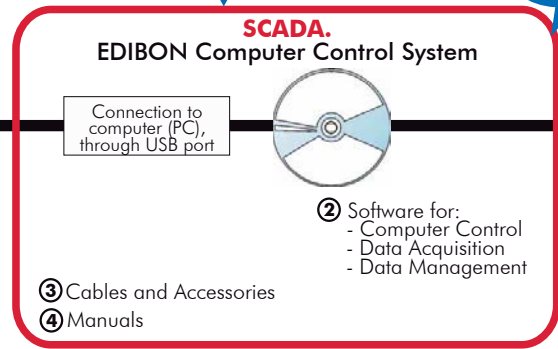


EDIBON PATENT

Always included in the supply:



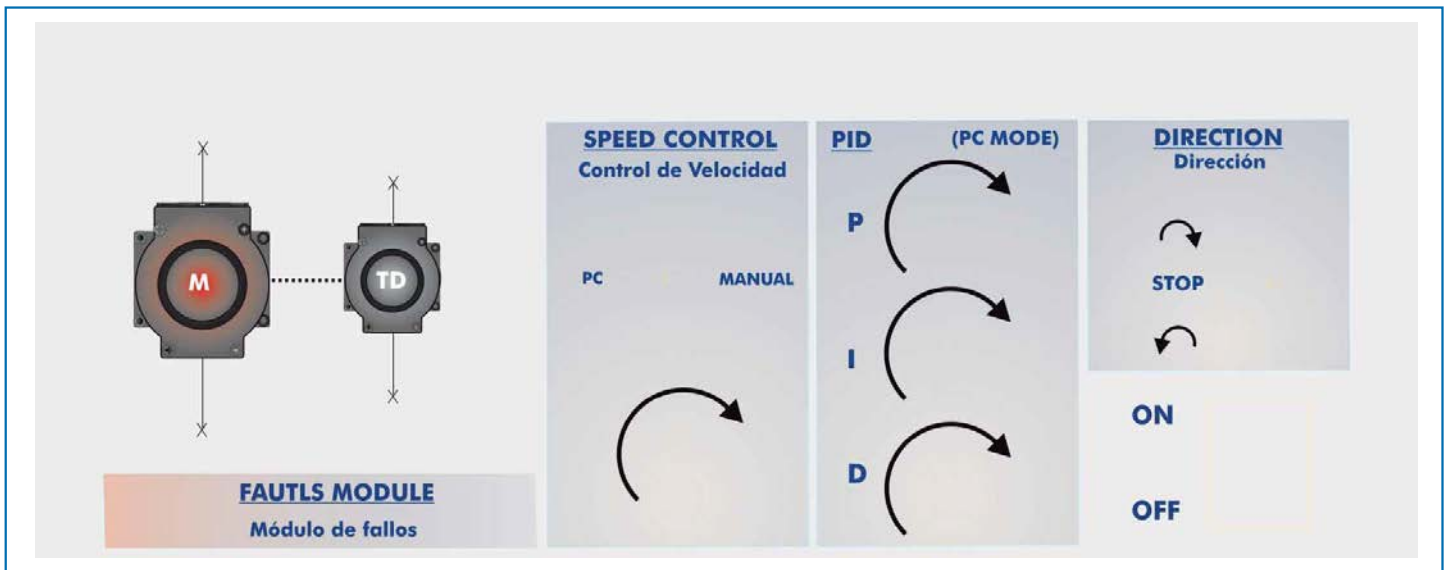
① Unit: SERIN/CCB. Servosystems Trainer (DC motors)



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- ↳ Units
- ↳ 2.-Electronics

PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION



DESCRIPTION

"SERIN/CCB" is an unit whose goal is studying low power servo systems. It is a low power DC motor speed control trainer that has a breakdown simulator.

This trainer is a basic version of the Advanced and Computerised "SERIN/CC" Trainer, being advisable for an introductory study of closed and open loop control systems.

It consists of an electromechanical unit with an DC motor and a tachometer, attached through an inertial wheel, mounted on a steel box that contains the power stage and the acquisition and control board, as well as the supervision and control software.

This set allows open and closed loop control, control and generation of command variable, ramp generator, proportional error amplifier and PID, current limiter, PWM modulator, turn inversion control, start and stop control, braking control, and breakdown simulator, that allows introducing a great number of dysfunctions so that students may diagnose nature and location of the fault, without risking the integrity of the equipment.

Unit control may be done manually, on the unit itself, basically or in a more advance way through the control software SCADA. This control software can do two kinds of control: Open-loop and Closed-loop control.

The base unit has four different parts as seen on the front panel:

- Connection zone for motor and tachogenerator.
- Manual or Computerised Speed control. There is a lever-like switch for selecting the kind of control.
- PID zone. Here, the values of the PID constants can be manipulated (Proportional, Integral and Derivative). This functionality is only available for PC mode, the speed control lever has to point to PC.
- Turning and stop control zone. Allows changing the turning sense and stopping the motor.

Simple integrated circuits to be able to analyse independently each functional stage.

Visible components with 2 mm connectors for voltage and current measurement.

Control through PWM pulses and power stage configured with MOSFET transistors.

SPECIFICACIONES

The trainer includes:

Base Unit:

Steel box.

Diagram in the front panel with similar distribution to the elements in the real unit.

Electromechanic unit.

Tachometric adaptor.

Generation and control of set point.

Ramp generator, as well as sinusoidal, triangular and square wave generator.

PWM modulator.

Open loop control.

Close loop control:

Proportional Control (P).

Integrative Proportional Control (PI).

Proportional derivative Control (PD).

Proportional Integrative derivative control (PID).

Current limiter.

Turn inversion control.

Stop/starting control.

Power stage and excitation of the power stage.

Brake control.

Fault simulator that allows the entries of a considerable amount of dysfunctions in order to the students diagnose its nature and find out the components that cause them. Without taking risks to provoke any damage in the unit.

Type of faults included in the unit:

Fault 1: The absolute value of the feedback signal from the tachogenerator is not calculated for its subtraction from the reference, thus, for one of the turning senses, the error is wrong.

Fault 2: The value of the Proportional constant of the PID is divided by ten with the user unable to detect it but its effect.

Fault 3: The value of the Integral constant of the PID is divided by ten with the user unable to detect it but its effect.

Fault 4: The value of the Derivative constant of the PID is divided by ten with the user unable to detect it but its effect.

Fault 5: The signal from the tachogenerator is modified, making the PID control to believe that the speed is ten times lower to the real one.

None of these faults are exclusive, being possible to combine them.

Direct current motor (DC) and tachometric generator.

Computer Control Software.

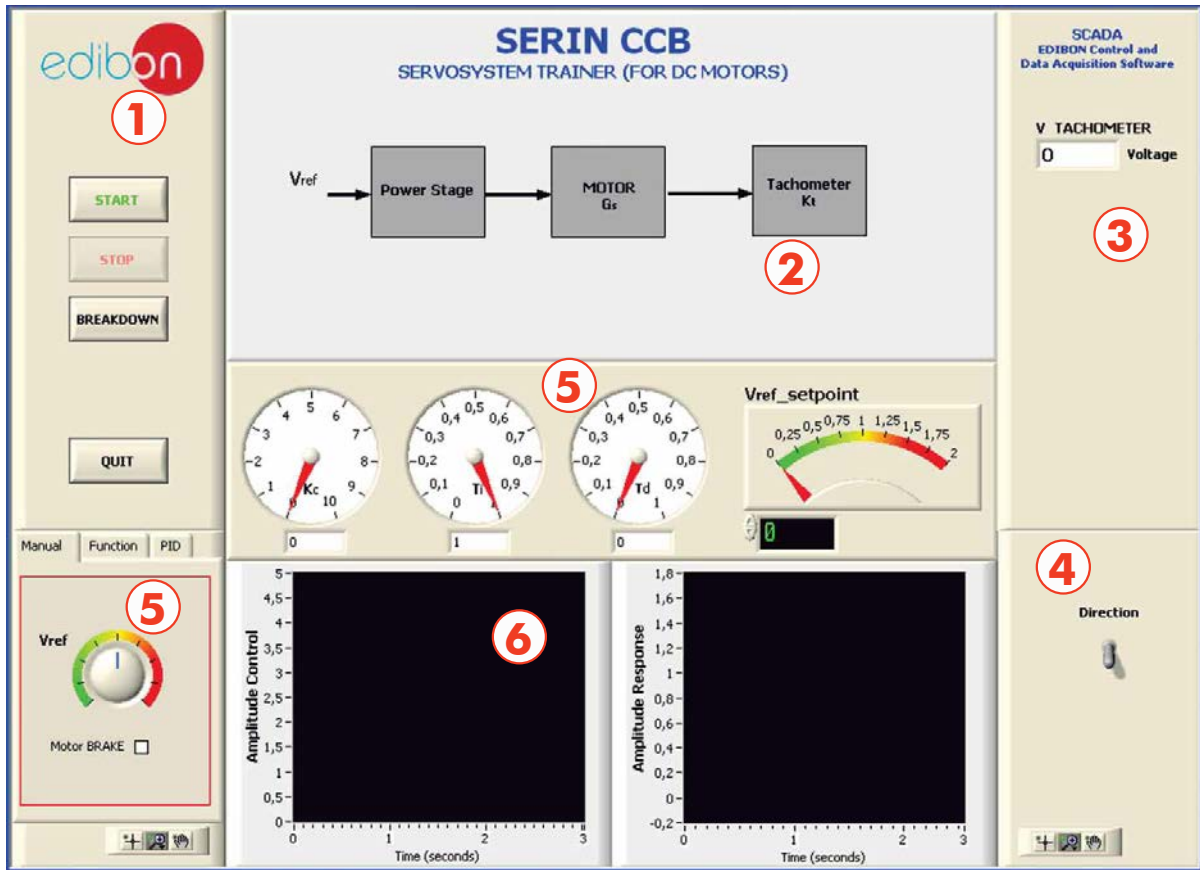
Cables and accessories, necessary for its correct operation.

Manuals:

This unit is supplied with several manuals: Required Services, Assembly and Installation, Starting-up, Safety, Interface and Control Software, Maintenance & Practices and simulation of faults Manuals.

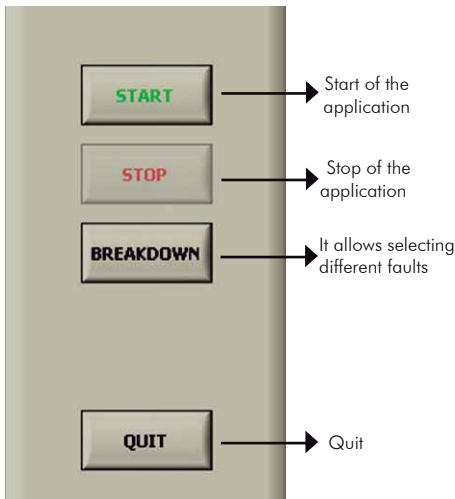
Software Main Screens

Main screen

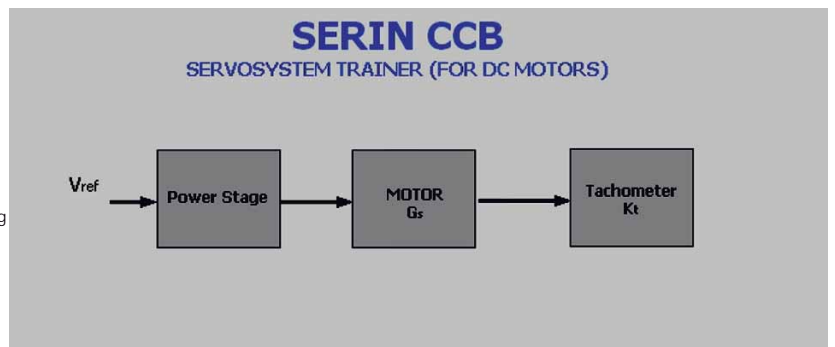


The application has several parts:

① **Actions:**



② **Equipment Diagram:**

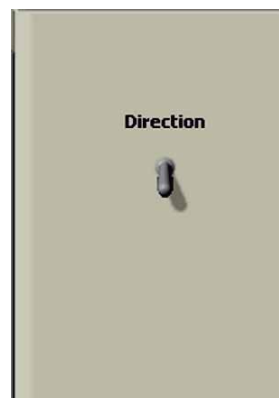


Note: The diagram changes according to the selected control (see part ⑤)

③ **Speed sensor. Tachogenerator:**



④ **Change of turning direction of the motor:**



Continue...

Software Main Screens (continuation)

⑤ **Controls:**

Open Loop Controls:

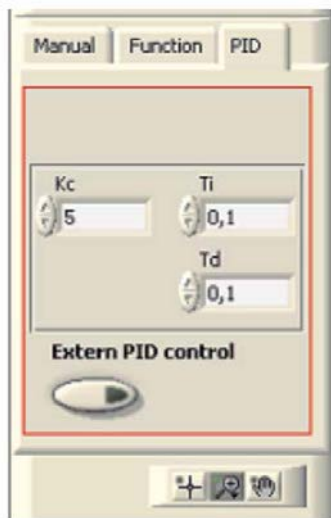


Manual Control from Software

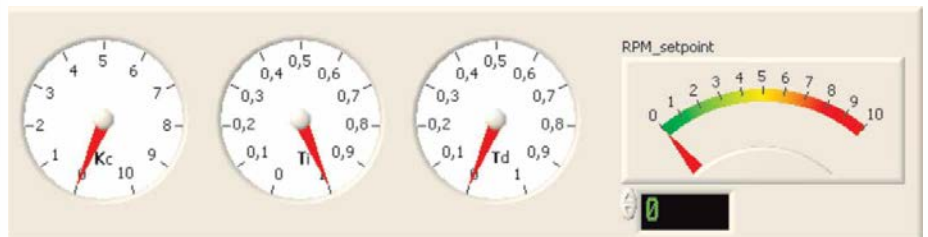


Functions Generator

Closed Loop Controls:

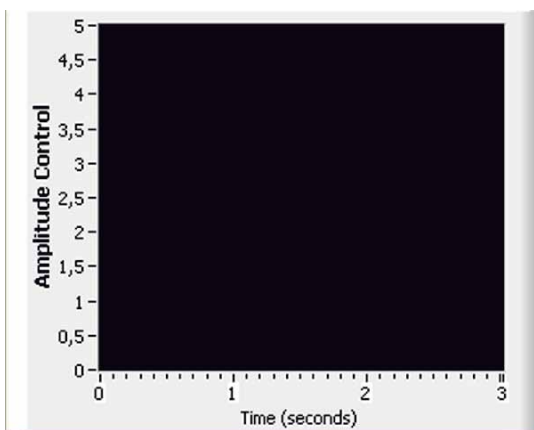


PID Control

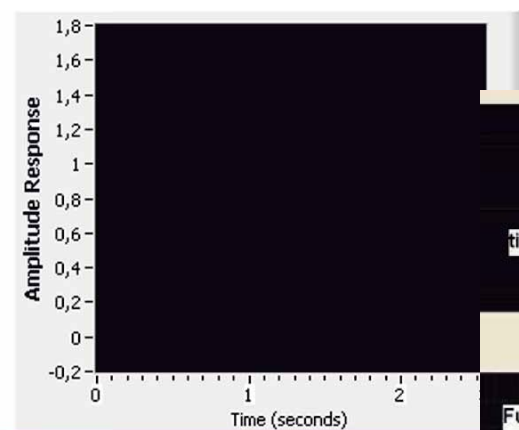


Control Set Point

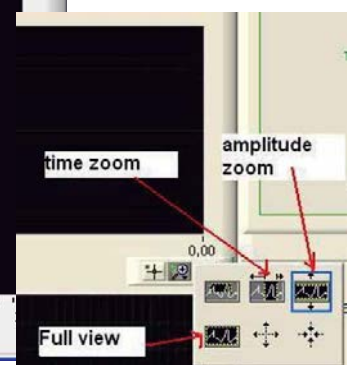
⑥ **Graphics:**



Actuation



System Response



Graph configuration tool

EXERCISES AND PRACTICAL POSSIBILITIES

Some Practical Possibilities of the Unit:

- 1.- Open loop control response.
- 2.- Demonstration of a braking ramp functioning.
- 3.- Functioning of a PWM modulator and the response of the system.
- 4.- Closed loop or feedback control through a Proportional control (P).
- 5.- Closed loop or feedback control through a Derivative control (D).
- 6.- Closed loop or feedback control through a Proportional-Integral controller (PI).
- 7.- Closed loop or feedback control through a Proportional-Derivative controller (PD).
- 8.- Achievement of an over damped system using a closed loop system.
- 9.- Achievement of a critically damped system using a closed loop PID.
- 10.- Instability, a characteristic of closed loop systems.
- 11.- Stabilisation of an unstable system.
- 12.- Faults simulation:

Type of faults including on the unit:

Fault 1: The absolute value of the feedback signal from the tachogenerator is not calculated for its subtraction from the reference, thus, for one of the turning senses, the error is wrong.

Fault 2: The value of the Proportional constant of the PID is divided by ten with the user unable to detect it but its effect.

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Fault 5: The signal from the tachogenerator is modified, making the PID control to believe that the speed is ten times lower to the real one.

None of these faults are exclusive, being possible to combine them.

REQUIRED SERVICES

- Electrical supply: Single-phase 220-V/50Hz. of 110 V./60Hz.
- Computer (PC).

DIMENSIONS & WEIGHT

- Dimensions: 400 x 330 x 310 mm. approx.
- Weights: 10 Kg. approx.

OTHER AVAILABLE VERSIONS

- **SERIN/CC.** Computer Controlled Industrial Servosystems Trainer (for DC motors).
- **SERIN/CA.** Computer Controlled Industrial Servosystems Trainer (for AC motors).

*Specifications subject to change without previous notice, due to the convenience of improvements of the product.



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REPRESENTATIVE:

