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PRODUCT FLYER

NI Educational Laboratory Virtual Instrumentation Suite (NI ELVIS)

CONTENTS

NI ELVIS

NI ELVIS III, NI ELVIS II+, and NI ELVIS II
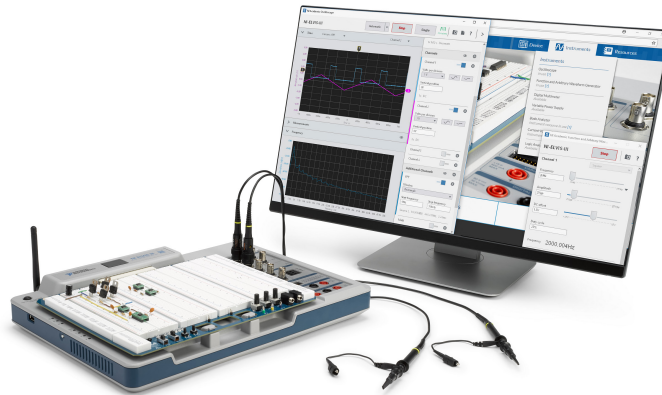
- **Software:** Includes interactive web and desktop soft front panels, instrumentation support for Windows and Mac, API support for LabVIEW and text-based languages, shipping examples, and detailed help files

- Seven hardware instruments plus Control I/O containing 16 AI, 4 AO, and 40 DIO

- 4-channel, 100 MS/s oscilloscope sample rate with 14-bit resolution and 50MHz bandwidth

- 16-channel 100 MS/s logic analyzer/pattern generator

- 16-channel, 1MS/s analog input with 16-bit resolution

- 40 DIO lines individually programmable as input, output, PWM, or digital protocols

Project-Based Learning for the Modern Engineer

NI ELVIS is a project-based learning solution combining instrumentation, embedded design, and web connectivity for engineering fundamentals and system design. It provides a comprehensive teaching solution for engaging students in hands-on labs involving analog circuits, mechatronics, power electronics, instrumentation, digital communications, digital electronics, controls, and more. Each laboratory solution includes lab material and complete experiments developed by experts in industry and education, so students can explore theory in the physical laboratory with a safe, in-depth experience.

With its hands-on approach, NI ELVIS helps educators teach students practical, experimental engineering skills. Built on the concept of teamwork, NI ELVIS connects students to their experiment, enabling constant collaboration all using the same technology used at over 35,000 companies worldwide. NI ELVIS combines the precision and accuracy of 7 benchtop instruments with the speed and customization of industrial embedded controllers in one single platform with easy pre-built interfaces and the ability to customize at a level not available in any other educational laboratory equipment.

Table 1. NI offers three NI ELVIS models based on your specification needs.

|	NI ELVIS II	NI ELVIS II+	NI ELVIS III
Description	Legacy NI ELVIS	Legacy NI ELVIS with higher oscilloscope performance	Latest NI ELVIS with integrated instrumentation and control I/O
Oscilloscope	2-CH, 1.25 MS/s[1], 10-bit	2-CH, 100 MS/s, 8-bit	4-CH, 100 MS/s, 14-bit
Function Generator	1-CH, 2,8 MS/s[2], 10-bit	1-CH, 2,8 MS/s[2], 10-bit	2-CH, 100 MS/s, 14-bit
Logic Analyzer / Pattern Generator	x	x	16-CH, 100MS/s
IV Analyzer	x	x	±10V, ±30mA, 15MHz
DMM	5 ½ digits	5 ½ digits	4 ½ digits
VPS	±12V, 500mA	±12V, 500mA	±15V, 500mA
Processor FPGA	x	x	Xilinx Zynq-7020
AI / AO	16-CH, 16-bits / 2-CH, 16-bits	16-CH, 16-bits / 2-CH, 16-bits	16-CH, 16-bits / 4-CH, 16-bits
DIO	20 DIO, 15 PFI	20 DIO, 15 PFI	40-CH
SFP Support	Windows	Windows	Windows, Mac, Web[3]
Programming Language Support	LabVIEW	LabVIEW	LabVIEW, Python, C[4]
Enclosure	Plastic. White.	Plastic. White.	Metal. NI Compass Silver.

[1]Single-channel specification. Two-channel specification is 2.0 MS/s.

[2]Single-channel specification. Two-channel specification is 500 kS/s.

[3]Full implementation of web soft-front panels coming 2019.

[4]C support coming fall of 2018.

Detailed View of the NI ELVIS III
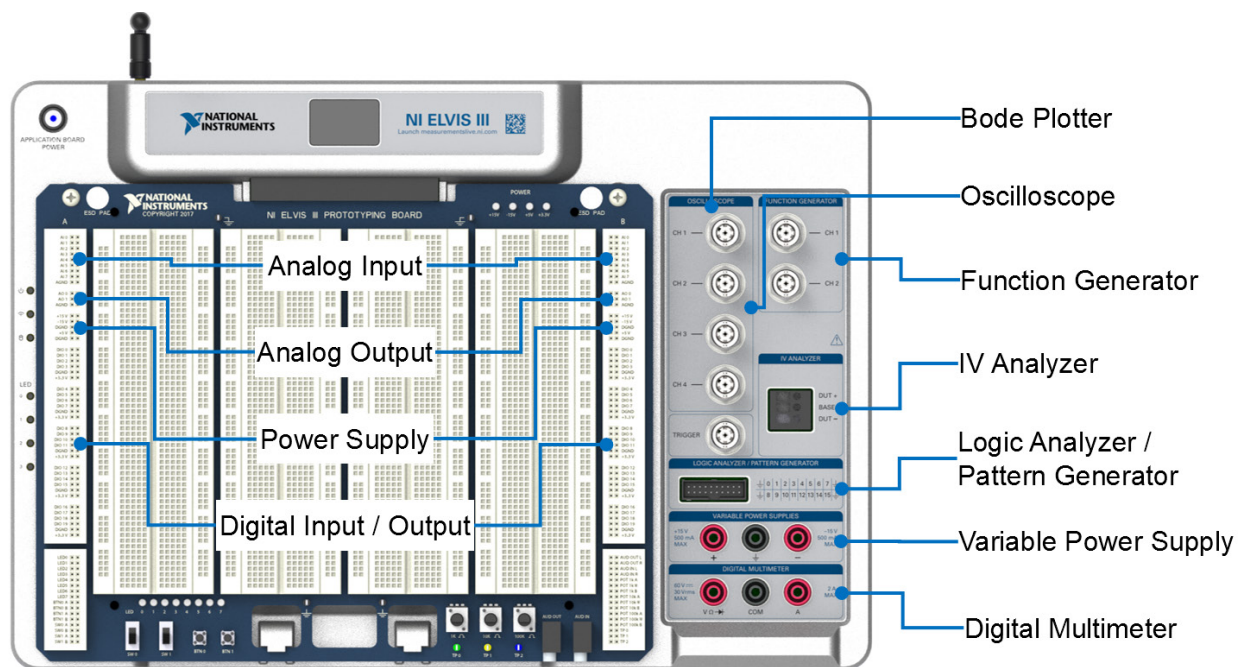
Key Features

Teach Innovation by Integrating Instrumentation with Embedded Design

Projects that inherently challenge students to employ innovative design thinking often involve interacting with an unknown process or device. Students are encouraged to understand the unknown though theory, simulation, and experimentation; however, projects that introduce the unknown in the messy, multi-system environment it exists in naturally tend to challenge the students to be much more innovative. Designing a test in this style not only requires an understanding of specifications, the limitations of the equipment, and the fundamental concepts being applied but it also requires students to contend with outside factors and how one change can have a cascading effect on the experimental setup.
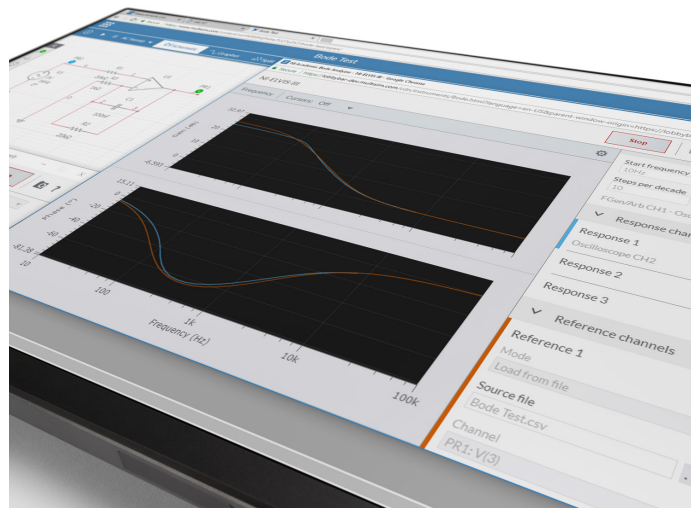

Figure 1. NI ELVIS III

To most effectively analyze concepts in this manner, not only do students need the ability to effectively instrument and analyze the experiment, but precise control and the ability to manipulate the type and behavior of the inputs to the system are critical to a student's understanding. The NI ELVIS III is the only engineering laboratory solution that combines 7 traditional instruments with fully customizable I/O, enabling complete implementation of the concepts in context approach.

Engage Students with a Modern, Web-Driven Experience

NI ELVIS meets students where they are with a web interface that drives collaboration, reduced time to measurement, and integration with teaching/learning resources to fully equip students in their educational career.

The seven instruments on NI ELVIS III are all accessed through a minimal install for both Windows and Mac, giving every student access to the instruments on their own computers instantly via USB, Ethernet, or Wi-Fi. Some of the instruments including the Bode Analyzer and the IV Analyzer are immediately accessible using a web soft front panel. This means that the instruments can be accessed on any device: computer, tablet, or cell phone, with no installation needed. At launch, only these two instruments will be accessible via the web; however, at a point soon every instrument will have an associated web soft front panel.

Figure 2. NI ELVIS experiment and simulation comparison

With NI ELVIS III, educators can find resources to teach and develop labs all in one place. Using the pre-created labs for NI ELVIS, students gain access to the lab instructions, video references describing the lab, and the instrument launcher all in the same window. Then, when completed, the answers are all compiled and sent in as a lab report. Moving lab resources to the web with NI ELVIS III saves time and reduces the number of programs students need to interface with.

Drive Teamwork with Easy Coordination of Experiments

One of the major requests from industry and accreditation is for students to come away from university with an understanding of how to work in teams to solve a common engineering problem. NI ELVIS III, being a network-connected device, enables collaboration on experimentation though multi-user access. Each of the seven instruments can be accessed simultaneously by different students all connected wirelessly to the NI ELVIS III. Also, the Control I/O can be programmed independently from students accessing the instrumentation. This means that in a group of students, each individual can each interact with the NI ELVIS III to perform part of an experiment, involving everyone in a completely collaborative experimentation environment.

Figure 3. Remote student design

Similarly, since NI ELVIS III can be remotely accessed, teaching assistants will find assessing student work much simpler. Rather than designating time to meet in person with each student, the TA can be a remote resource logging into each device after students believe they have completed the assignment.

NI ELVIS III removes barriers to collaboration and enables more students to go through a lab in shorter periods of time, increasing student satisfaction and making best use of teaching staff resources.

Interchangeable, Course-Specific Experiments

NI ELVIS addresses engineering curriculum by integrating project-based learning, teamwork, and design with course-specific application boards and labs developed by experts from education and industry. With a constantly expanding ecosystem, NI ELVIS addresses courses from the fundamentals of electrical and mechanical engineering through to system-level design in power electronics and mechatronics. NI has partnered with leading companies in engineering education such as Texas Instruments, Digilent, Emona, Integrator, and Quanser to offer complete lab solutions for electronics, controls, mechatronics, and communications.
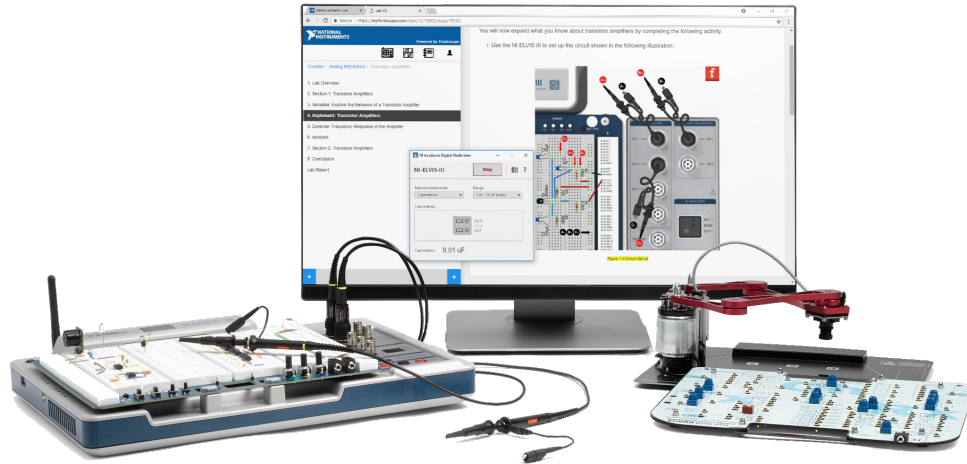

Figure 4. NI ELVIS ecosystem

The application boards provide not only easy access to the hardware needed to complete engineering labs but also the laboratory exercises and programs necessary to complete the exercises. These are freely available even before purchase of the board and can be downloaded at ni.com/teach.

To explore the application boards NI offers for NI ELVIS, visit one of the following pages:

NI ELVIS Electronics Boards

NI ELVIS Mechatronic Boards

NI ELVIS Controls Boards

NI ELVIS Communications Boards

NI ELVIS III Soft Front Panels

The NI ELVIS III soft front panels are all launched from Measurements Live at measurementslive.com. Each soft front panel corresponds to an instrument with 7 soft front panels in total including: Oscilloscope, Function and Arbitrary Waveform Generator, Digital Multimeter, Variable Power Supply, Bode Analyzer, IV Analyzer, and Logic Analyzer and Pattern Generator. The soft front panels are implemented in two formats: desktop and web soft front panels. The desktop soft front panels are installed via a small executable for Windows and Mac and will launch when selected in the instrument launcher. The web soft front panels require no install and will launch in a new browser window. An update in 2019 will make each instrument available via the web soft front panel.

Measurements Live

Measurements Live is the primary interface for the NI ELVIS III. It contains the connection to the device, the instrument launcher, and links off to all of the additional user resources for the device. Measurements Live can be access at measurementslive.com
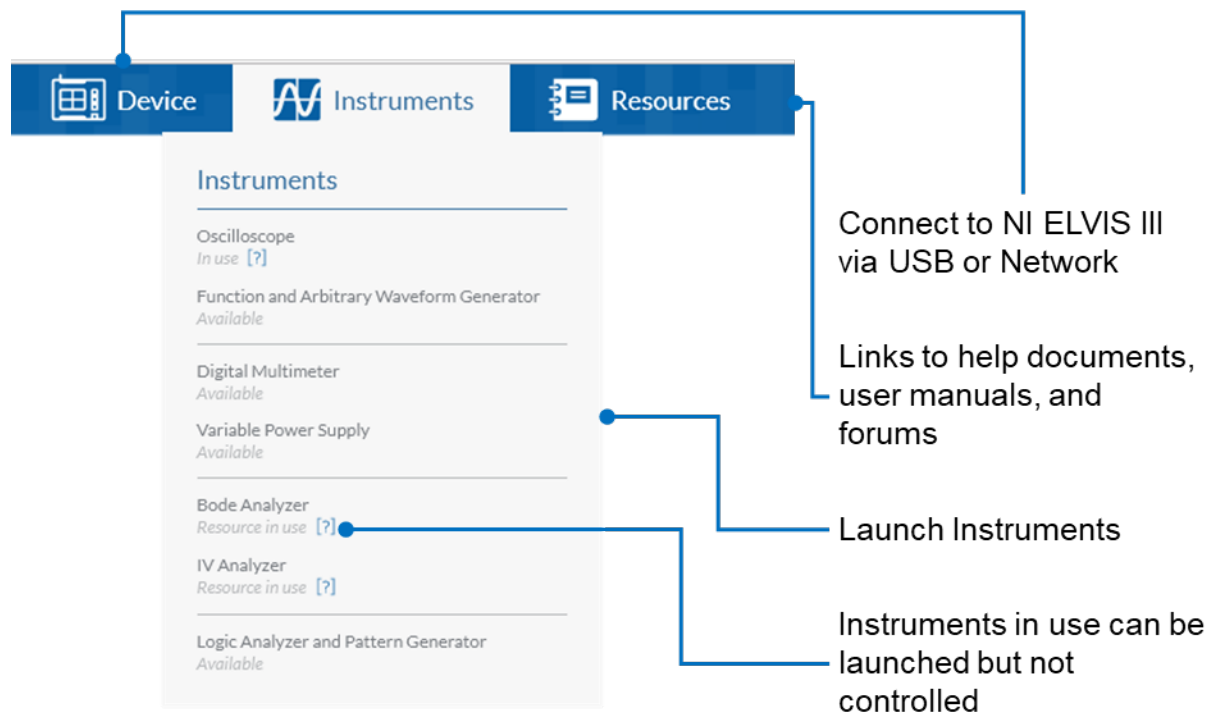

Figure 5. Measurements Live

Oscilloscope Soft Front Panel

The oscilloscope soft front panel is one of the seven soft front panels for NI ELVIS III. It communicates with the 4-channel oscilloscope to display waveforms, measurements, and frequency information. The desktop soft front panels are installed using a minimal built-in installer and are launched via Measurements Live.
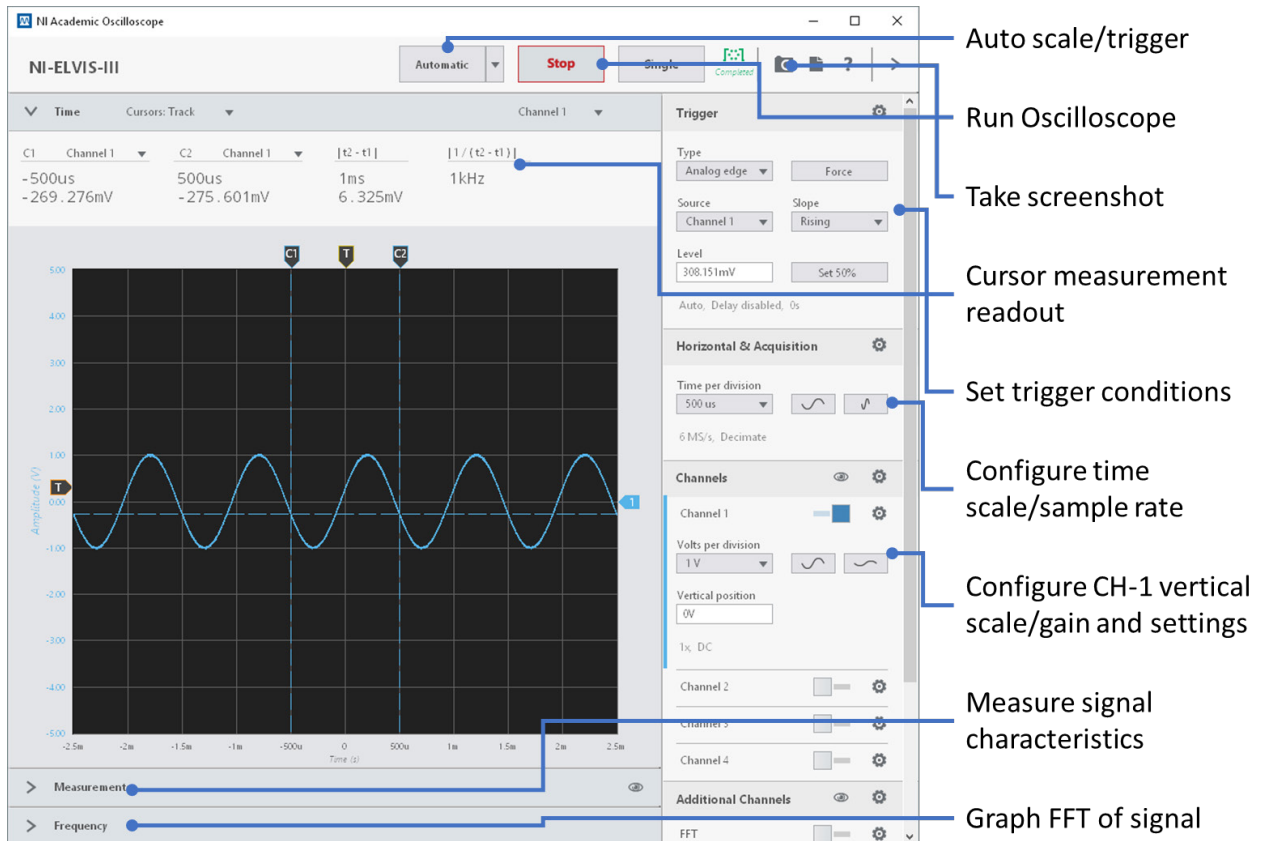

- Auto scale/trigger
- Run Oscilloscope
- Take screenshot
- Cursor measurement readout
- Set trigger conditions
- Configure time scale/sample rate
- Configure CH-1 vertical scale/gain and settings
- Measure signal characteristics
- Graph FFT of signal

Figure 5. NI ELVIS III oscilloscope soft front panel

Bode Analyzer Web Soft Front Panel

The bode analyzer is one of two web soft front panels. It is launched from Mesurements Live and opens a new browser window instead of a desktop application.
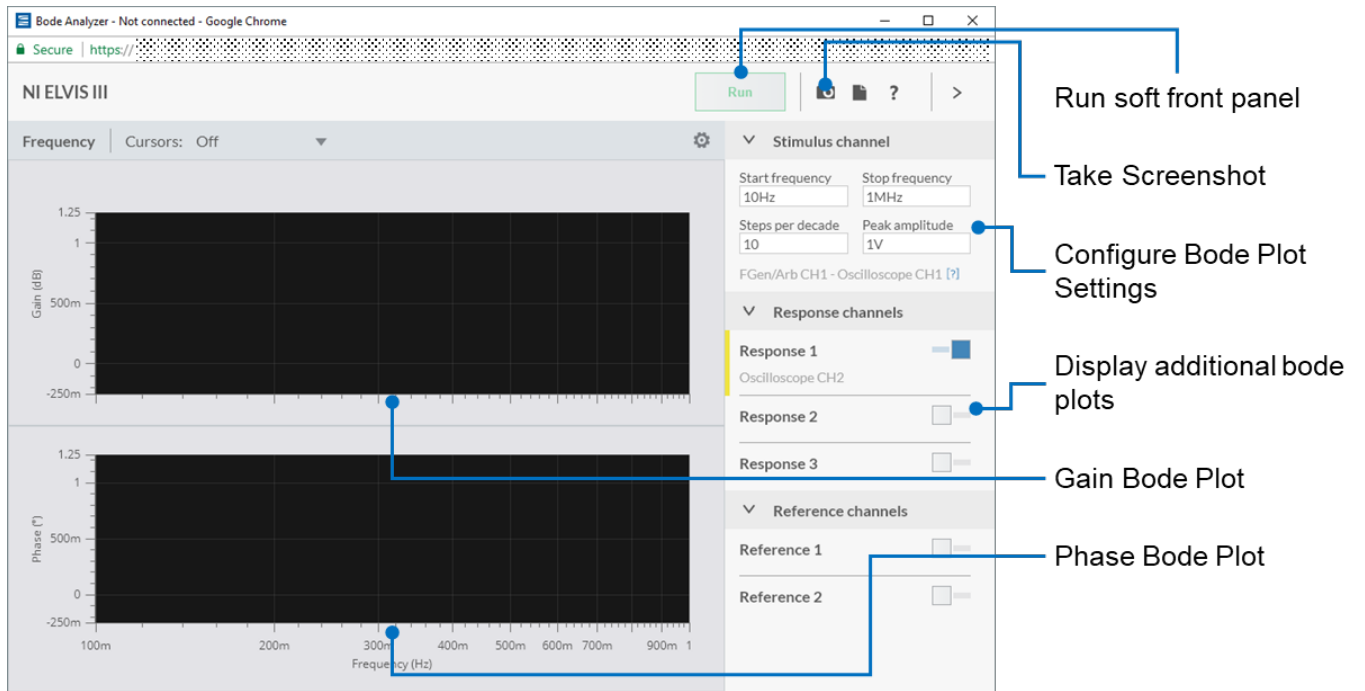

Figure 6. NI ELVIS III body analyzer web soft front panel

NI ELVIS with Multisim Live

The NI ELVIS III soft front panels each have the capability to turn on a reference channel so additional outside data can be imported. Students performing circuits experiments are traditionally required to fully understand and simulate a circuit before building and beginning the experiment. Doing this reduces the time spent in the lab and leads to more intentional work and less guessing. Multisim Live is a browser-based SPICE circuit simulation environment providing fully interactive simulation, touch and mobile compatibility, and a direct connection into the standard for educational circuit simulation, Multisim (for desktop). When students create a simulation in Multisim Live, it can easily be exported into the NI ELVIS III soft front panels for direct simulation to experiment comparison. Now students can fully understand fundamental differences between the simulation and experiment leading to faster conclusions and accelerated discovery. More information and instructions can be found in the NI ELVIS III Multisim Live Integration whitepaper.
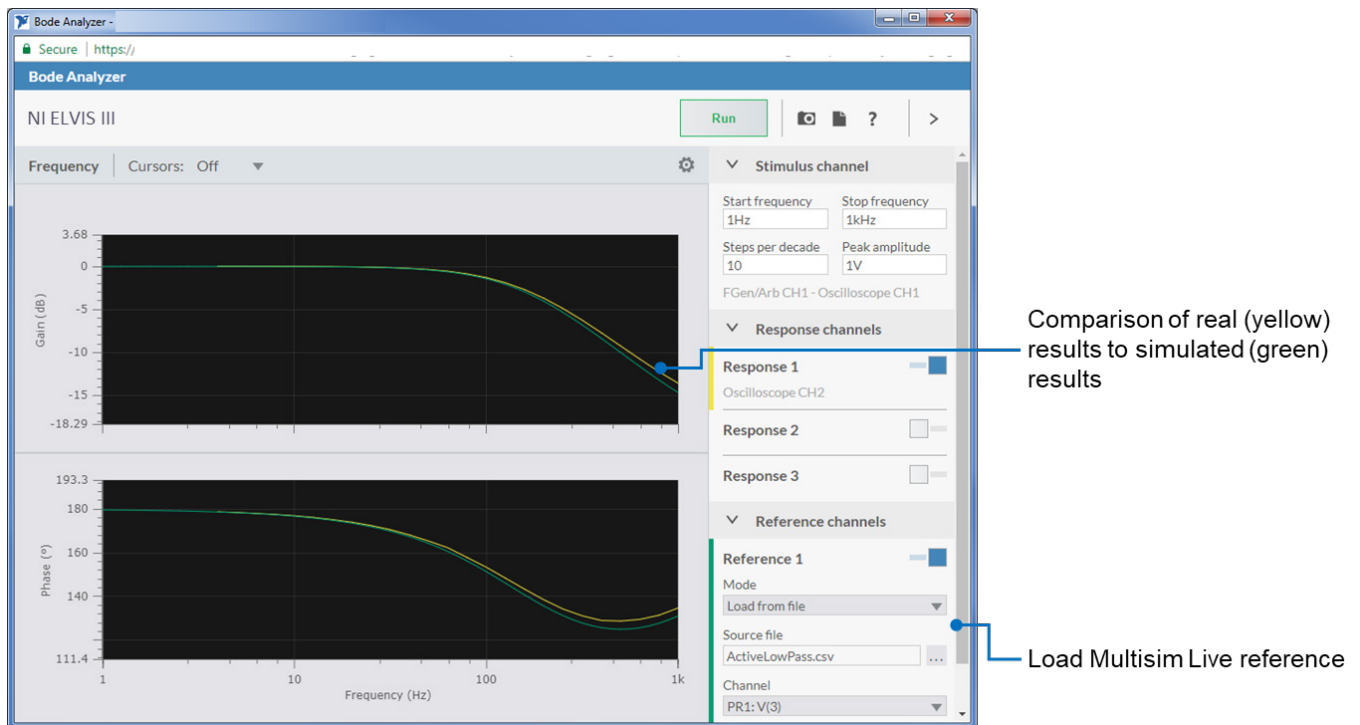

Figure 7. Comparing Multisim Live data to NI ELVIS III acquired data

NI ELVIS III Application Programming Interface (API)

In addition to the soft front panels, NI ELVIS includes a best-in-class API that works with a variety of development options such as LabVIEW, Python, and soon C. The API has the ability to automate measurements from the instrumentation and also programmatically acquire, analyze, and control data through the Control I/O. The Control I/O is a realtime operating system implemented on the NI ELVIS III with over 60 lines of customizable analog and digital inputs and outputs. They are traditionally used for courses that require fast response time to impulses or courses that require larger channel counts for data acquisition or digital communications.

More information about programming the NI ELVIS III in LabVIEW can be found here while more information about programming in Python can be found here.

Programming the Control I/O

The Control I/O is programmed through one of two means: either using Express VIs or building using lower-level Vis. The express VIs, as shown below, are simple blocks placed that are configured via a user interface that pops up. It requires no knowledge of programming and lets the user easily manipulate data while keeping the customization of the data acquisition to a minimal.
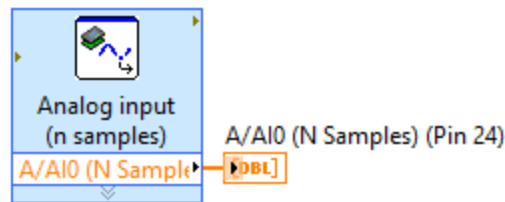

Figure 8. Analog input using Express VI

The lower-level programming breaks out the Express VI into more detailed blocks that specify input/output timing, triggering, and more details as seen below. This is used when more control is needed over acquisition settings.

Figure 9. NI ELVIS being taught using an application board

Programming the NI ELVIS Instrumentation

The NI ELVIS III instrumentation is programmed in a very similar manner to the Control I/O where each individual instrument can be commanded to initialized, be configured as needed by the user, then the data is pulled out and manipulated as seen below.
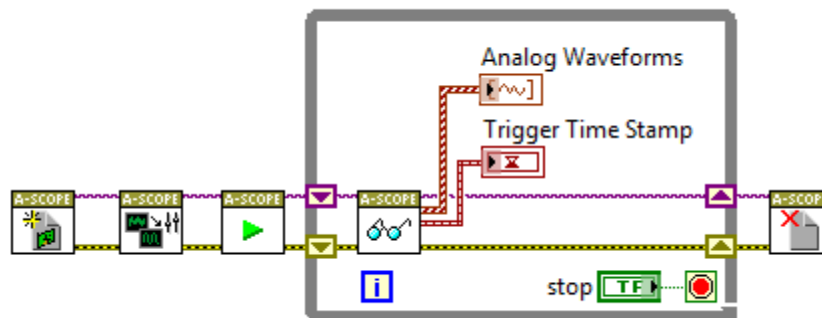

Figure 4. NI ELVIS being taught using an application board

Hardware Services

All NI hardware includes a one-year warranty for basic repair coverage, and calibration in adherence to NI specifications prior to shipment. PXI Systems also include basic assembly and a functional test. NI offers additional entitlements to improve uptime and lower maintenance costs with service programs for hardware. Learn more at ni.com/services/hardware.

	Standard	Premium	Description
Program Duration	3 or 5 years	3 or 5 years	Length of service program
Extended Repair Coverage	•	•	NI restores your device's functionality and includes firmware updates and factory calibration.
System Configuration, Assembly, and Test[1]	•	•	NI technicians assemble, install software in, and test your system per your custom configuration prior to shipment.
Advanced Replacement[2]		•	NI stocks replacement hardware that can be shipped immediately if a repair is needed.
System Return Material Authorization (RMA)[1]		•	NI accepts the delivery of fully assembled systems when performing repair services.
Calibration Plan (Optional)	Standard	Expedited[3]	NI performs the requested level of calibration at the specified calibration interval for the duration of the service program.

[1]This option is only available for PXI, CompactRIO, and CompactDAQ systems.
[2]This option is not available for all products in all countries. Contact your local NI sales engineer to confirm availability.
[3]Expedited calibration only includes traceable levels.

PremiumPlus Service Program

NI can customize the offerings listed above, or offer additional entitlements such as on-site calibration, custom sparing, and life-cycle services through a PremiumPlus Service Program. Contact your NI sales representative to learn more.

Technical Support

Every NI system includes a 30-day trial for phone and e-mail support from NI engineers, which can be extended through a Software Service Program (SSP) membership. NI has more than 400 support engineers available around the globe to provide local support in more than 30 languages. Additionally, take advantage of NI's award winning online resources and communities.

16 May 2018

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