NI Educational Laboratory Virtual Instrumentation Suite (NI ELVIS)

NI ELVIS

- Design and prototyping platform for circuits, control, instrumentation, communication, and embedded experiments
- USB plug-and-play interface
- Virtual instrumentation suite
  - Oscilloscope, digital multimeter (DMM), function generator, variable power supply, bode analyzer, arbitrary waveform generator, dynamic signal analyzer (DSA), voltage/current analyzer with LabVIEW source code
  - Completely open and customizable in LabVIEW graphical programming environment
  - Tight integration with Electronics Workbench Multisim and MultiMCU
  - Express VIs for point-and-click configuration of customized instruments in LabVIEW and SignalExpress

Workstation Features

- Short-circuit and high-voltage protection with resettable fuse board
- Variable power supplies, manual or programmatic control
- Function generator, manual or programmatic control
- ±15 and +5 V supply
- BNC inputs for DMM and scope
- Detachable, customizable prototyping board
- Affordable for student ownership
- Designed to fit in a 2 or 3-ring binder

Companion Products

- Controls – Quanser control boards
- Microcontroller – Freescale MPU
- Embedded/DSP – Analog Devices BF537
- Sensors – Vernier sensor adapters for NI ELVIS

Overview

NI ELVIS is the leading platform for teaching concepts in areas such as instrumentation, circuits, control, communication, and embedded design in a hands-on fashion. With its integrated suite of the 12 most commonly used instruments in a compact, rugged, laboratory-friendly package, and now with a USB interface, NI ELVIS delivers a complete design and prototyping platform. Professors can use it for freshman to senior-level classes to help students learn concepts in a hands-on manner.

Powered by LabVIEW

The new NI ELVIS is now completely customizable with the premier measurement and control software, National Instruments LabVIEW. It includes Express VIs that provide point-and-click configuration capabilities for the individual instruments, which makes building customizable instruments very easy. You also can use the new NI ELVIS with National Instruments SignalExpress software, which is based on LabVIEW, for quickly designing measurement setups.

Multidisciplinary Teaching Platform

NI ELVIS provides a multidisciplinary teaching platform for hands-on learning in areas such as measurements, circuits, control, communication, and microprocessor and embedded design. Several industry and education leaders in these areas now support NI ELVIS. Quanser offers NI ELVIS-compatible boards for controls. Freescale has a microprocessor board for education that you can use with NI ELVIS. Analog Devices (ADI) includes the NI ELVIS connector on its ADI BF537 board to conduct closed-loop learning experiments.

Single, Simplified Toolchain for Circuits Education

With the introduction of Electronics Workbench Multisim 9 and a new driver for NI ELVIS that integrate seamlessly with NI LabVIEW, professors and students now have access to a single, simplified toolchain to teach circuits education – from theory to design, prototyping, and deployment. Professors and students can use Multisim to design and simulate circuits they learn in theory and prototype and deploy them on NI ELVIS. They can also use LabVIEW and NI SignalExpress to test and verify that the actual circuit tracks the theoretical values using real-world data.

Ordering Information

NI ELVIS/USB-6251 Bundle 777448-63
NI ELVIS/USB-6251 Multisim Circuit Design Bundle.....777448-64
NI ELVIS/PCI-6251 Bundle 778748-02

BUY NOW!

For complete product specifications, pricing, and accessory information, call (800) 813 3693 (U.S.) or go to **ni.com/academic/measurements**.

NATIONAL INSTRUMENTS™

Specifications

Analyzers

Oscilloscope

Channels	2
Data storage, cursors, autoscaling	
Max input bandwidth	50 kHz[1]
Max sampling rate	500 kHz/channel[1]
Range	±10 V
Input resolution	12, 16, or 18 bits[1]

Bode Analyzer

Frequency and phase plots
Frequency range and step control
Logarithmic or linear frequency spacing
Data storage, cursors, autoscaling

Frequency range	5 Hz to 35 kHz[1]

Dynamic Signal Analyzer

Input range	±10 V
Input resolution	12, 16, or 18 bits[1]

Impedance Analyzer

Measurement frequency range	5 Hz to 35 kHz

2-Wire Current Voltage Analyzer

Voltage range	±10 V
Current range	±10 mA

3-Wire Current Voltage Analyzer

NPN BJT transistor only
Data storage, cursors, autoscaling

Maximum collector voltage	10 V
Base current resolution	1 µA (16-bit analog output) 15 µA (12-bit analog output)

Digital Multimeter

Resistance

Accuracy	1%
Range	5 Ω to 3 M Ω

DC Voltage

Accuracy	0.3%
Range	±20 V
Input impedance	1 M Ω

AC Voltage

Accuracy	0.3%
Range	±14 V_{rms}

Current

DC accuracy	0.25% ±3 mA[2]
AC accuracy	0.25% ±3 mA[2]
Range	±250 mA
Shunt resistance	0.5 Ω
Maximum common-mode voltage	±20 V
Common-mode rejection	70 dB

Capacitance

Accuracy	2%
Range	50 pF to 500 µF
Test voltage range	1 V_{pp}

Continuity

Resistance threshold	15 Ω max

Inductance

Accuracy	1%
Range	100 µH to 100 mH
Test frequency	950 Hz
Test frequency voltage	1 V_{pp}

Digital I/O

Digital input resolution	8 bits
Digital output resolution	8 bits
Digital addressing	4 bits

Source

Function Generator

Manual or software control
Sine, triangle, square waveforms
Frequency sweep
TTL sync pulse out
AM, FM modulation

Frequency range	5 Hz to 250 kHz
Frequency accuracy	3%
Output amplitude	±2.5 V
Software amplitude resolution	8 bits
Offset range	±5 V
AM voltage	10 V max
Amplitude modulation	Up to 100%
FM voltage	10 V max

Amplitude Flatness

To 50 kHz	0.5 dB
To 250 kHz	3 dB

Arbitrary Waveform Generator

Channels	2, 1-shot or continuous generation

[1]Specification depends on data acquisition device functionality.

[2]Proper null correction at the common-mode voltage can reduce ±3 mA error to 200 µA noise.

Waveform Editor

Amplitude	±10 V
Frequency range	DC to 100 kHz[1]
Output drive current	25 mA max
Output impedance	1
Slew rate	1.5 V/µs

Power Supplies

+15 V

Output current	Self-resetting circuitry, not to shut down at or below 500 mA
Output voltage	15 V at ±5% no load
Line regulation	0.5% max
Load regulation	1% typ, 5% max 0 to full load[2]
Ripple and noise	1%

-15 V

Output current	Self-resetting circuitry, not to shut down at or below 500 mA[2]
Output voltage	-15 V at ±5% no load
Line regulation	0.5% max
Load regulation	1% typ, 5% max 0 to full load[2]
Ripple and noise	1%

+5 V

Output current	Self-resetting circuitry, not to shut down at or below 2 A
Output voltage	+5 V at ±5% no load
Line regulation	0.50% max
Load regulation	22% typ, 30% max 0 to full load[2]
Ripple and noise	1%

Variable Power Supplies

0 to +12 and -12 V

Ripple and noise	0.25%
Software resolution	7 bits
Current limiting	0.5 V at 130 mA, 5 V at 275 mA, 12 V at 450 mA

Safety and Compliance

Safety

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CAN/CSA-C22.2 No. 61010-1

Note: For UL and other safety certifications, refer to the product label or visit **ni.com/certification**, search by model number or product line, and click the appropriate link in the Certification column.

Electromagnetic Compatibility

This product is designed to meet the requirements of the following standards of EMC for electrical equipment for measurement, control, and laboratory use:

- EN 61326 EMC requirements; Minimum Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A

Note: For EMC compliance, operate this device according to product documentation.

CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 73/23/EEC; Low-Voltage Directive (safety)
- 89/336/EEC; Electromagnetic Compatibility Directive (EMC)

Note: Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit **ni.com/certification**, search by model number or product line, and click the appropriate link in the Certification column.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers: At the end of their life cycle, all products must be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit **ni.com/environment/weee.htm**.

[1]Specification depends on data acquisition device functionality.

[2]Proper null correction at the common-mode voltage can reduce ±3 mA error to 200 µA noise.

NI Services and Support

NI has the services and support to meet your needs around the globe and through the application life cycle – from planning and development through deployment and ongoing maintenance. We offer services and service levels to meet customer requirements in research, design, validation, and manufacturing. Visit **ni.com/services**.

Training and Certification

NI training is the fastest, most certain route to productivity with our products. NI training can shorten your learning curve, save development time, and reduce maintenance costs over the application life cycle. We schedule instructor-led courses in cities worldwide, or we can hold a course at your facility. We also offer a professional certification program that identifies individuals who have high levels of skill and knowledge on using NI products. Visit **ni.com/training**.

Professional Services

Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide National Instruments Alliance Partner program of more than 600 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit **ni.com/alliance**.

NATIONAL INSTRUMENTS™
Certified Alliance Partner

OEM Support

We offer design-in consulting and product integration assistance if you want to use our products for OEM applications. For information about special pricing and services for OEM customers, visit **ni.com/oem**.

Local Sales and Technical Support

In offices worldwide, our staff is local to the country, giving you access to engineers who speak your language. NI delivers industry-leading technical support through online knowledge bases, our applications engineers, and access to 14,000 measurement and automation professionals within NI Developer Exchange forums. Find immediate answers to your questions at **ni.com/support**.

We also offer service programs that provide automatic upgrades to your application development environment and higher levels of technical support. Visit **ni.com/ssp**.

Hardware Services

NI Factory Installation Services

NI Factory Installation Services (FIS) is the fastest and easiest way to use your PXI or PXI/SCXI combination systems right out of the box. Trained NI technicians install the software and hardware and configure the system to your specifications. NI extends the standard warranty by one year on hardware components (controllers, chassis, modules) purchased with FIS. To use FIS, simply configure your system online with **ni.com/pxiadvisor**.

Calibration Services

NI recognizes the need to maintain properly calibrated devices for high-accuracy measurements. We provide manual calibration procedures, services to recalibrate your products, and automated calibration software specifically designed for use by metrology laboratories. Visit **ni.com/calibration**.

Repair and Extended Warranty

NI provides complete repair services for our products. Express repair and advance replacement services are also available. We offer extended warranties to help you meet project life-cycle requirements. Visit **ni.com/services**.

NATIONAL INSTRUMENTS™

ni.com • (800) 813 3693
National Instruments • info@ni.com

351370A-01 2006-7152-305-101-D

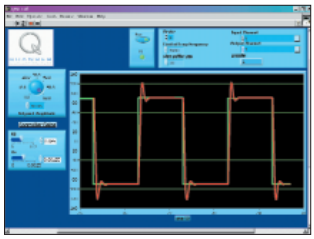
QUANSER
INNOVATE. EDUCATE.

QUANSER ENGINEERING TRAINERS FOR NI ELVIS (QNET)

LabVIEW

QNET - 011: Rotary Inverted Pendulum

NEW!
Available in NI-ELVIS Bundle see ni.com for pricing!



Description

The QNET Rotary Inverted Pendulum offers students the opportunity to balance a vertical rod at the tip of a rotating arm using a DC motor. This is a classic pendulum control experiment that can now be performed using the NI ELVIS Workstation & LabVIEW software.

Key Features

Reliable & Versatile
- Durable DC servo motor
- Built-in power supply
- High resolution optical encoders to sense positions

Convenient
- Plug-and-play design facilitates quick & easy lab setup
- Compact & easy to store

Comprehensive
- Covers a wide range of curriculum topics
- Complete documentation provided through user manuals and setup guides

Compatible
- Full compatibility with NI ELVIS & LabVIEW
- Full compatibility with NI LabVIEW Report Generation Toolkit

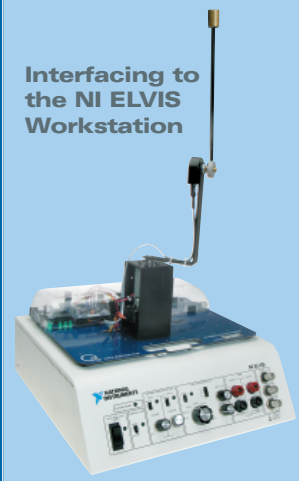
Practical Controller Implementations

- Unstable systems
- Tracking Control & Regulation
- Full State-Feedback
- Observer Design & Implementation
- Disturbance Rejection
- System Modeling & Simulation
- Pole-Placement Technique
- Root Locus Design
- Nyquist Stability
- Non-Minimum Phase
- Limit Cycle
- Real-Time Control
- Discrete Time Sampling
- System Identification
- Multivariable Control Design

System Parameters

Motor		
Torque constant	0.052	Nm/Amp
Terminal resistance	10.6	Ohm
Terminal Inductance	0.82	mHenry
Rotor Inertia	11.6	gm-cm2
Max Torque	0.07	Nm
Linear Amplifier		
Gain	2.0	V / V
Max output voltage	15	V
Max current	1.5	Ampere
Max output power	22	Watt
Max dissipated power (with heat sink) Rload = 4 Ohm	8	Watt
Current sense resistor		
Current sensitivity	2.0	Volt / Amp
Encoders		
Lines per revolution	1024	Lines
Resolution- Quadrature	0.0879	Deg / count
Type		TTL
Signals		A, B
Pendulum		
Pendulum Length	21	cm.
Pendulum Mass	20	grams
Coupling Arm Length	9	cm.

Interfacing to the NI ELVIS Workstation



The following connections are automatically achieved when the QNET-011 system is plugged in:

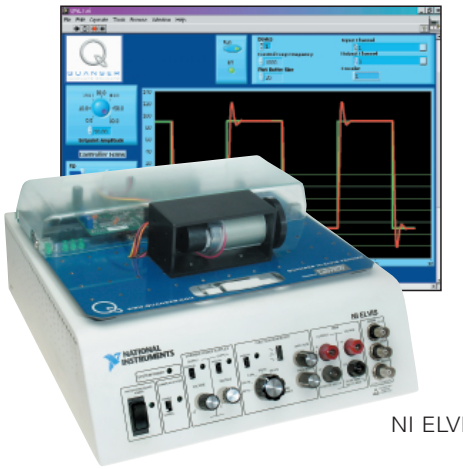
NI E-Series DAQ	Signal range	Signal
Inputs		
Analog input #0	± 10 V	Current measurement
Counter #0	TTL	Motor Encoder
Counter #1	TTL	Pendulum Encoder
Output		
Analog output #0	± 10 V	Amplifier command

Specifications subject to change without notice

QUANSER
INNOVATE. EDUCATE.

QUANSER ENGINEERING TRAINERS FOR NI ELVIS (QNET)

QNET Series



Description

The Quanser Engineering Trainers for NI ELVIS (QNET) Series is a new line of training equipment that considerably increases the value of your investment in NI ELVIS & LabVIEW software. Designed to connect easily to the NI ELVIS Workstation in place of the standard prototype board, these cost-effective, plug-and-play boards significantly extend the functionality of the NI platform. A wide range of control experiments that feature hardware-in-the-loop operation can be conducted in the lab environment. Fully compatible with NI ELVIS & LabVIEW, the QNET series is formally endorsed by National Instruments.

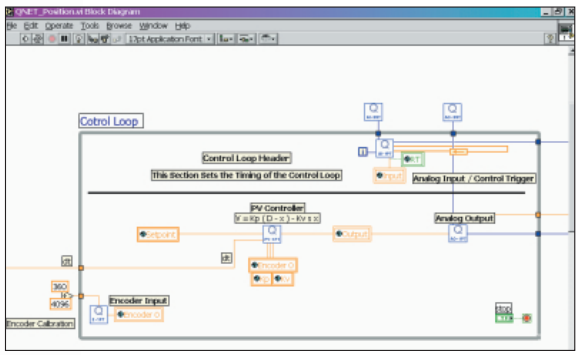
NI ELVIS Workstation and LabVIEW available from National Instruments

Why QNET?

- **Maximize The Value Of Your Investment In NI ELVIS & LabVIEW**
  QNET extends the functionality of NI ELVIS & LabVIEW through instrumented training boards that can be easily connected to the Workstation and which facilitate a diverse range of control experiments.
- **Dramatically Reduce Lab Planning Time**
  With a comprehensive set of prepackaged curriculum material, the burden to develop lab material is alleviated.
- **Optimize Lab Facilities for Multiple Experiment Use**
  The plug-and-play feature makes it easy to setup and switch experiments in a matter of minutes, resulting in optimal use of your facilities.
- **Advance Learning & Facilitate Greater Insight into Engineering Concepts**
  With hardware-in-the-loop implementations, students get hands-on, practical experience in the important aspects of engineering practice. This spurs student interest and motivation, and ultimately improves the quality of education students receive.
- **Lower Total Cost of Ownership**
  Quanser's and National Instrument's unparalleled academic-based support ensure technical questions are resolved in a timely fashion, allowing professors & teaching assistants to focus on other, higher-value tasks.

About NI ELVIS :

NI ELVIS is a LabVIEW-based platform designed to provide an integrated and flexible environment that enhances measurement, design, and prototyping in an educational laboratory. NI ELVIS integrates LabVIEW software, a multifunction data acquisition board, and the NI ELVIS Workstation to build a suite of virtual instruments. **visit http://www.ni.com/academic**



QNET Product Range

- DC Motor Control
- Rotary Inverted Pendulum
- HVAC Trainer