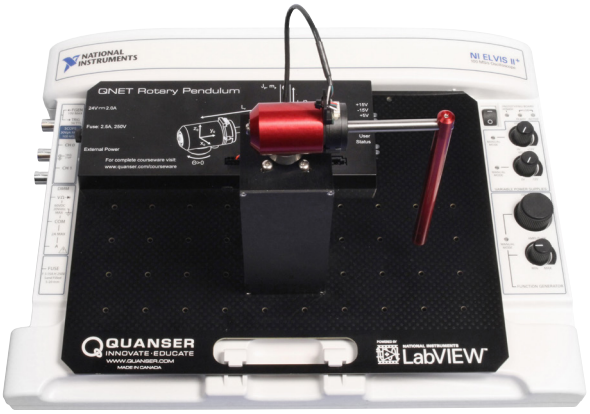
QNET 2.0 ROTARY PENDULUM BOARD FOR NI ELVIS

Classic pendulum control experiment designed for NI ELVIS platform and LabVIEW™ software, ideal for undergraduate laboratories.

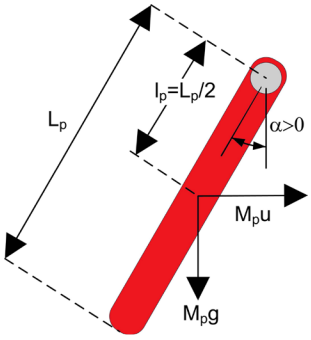


NI Part No. 783650-01

System specifications on reverse page.

TEACH FUNDAMENTALS OF ROTARY PENDULUM CONTROL

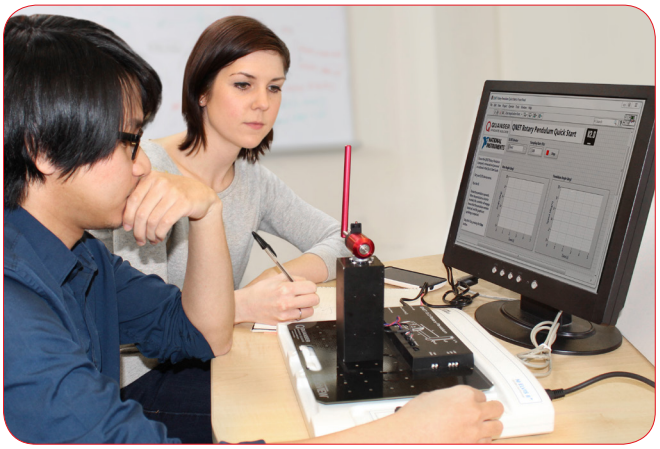
The Quanser QNET 2.0 Rotary Pendulum board is a versatile servo system designed to teach and demonstrate the fundamentals of inverted pendulum balance and control. Designed exclusively for NI ELVIS platform and LabVIEW™ software, the system can easily be configured to demonstrate various control techniques, including LQR and hybrid swing up.



Free-body diagram of pendulum

HOW IT WORKS

The QNET 2.0 Rotary Pendulum board consists of a direct-drive DC motor mounted vertically in a solid aluminum frame and a pendulum suspended on a horizontal axis at the end of a L-shaped arm. The arm is connected to the motor shaft and pivots between ±180 degrees. The control variable is the input voltage to the pulse-width modulated (PWM) amplifier that drives the motor. The output variables are the angle of the pendulum and the angular position of the DC motor, measured by single-ended rotary encoders.



Students learn how to model a pendulum, design and implement controllers to swing up and balance the pendulum in the upright position.

QNET 2.0 ROTARY PENDULUM WORKSTATION COMPONENTS

- QNET 2.0 Rotary Pendulum board
- NI ELVIS II or ELVIS II+[1]
- ABET-aligned course resources with comprehensive lab exercises, fully documented system models, and pre-designed VIs

ACCELERATE DISCOVERY WITH NI ELVIS PLATFORM

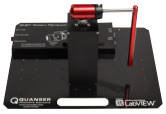
The NI Educational Laboratory Virtual Instrumentation Suite (NI ELVIS) presents a modular teaching platform suitable for any engineering lab. Integrating 12 most commonly used instruments, including an oscilloscope, digital multimeter, function generator, dynamic signal analyzer in one device allows for quick and easy measurement, design and prototyping in an educational laboratory setting.

With a wide range of Quanser plug-and-play add-on boards for NI ELVIS, you can give students a great lab experience, and increases the value of your investment in NI ELVIS and LabVIEW software. Plus the comprehensive courseware reduces your lab planning time and allows you to focus on higher-value tasks.

For the full range of Quanser QNET boards, visit www.quanser.com

Teach Mechatronics

Teach Controls

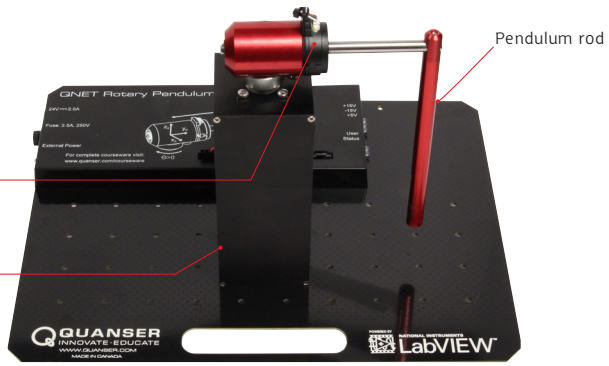


Teach Power Electronics

[1] Can be purchased directly from Quanser in selected regions. For details contact sales@quanser.com

SYSTEM SPECIFICATIONS

QNET 2.0 ROTARY PENDULUM BOARD



FEATURES

- Durable DC servo motor
- Built-in PWM amplifier with linear response
- High resolution optical encoders to sense to sense motor and pendulum positions
- Built-in PCI connector for NI ELVIS II /ELVIS II+ for quick and easy lab setup
- Fully compatible with LabVIEW™
- Fully documented system models and parameters provided for LabVIEW™
- Comprehensive digital course resources aligned with ABET requirements
- Additional community-created resources available on www.QuanserShare.com

COURSEWARE TOPICS COVERED

- System modeling
- Parameter estimation
- State-feedback balance control
- LQR optimization
- Non-minimum phase
- Friction compensation
- Non-linear swing up control
- Energy-based control
- Hybrid control

DEVICE SPECIFICATION

Rotary pendulum link length	12.9 cm
DC motor nominal input voltage	18 V
DC motor nominal speed	3050 rpm
DC motor nominal current	0.54 A
DC motor terminal resistance	8.4 Ω
DC motor rotor inertia	4.0 x 10^{-6} kg.m^2
Encoders line count	512 lines/rev
Encoders line count (in quadrature)	2048 lines/rev
Encoders resolution (in quadrature)	0.176 deg/count
Amplifier type	PWM
Amplifier peak current	2.5 A
Amplifier continuous current	0.5 A
Amplifier output voltage	± 24 V with 42% duty cycle limit (± 10 V)

About Quanser:
Quanser is the world leader in education and research for real-time control design and implementation. We specialize in outfitting engineering control laboratories to help universities captivate the brightest minds, motivate them to success and produce graduates with industry-relevant skills. Universities worldwide implement Quanser's open architecture control solutions, industry-relevant curriculum and cutting-edge work stations to teach Introductory, Intermediate or Advanced controls to students in Electrical, Mechanical, Mechatronics, Robotics, Aerospace, Civil, and various other engineering disciplines.