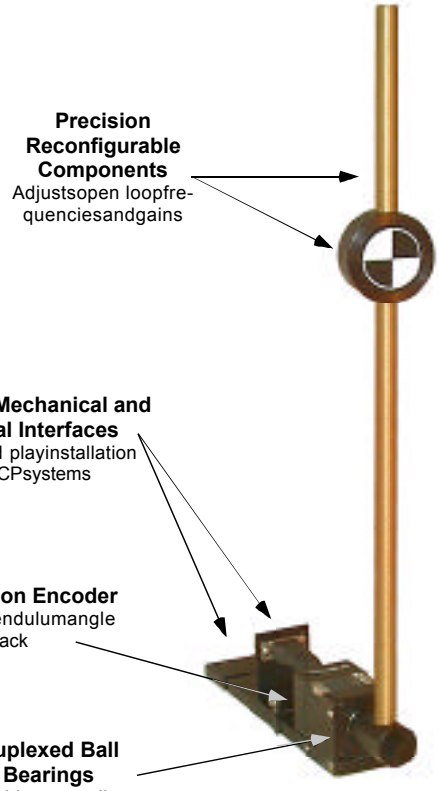
Inverted Pendulum Accessory

A Second Pendulum Option From ECP: Modular System Add-on



Precision Reconfigurable Components
Adjustsopen loopfre-quenciesandgains

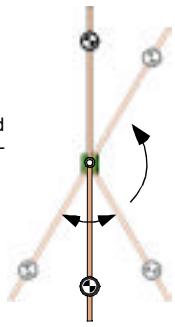
Universal Mechanical and Electrical Interfaces
Forplugand playinstallation with ECPsystems

High Resolution Encoder
Givesprecisependulumangle feedback

Duplexed Ball Bearings
Providesruggedlow frictionpivot

Self-Erecting, Inverted & Noninverted Operation

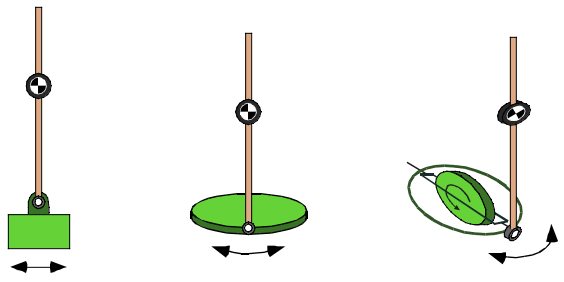
Lets you control open loop stable and unstable systems and dynamically transition between thetwo



Fully Adjustable Dynamic Parameters

Adjustable pendulum weight, rod length, andbaseinertiaare idealforstudyingcontrol robustness and supporting multiple studentassignmentswith same equipment

Easily Adapts to Most ECP Plants



Translating Base
(Model210Plant)

RotatingBase
(Model205&220 Plants)

Gyro-Actuated
(Model750Plant)

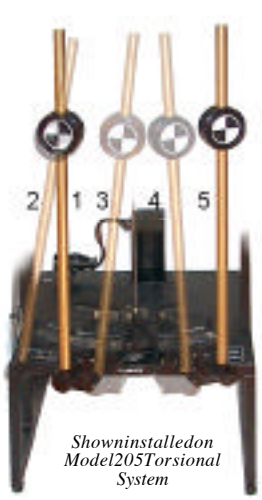
Our inverted pendulum accessory is a cost effective way to enhance your laboratory's capability. It has a wealth of features not found in any other commercially available inverted pendulum apparatus. Precision construction, fully adjustable dynamic parameters, and easy installation make it a valuable addition to any control systems laboratory. As with all ECP systems, complete dynamic models and example controllers are provided along with Matlab® scripts, for easy control modeling and design. The Executive USR® program lets you easily implement control and characterize the system via transient response, frequency response, stability and parameter robustness test features. With provided controllers and plug-and play installation you will get the system up and running in just minutes and perform interesting experiments the very same day!

Two Pendulum Solutions From ECP

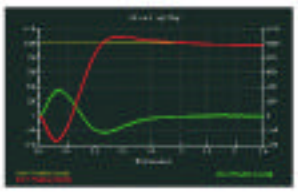
ECP now offers two pendulum choices. Our ECP Inverted pendulum (Model 505) is a stand-alone system with unique dynamic characteristics (right half plane zeros and poles). This system has proven itself in 10 years of reliable in-field use and offers one of the lowest cost solutions for a stand-alone experiment commercially available. The Pendulum Accessory (A51) described on this page is based on the classical inverted pendulum model and adds on to other stand-alone ECP systems using their actuators, base feedback, and electronics.

Stimulating Experiments

(Example: High Bandwidth Step Response)



Showninstalledon Model205Torsional System



Commandedposition(yellow),Base Position(red)andPendulumAngle (green)testdatashowclassical responsecharacteristics

A high bandwidth stabilizing controller regulates the base position. In the step response, the base makes an initial rapid reverse motion (nonminimum phase controller) [2], then moves in a positive direction [3] and overtakes the rod [4], to decelerate it and come to a final position [5]. The maneuver is complete in 0.8 seconds.