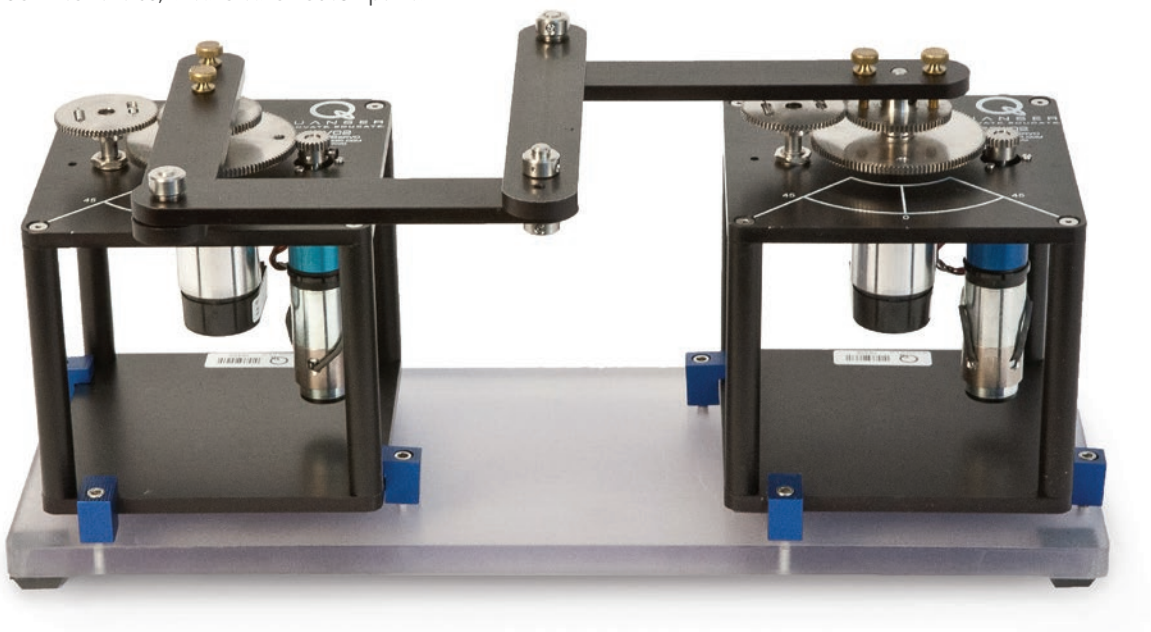
2 DOF ROBOT WORKSTATION

The Two Degrees of Freedom (2 DOF) Robot module helps students learn the fundamentals of robotics. When mounted on two Rotary Servo Base Units, you obtain a four-bar linkage robot. Students can learn real-world robotic concepts such forward and inverse kinematics, and end effector planar position control.



The 2 DOF Robot is particularly suitable for teaching intermediate robotic principles. It can be expanded to allow teaching of the 2 DOF Inverted Pendulum experiment. Applications of the 2 DOF Robot typically are pick-and-place robots used in manufacturing lines, such as PCB printing.

"My students use Quanser modules as a rapid prototype to choose and analyze different control scenarios. They start doing experiments very quickly."

Dr. Roxana Saint-Nom,
Electrical Engineering Department Chair,
CAERCEM Researcher,
Buenos Aires Institute of Technology, Argentina

HOW IT WORKS

The 2 DOF Robot module is connected to two Rotary Servo Base Units, which are mounted at a fixed distance and control a 4-bar linkage system: two powered arms coupled through two non-powered arms. The system is planar and has two actuated and three unactuated revolute joints.

The goal of the 2 DOF Robot experiment is to manipulate the X-Y position of a four-bar linkage end effector. Such a system is similar to the kinematic problems encountered in the control of other parallel mechanisms that have singularities.

A popular application of the 2 DOF Robot experiment is the pick-and-place robot used in manufacturing lines.

WORKSTATION COMPONENTS 2 DOF ROBOT EXPERIMENT

Component	Description
Plant	• 2 x Servo Base Unit (SRV02) • 2 DOF Robot module
Controller Design Environment[1]	• Quanser QUARC® add-on for MATLAB®/Simulink® • Quanser RCP Toolkit add-on for NI LabVIEW™
Documentation	• Instructor workbook* • Student workbook* • User Manual* • Quick Start Guide
Real-Time Targets[1]	• Microsoft Windows®
Data Acquisition Board[2]	• Quanser Q2-USB
Amplifier	• Quanser VoltPAQ-X2
Others	• Complete dynamic model • Simulink® pre-designed controllers • LabVIEW™ pre-designed controllers

Using LabVIEW™? This experiment can also be configured with NI myRIO and CompactRIO. For details contact Quanser@NI.com

SYSTEM SPECIFICATIONS 2 DOF ROBOT MODULE

CURRICULUM TOPICS PROVIDED

Model Topics
- Transfer function representation
- Kinematics

Control Topic
- PD

FEATURES

- 4-bar precision-crafted aluminum linkage system
- Can mount the 2 DOF Inverted Pendulum module for additional experiments (sold separately)
- 2 DOF robot module easily attaches to the Rotary Servo Base Unit
- Easy-connect cables and connectors
- Fully compatible with MATLAB®/Simulink® and LabVIEW™
- Fully documented system models and parameters provided for MATLAB®, Simulink®, LabVIEW™ and Maple™
- Open architecture design, allowing users to design their own controller

DEVICE SPECIFICATIONS

SPECIFICATION	VALUE	UNITS
Mass of 4-bar Linkage Module	0.335	kg
Mass of Single Link	0.065	kg
Length of Link	0.127	m
Link Moment of Inertia about Cog	8.74×10^{-5}	$kg.m^2$
Link Moment of Inertia about Pivot	3.49×10^{-4}	$kg.m^2$
2 DOF Robot Overall Dimensions (L x W x H)	40 x 30 x 20	cm
2 DOF Robot Total Mass	4.0	kg

* Hard copies are not included. Documentation is supplied in electronic format on a CD
[1] MATLAB®/Simulink®, LabVIEW™ and Microsoft Windows® license needs to be purchased separately
[2] Quanser QPIDe (PCIe-based data acquisition devices) is recommended when a deterministic real-time performance is required

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