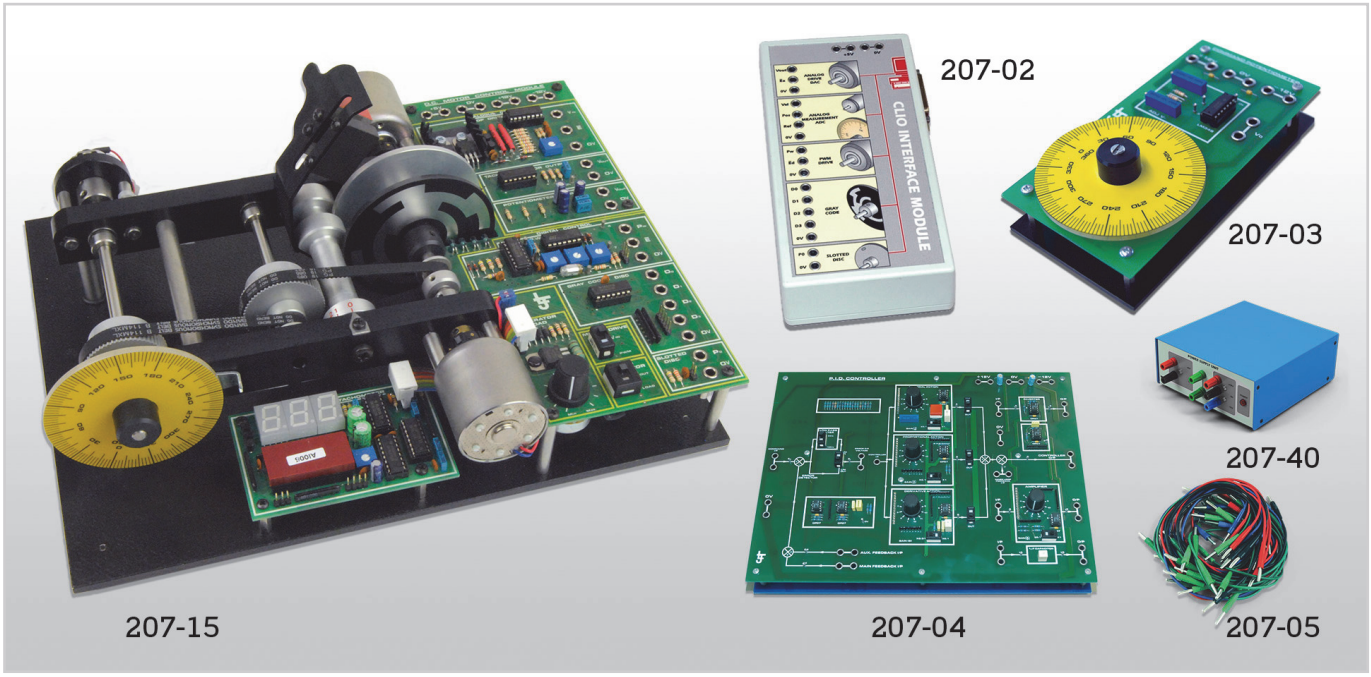
Product Information Sheet

Analogue and Digital Motor Control Teaching Set



This combined teaching set provides a complete solution to teaching analog and digital motor control.

The comprehensive teaching set includes a DC motor control module, command potentiometer, PID controller module, input/output interface module, and PDF format curriculum manuals. A power supply unit and connection leads are also provided.

The DC motor module is connected to a computer via a high-speed digital interface. Software is then used to provide a rich graphical environment to study the performance of speed and position control systems using both analog and digital transducers.

The mechanical unit is fitted with incremental and absolute (Gray) encoders. The motor can be controlled via a proportional voltage input or via a Pulse-Width Modulated (PWM) input. Conventional analog tacho generator and potentiometer feedback is also provided, interfaced to the computer via analog to digital converters.

The software provides a graphical environment in which the performance of the control system can be displayed and then analyzed. The software can also be used with a simulated servo system or process plant for further study.

Topics include:

- The Digital Storage Oscilloscope
- Transient and Steady State Response
- Proportional Speed Control
- Proportional Position Control
- Second Order Response Parameters
- Velocity and Transient Velocity Feedback
- Controller Characteristics
- Integral Speed Control
- Proportional Plus Integral Speed Control
- Proportional Plus Integral Plus Derivative Position Control
- Instability
- Introduction to Control Systems
- Time Response
- Frequency Response
- Principles of Feedback
- Proportional Position Control
- Behavior of Second Order Systems
- Positional Control with Velocity Feedback
- Three-Term or PID Control
- Stability
- The Use of Computers for Control
- Analog Interfacing
- Direct Digital Control
- Digital Interfacing

Typical activities include:

- Describe the Main Elements of a PID Controller
- Investigate the data capture features of a digital storage oscilloscope.
- Conduct simple step, ramp, and frequency response tests.
- Demonstrate Proportional Speed control.
- Outline the reasons for adding velocity feedback.
- Demonstrate the change in following error when transient velocity feedback replaces velocity feedback.
- Discuss the effects of noise when subjected to derivative action.
- Demonstrate various combinations of PID control.
- Demonstrate the stabilizing effect of a proportional action on a system controlled with integral action.
- Operate the software controls to drive the DC Motor and observe its behavior.
- Measure the parameters of a plant using step tests.
- Account for the excellent steady state performance of a proportional servo position system.
- Set up a servo system to respond to ramp inputs using proportional gain and transient velocity feedback.

LJ Create –Product Information Sheet (Continued)

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- Show how positive feedback can occur in a negative feedback system.
- Explain Gain Margin and Phase Margin.
- Describe the advantages and disadvantages of using computers in real-time control.
- Outline the problems arising from low resolution and slow sampling.
- Describe Gray code position measurement and other absolute and relative digital position measurement techniques.

The Virtual Control Laboratory software will allow the control and monitoring of a DC motor module and command potentiometer, and it includes the following items:

- Real time Windows based Virtual
- Control Laboratory software
- CLIO Control laboratory input/output
- interface module
- Parallel interface lead for connection
- between the interface module and the PC

The software allows the user to divide the screen into four independently configurable sections:

- Control Reference signal
- Controller
- Plant
- Display

The control reference signal can be set from an internal signal generator that can provide sine, step, ramp, sawtooth, random, DC level and pulse waveforms.

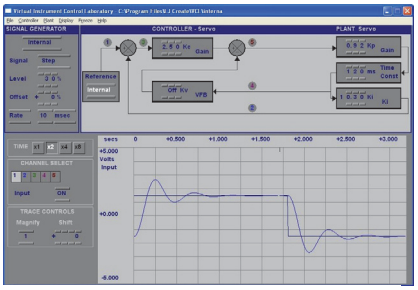
The controller is also capable of being set to open, proportional, servo and PID modes.

The output signal from the CLIO module capable of:

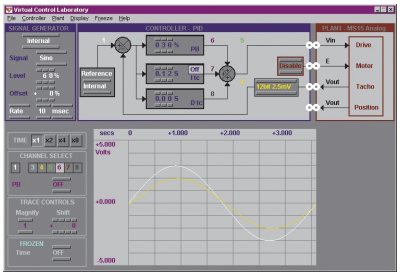
- Outputting an analog signal while measuring voltages representing motor position and velocity
- Outputting a PWM signal while measuring position and velocity using gray code and slotted disks
- Simulating a servo system by providing output and velocity signals
- Simulating a 2nd order system without an integrator

The display is able to show eight channels in real time. The channels are color-coded and can be being switched independently off if required. The display information can be frozen and exported in Excel or Matlab format, as well as a text file.

The interface module has a power requirement of +5V at 100mA.



Step Response Example Screen



PID Control Example Screen

Items Included:

- 207-02 Virtual Control Laboratory
- 207-03 Command Potentiometer
- 207-04 PID Controller Module
- 207-05 4mm Connection Leads
- 207-15 D.C. Motor Control Module
- 207-40 Power Supply
- Curriculum manuals in PDF format

Other Items Required:

- Windows-based Computer
- Dual Trace Oscilloscope
- Function Generator
- Multimeter

General Information:

Weight: 8.5 kg
Dimensions: See individual info
Supply Voltage: 50-60Hz 110-120V AC or 220-240V AC
Packed Volume: 0.05 m^3
Packed Weight: 10.1 kg

Order Code: 207-00

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