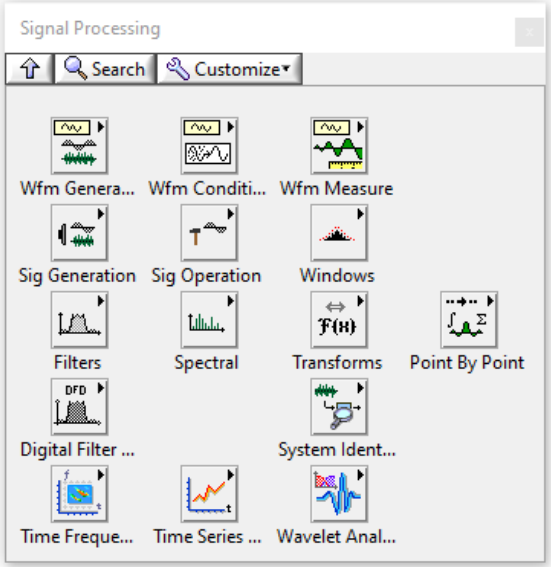

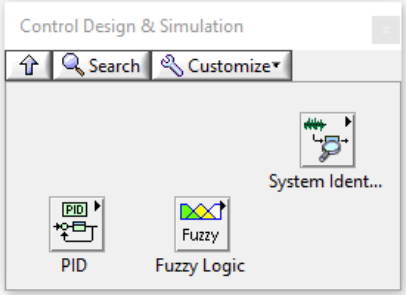

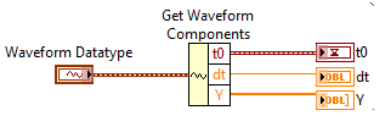

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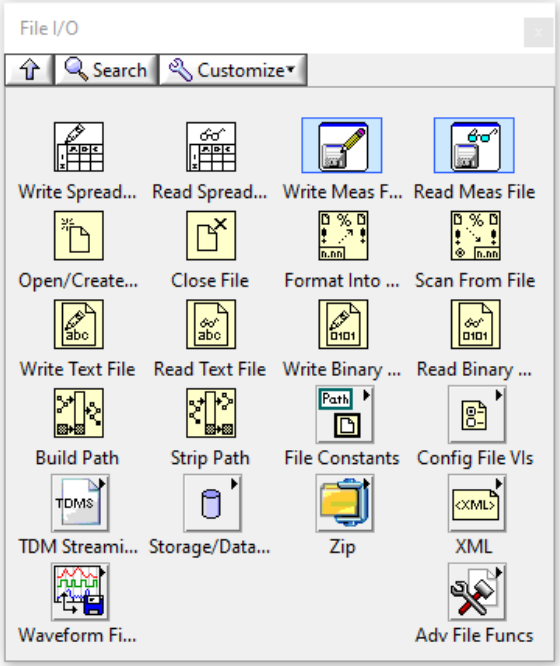
File I/O
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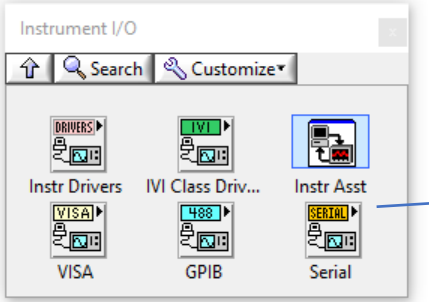
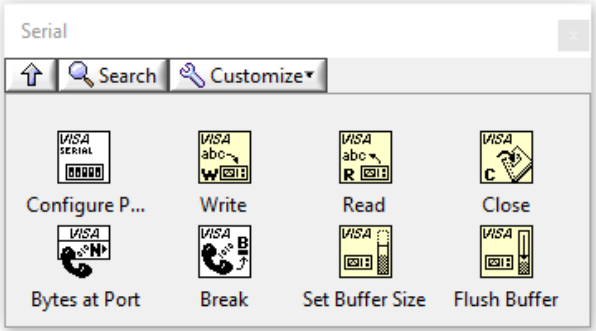
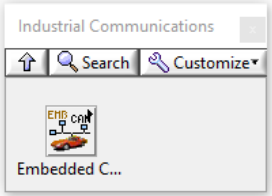
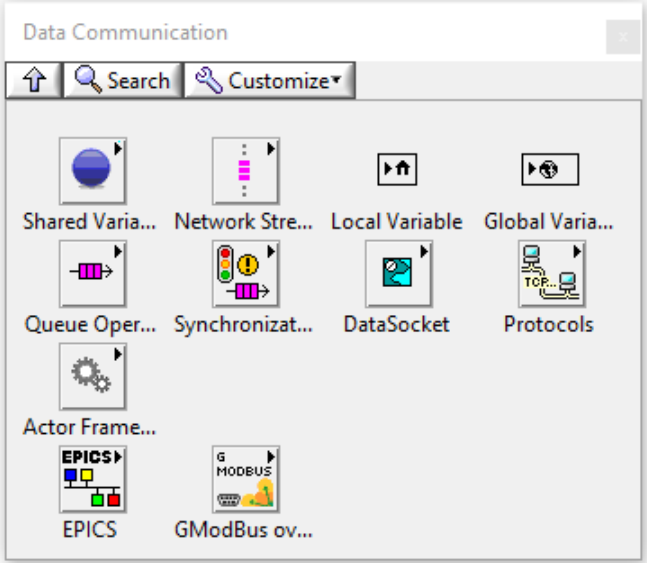
Adv File Funcs

COMMUNICATION









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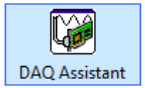
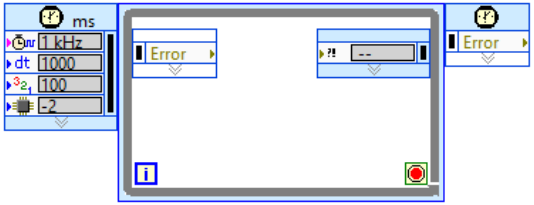
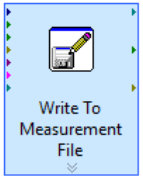
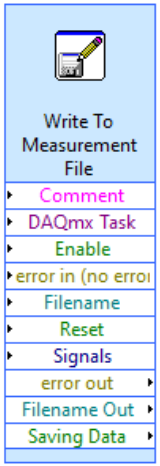
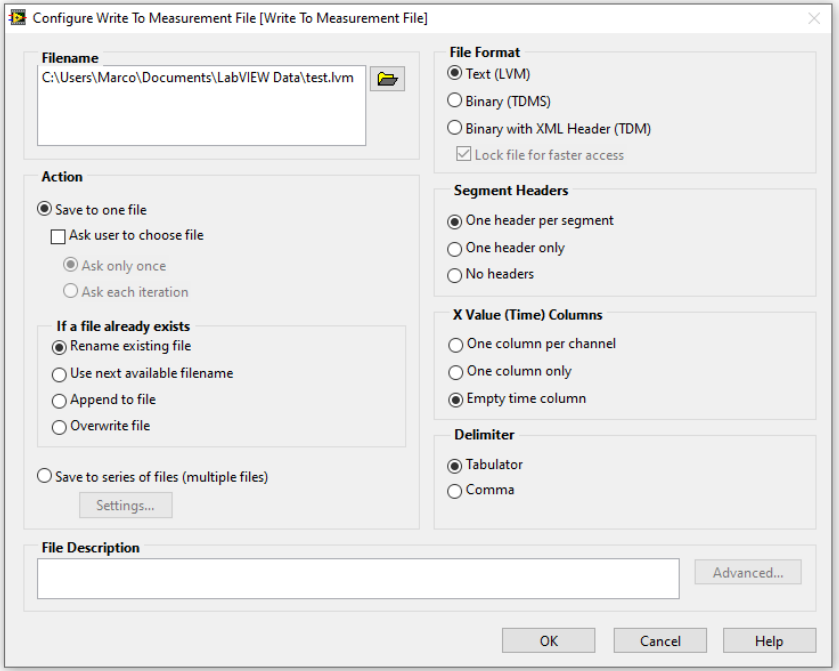


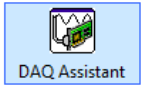


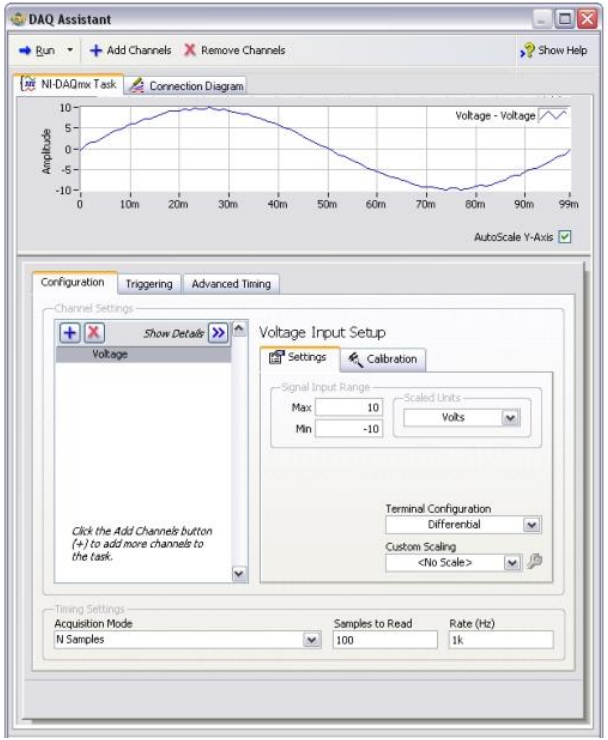




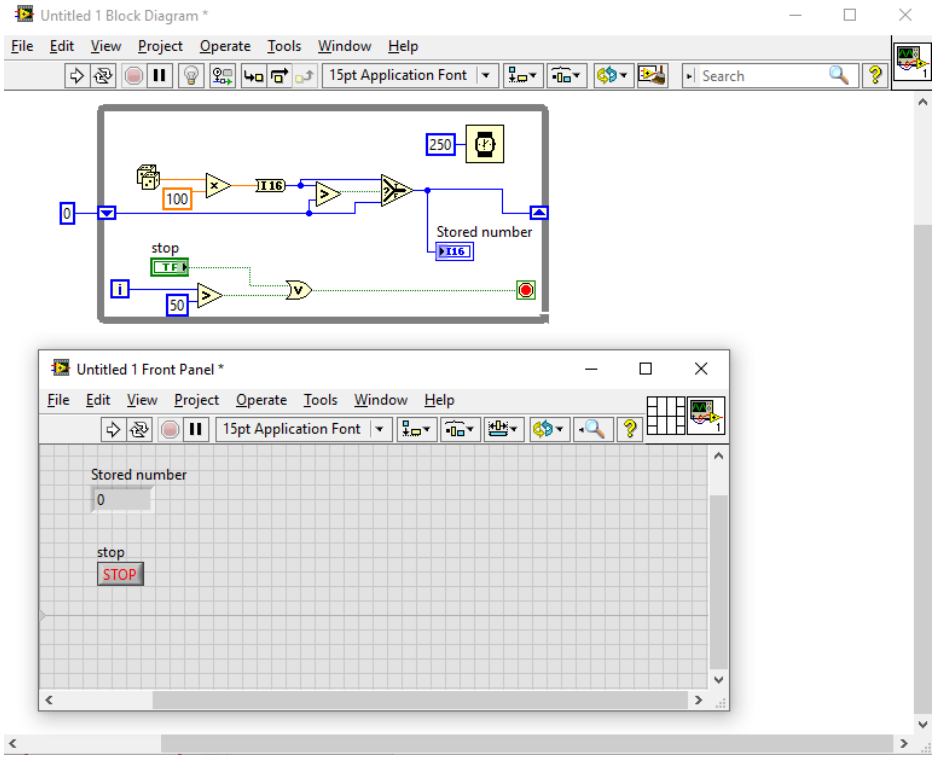


GRAPHICAL INTERFACE BASED BLOCKS



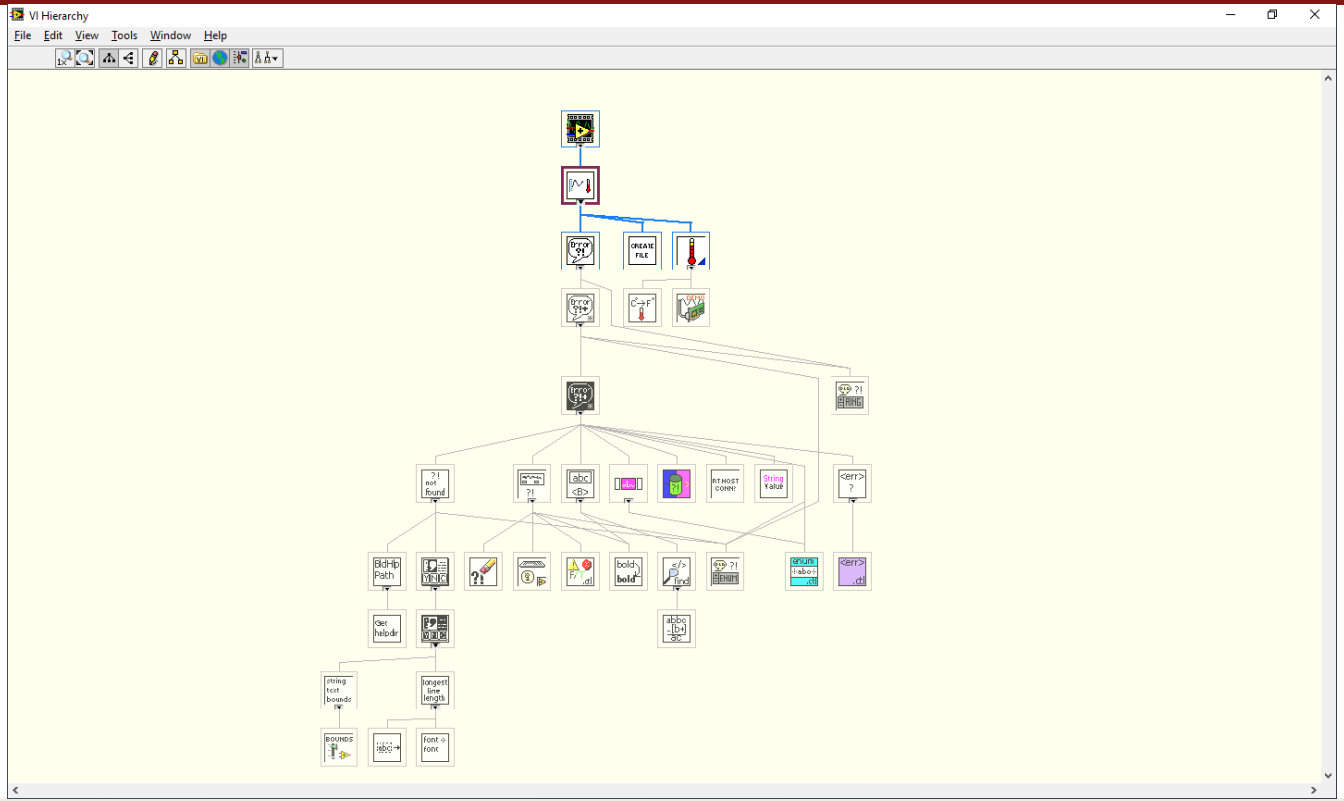


NI/ LABVIEW / VI / SOME EXAMPLES



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

VI HIERARCHY



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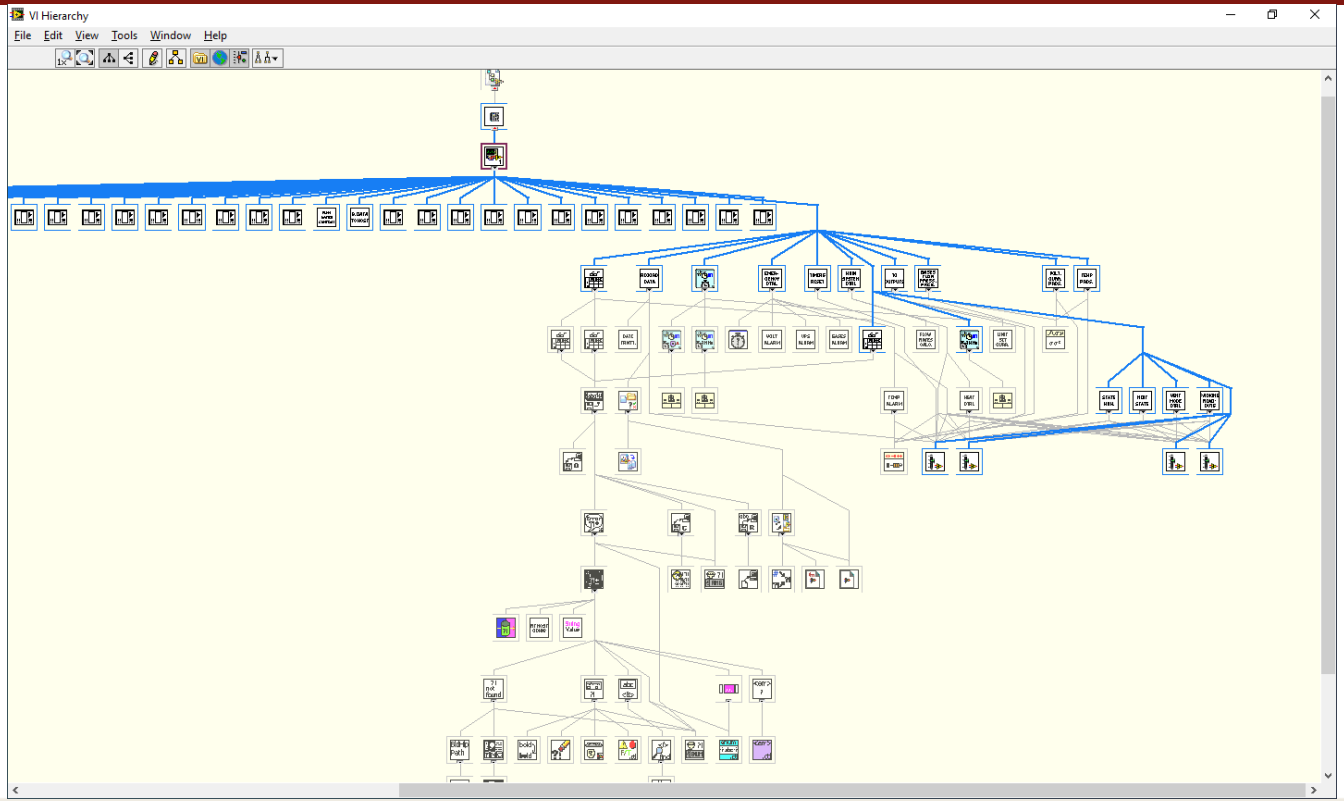
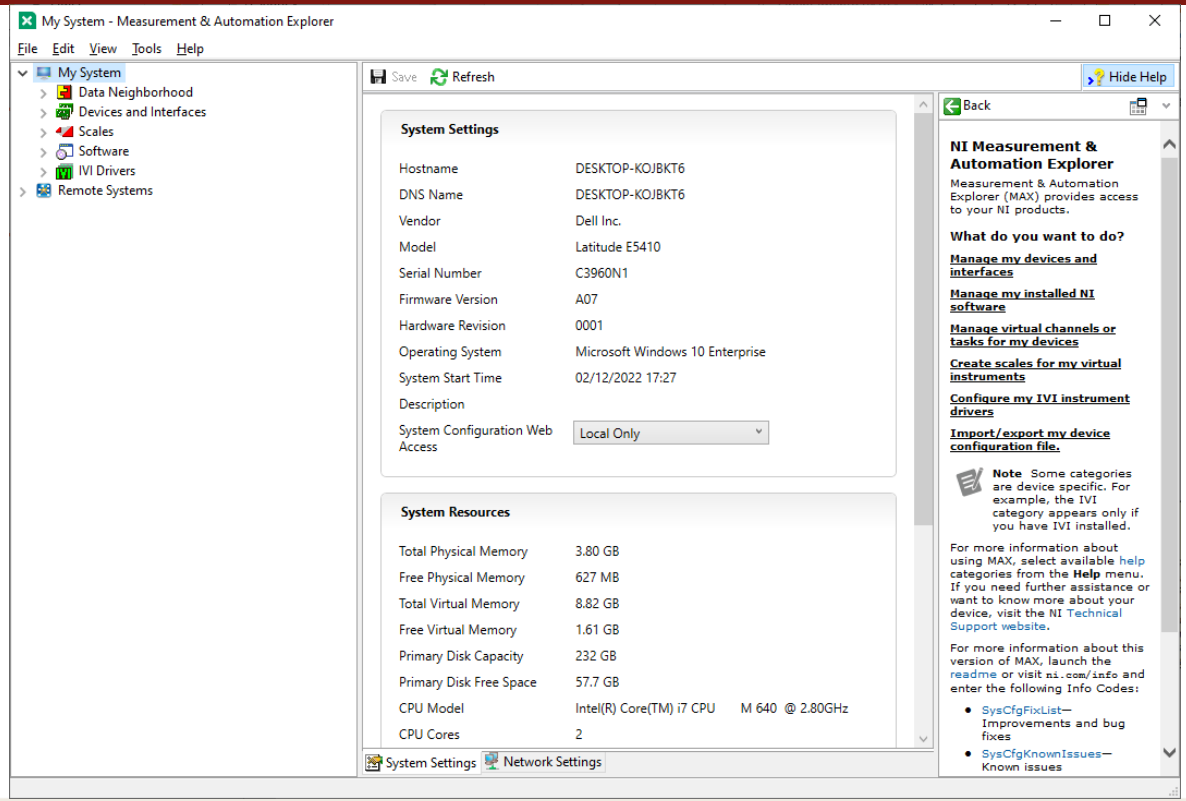


NI-MAX (MEASUREMENT &AUTOMATION EXPLORER)



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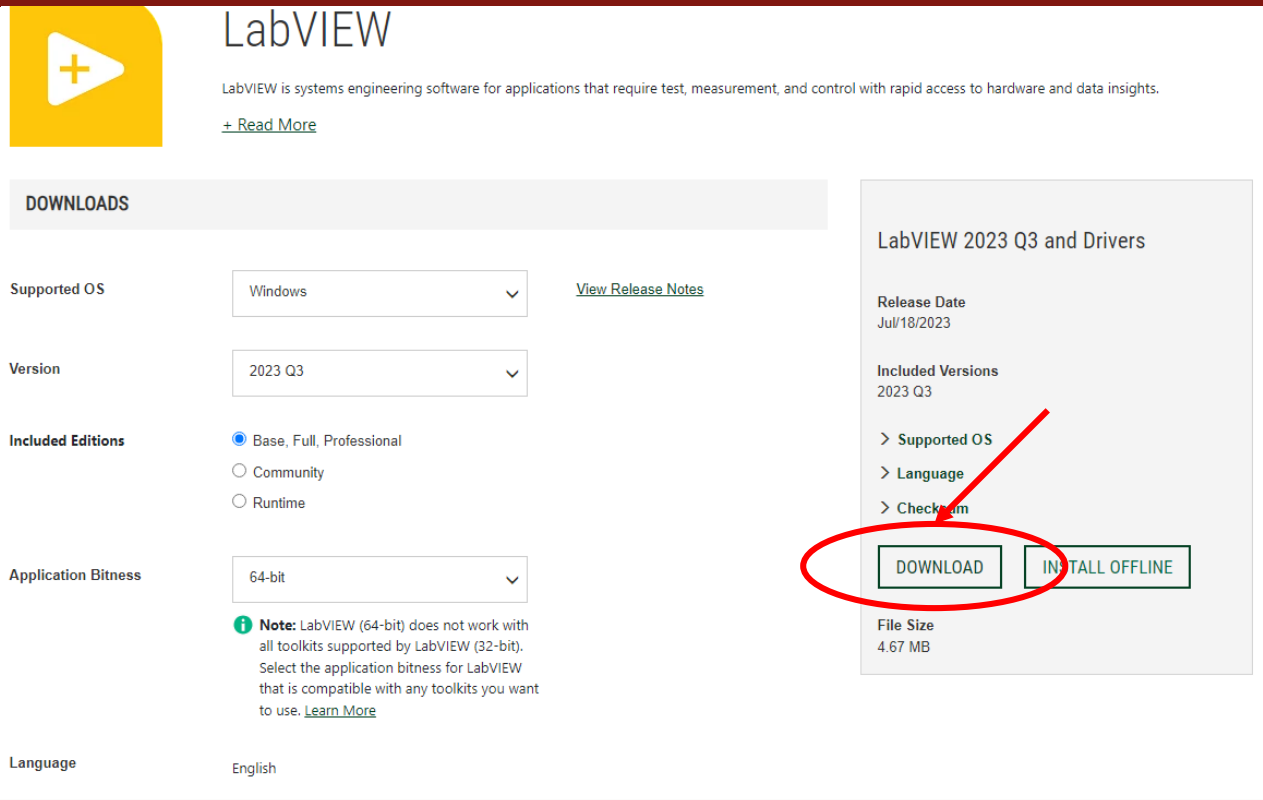

Version to install: 2024 Q3

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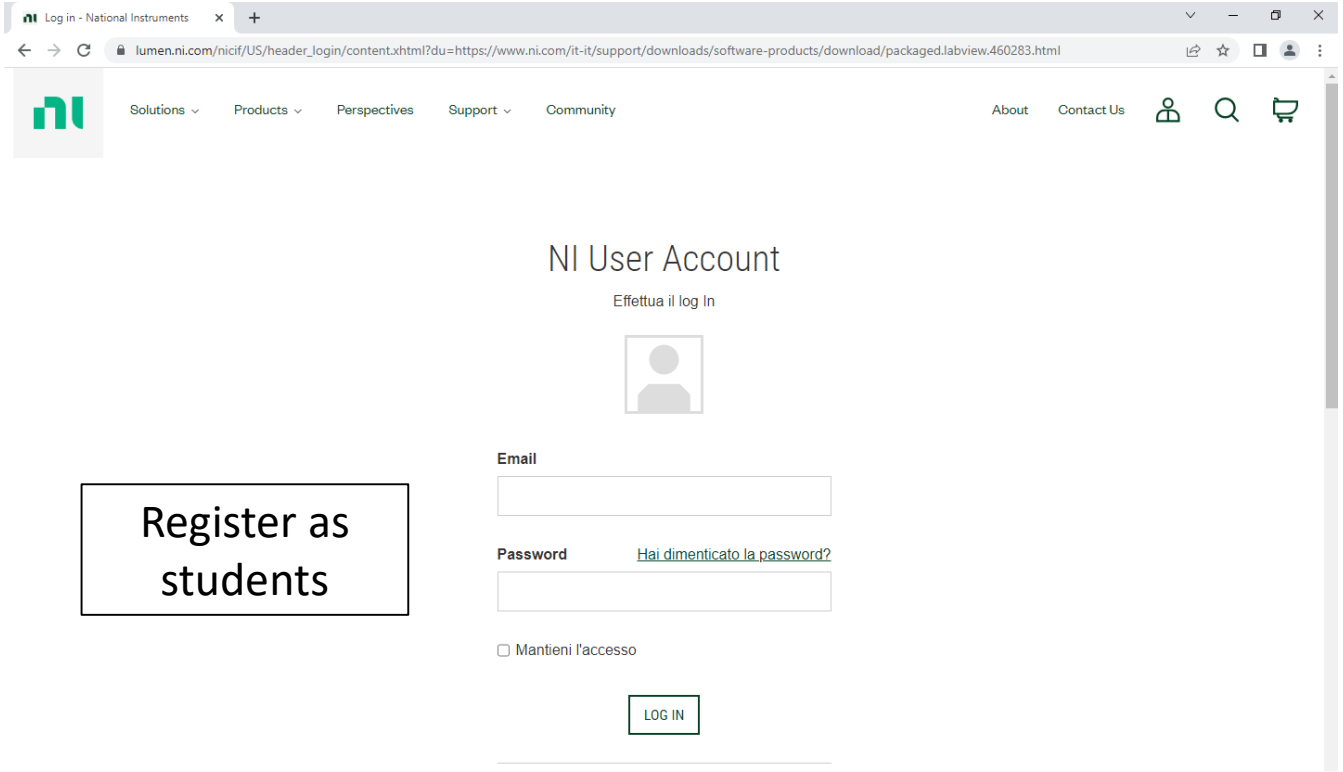
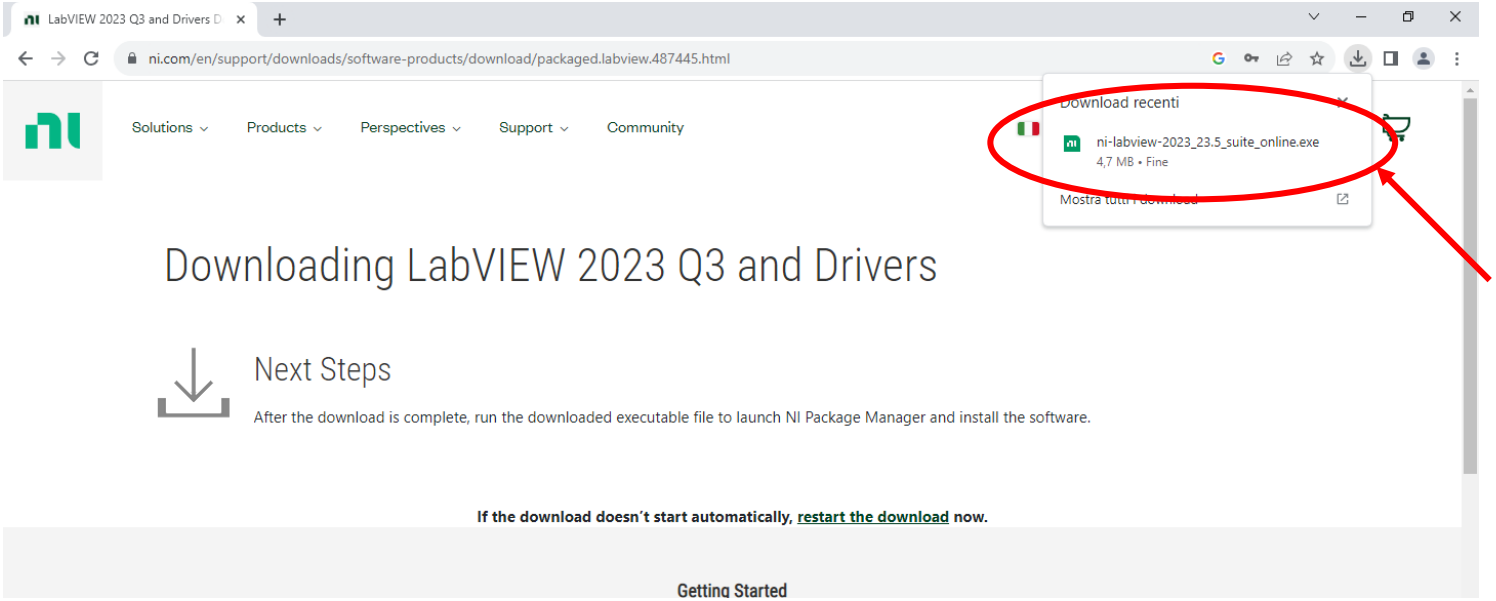


Register as students

LABVIEW INSTALLATION



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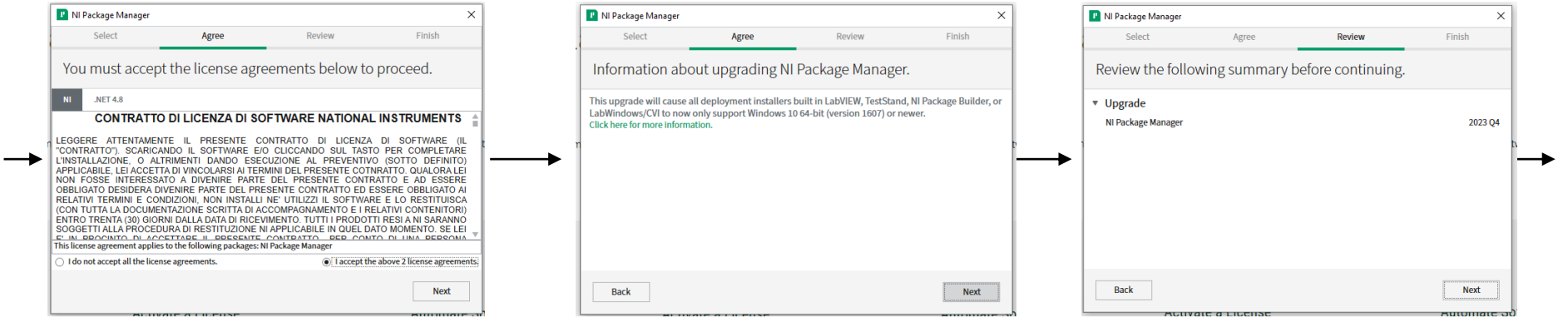

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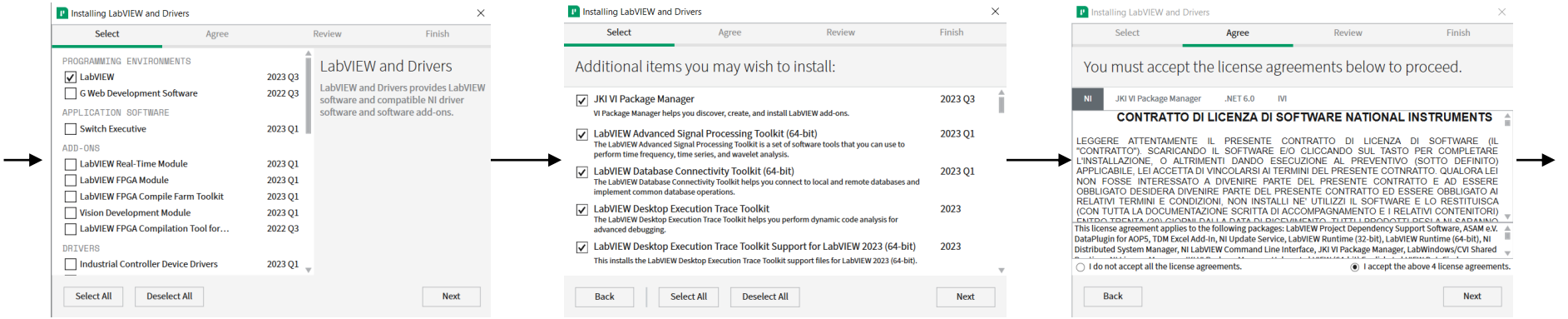

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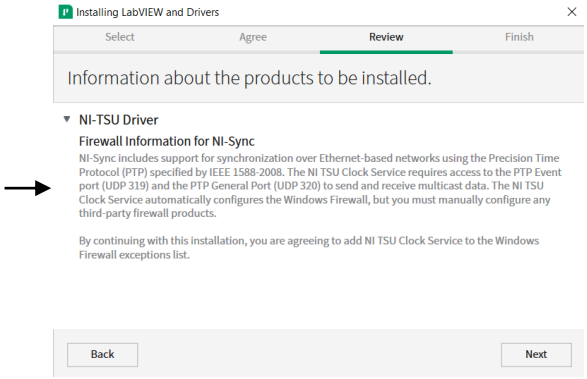
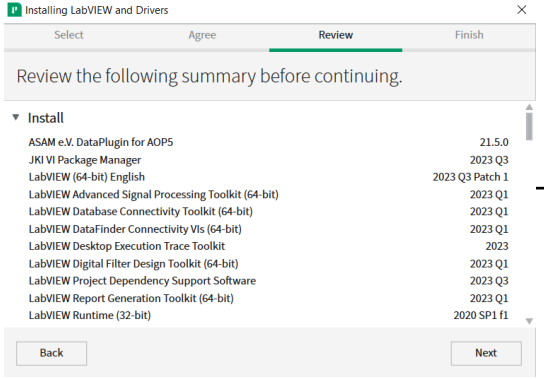
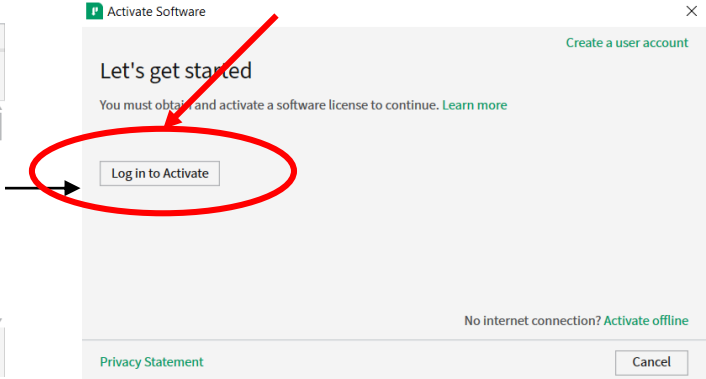
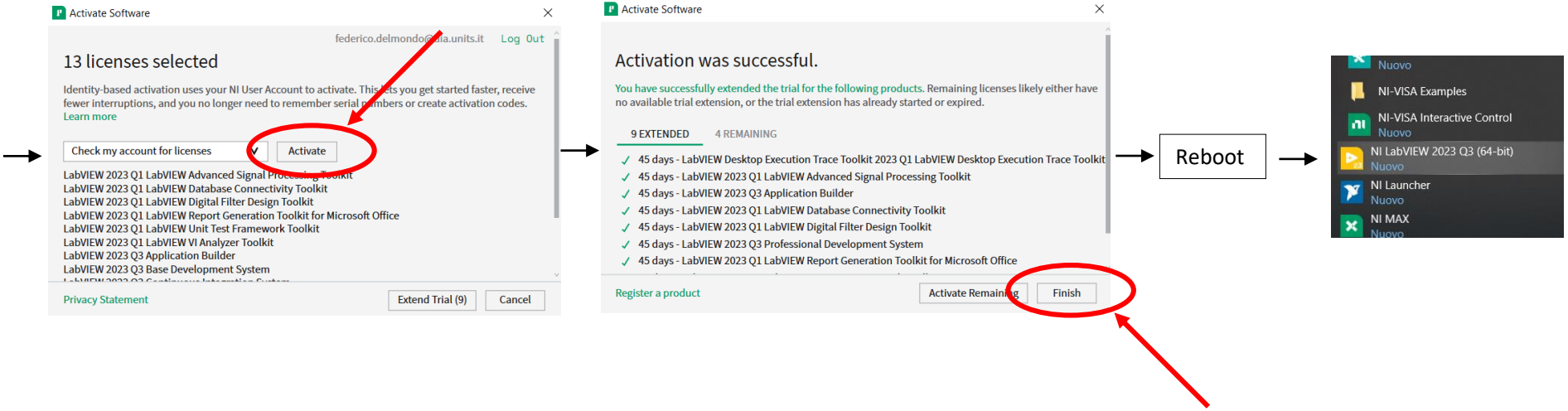






LABVIEW INSTALLATION



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