# Trainer for Field Bus Applications

CEAB

Technical Teaching Equipment


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Products
Products range
Units
6.- Mechatronics & Automation
&
10.-Process Control

## INTRODUCTION

The field buses are the main part in the communication among devices in a modern industrial plant.

The communication and field bus networks are the best way to transfer data between industrial devices, offering an automatic flow and real time exchange of all the information concerning the control process, across all levels of the industrial plant: sensors, actuators, PLCs and controllers (field level) and the control and supervision computer (control level).

The industrial controller network (using the field buses), provides the operator an easy and efficient way to control many industrial process.

The EDIBON Trainer for Field Bus Applications "CEAB" allows student the familiarization with the function and configuration of field bus technology based on Profibus DP.

The "CEAB" provides the students several devices (slaves) which are activated and are read by a computer (PC) with a Profibus DP interface card (master).

The following subjects or topics are covered and studied: bus topology, field bus Profibus DP characteristics, system configurator with Device Master File "DMF", communication protocols, tags configurations, OPC (OLE for Process Control) server, input and output process data, etc.

**ISO 9000: Quality Management**
(for Design, Manufacturing, Commercialization and After-sales service)

**European Union Certificate**
(total safety)

**Certificates ISO 14000** and
**ECO-Management and Audit Scheme**
(environmental management)

**Worlddidac Quality Charter Certificate**
(Worlddidac Member)

## GENERAL DESCRIPTION

The "CEAB" unit is based on a modular design structure whose functionality is divided into different modules to allow the student a better understanding of the unit. The modules provided with the unit are: industrial controller, set point generator, digital voltmeter, analog inputs module, analog outputs module, digital inputs/outputs module, interface card (to be placed in a computer slot) and central process control software (with OPC server drivers). Every single module has a Profibus connector.

- Industrial Controller module: industrial controller with 2 analog inputs and an analog/digital output. The analog inputs are used to connect the process variable value (PV) and set point value (SP) signals respectively. The analog/digital output is used for deliver the output process value (OP). The controller also has two relays. The industrial controller is connected via field bus (Profibus DP) through an interface card with a computer (PC).

- Set Point Generator module: it allows to generate a step signal by switching between two different selectable voltages. The voltage levels can be adjusted using two potentiometers.

- Digital voltmeter: this module allows to visualize the amplitude of a dc signal.

- Analog Profibus DP Inputs module: composed of 4 input plugs connected with a Profibus DP connector.

- Analog Profibus DP Outputs module: composed of 4 output plugs connected with a Profibus DP connector.

- Digital Profibus DP Inputs/Outputs module: allows to generate 4 digital signals through 4 switches having 4 indicator leds to show the state of the generated digital signal. All of these signals are connected with the Profibus DP connector.

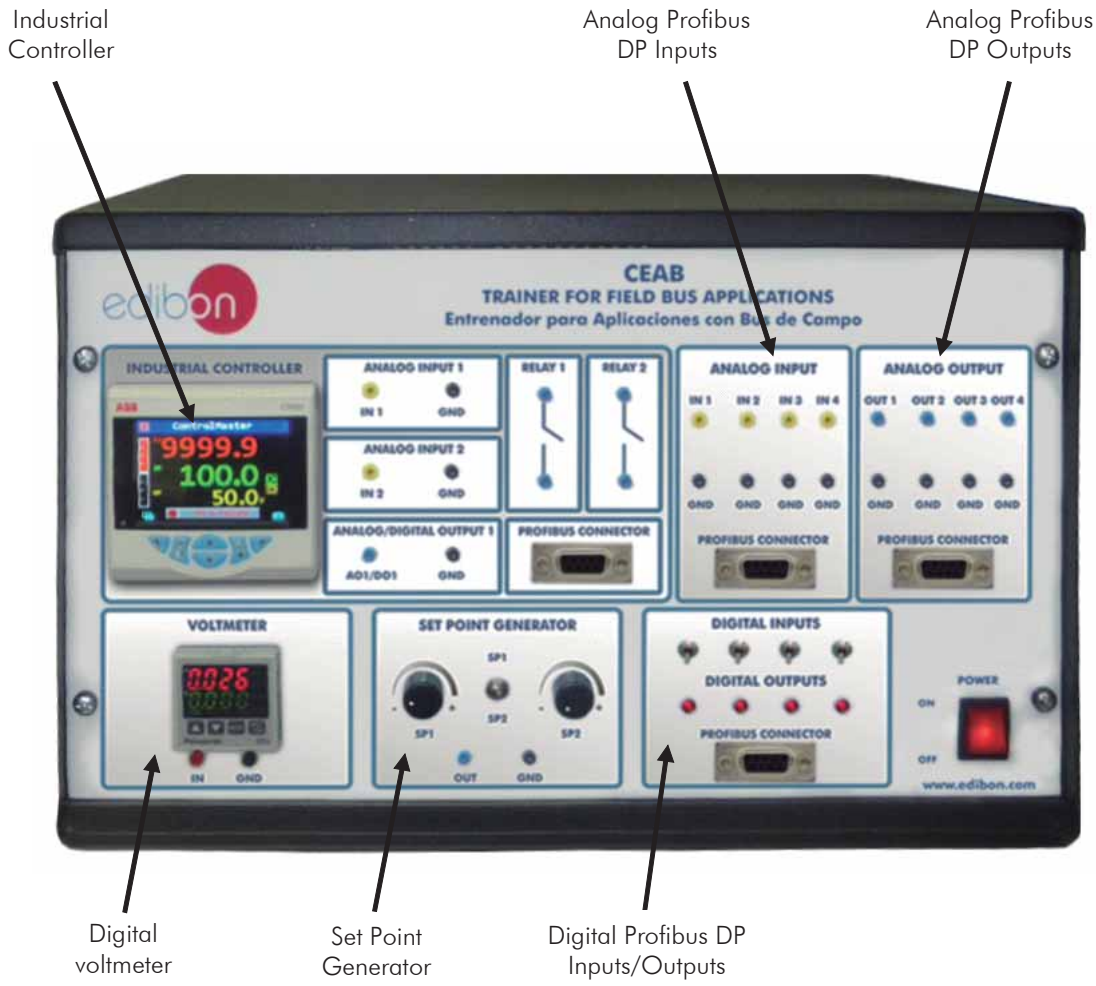
- Interface Card (to be placed in a computer slot): allows the controller signals to be available for a computer PC, for further processing.

- Trainer Software, composed of:

  The OPC server configuration drivers: allows the modules data to be available for others programs (under Microsoft Windows).

  The Control Configuration Software: to modify and display the modules data (Analog Profibus DP Inputs module, Analog Profibus DP Outputs module and Digital Profibus DP Inputs/Outputs module), and to allow to set the industrial controller parameters. Several functions such as recorders and alarm logs enable a simple control room function to be simulated.

## PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION



## SPECIFICATIONS

The trainer (CEAB) is composed of:
- Unit (in metallic box), including:
  - Industrial controller module:
    - Industrial Controller module:
      - ABB Controller CM30.
      - Display: color 1/4 VGA TFT, liquid crystal display (LCD) with built-in backlight.
      - Language: English, German, French, Italian and Spanish.
      - Operator keypad: 6 tactile membrane keys.
      - Password protection: Basic/Advanced user-assigned password protection.
      - Trend display:
        - Recording of 2 variables.
        - Configurable sample rate (1 second to 5 minutes).
      - Control parameters:
        - Proportional band: 0 to 999.9 %.
        - Integral: 0 to 10000 s.
        - Derivative: 0 to 999.9 s.
        - Manual Reset 0.0 to 100 %.
      - Autotune: On-demand calculation of control settings.
      - Process alarms:
        - Number: 8.
        - Types: High/Low process and High / Low latch.
        - Acknowledgement: Via front panel keys or digital signals.
        - Source: Fully configurable (for example, PV, analog input, math block inbuilt, OP control loop deviation).
        - Hysteresis: Level and time.
        - Alarm enable: Enable/Disable of individual alarms via a digital signal.
    - Analog inputs:
      - Number: 2.
      - Complete configurable process input: voltage (V or mV), current (mA), resistance (ohms), Thermocouple, 3-Wire RTD, frequency, pulse, volt-free digital input and 24V digital input.
      - Selectable set points via software (remote from the computer) or front panel.
    - Analog/Digital output:
      - Number: 1.
      - Type: configurable as analog or digital pulse.
      - Analog range: 0 to 20 mA (programmable).
      - Control output types (Configurable through software):
        - Current proportioning/Voltage proportioning (using resistor).
        - Time proportioning.
        - On/Off.
        - Motorized valve with feedback.
        - Motorized valve without feedback.
        - Split output with combinations of relay digital O/P and current O/Ps.
    - Relays:
      - Number: 2.
      - Type: N/O.
      - Contact rating: 5A, 240V.
    - Communication (PC): RS-485 connector (Profibus DP).
  - Set Point Generator module:
    - 2 Voltages selectable through a switch, which allows generate a step signal.
    - Amplitude: 0 to 10Vdc.
  - Analog Profibus DP Inputs module:
    - 4 analog input connectors.
    - RS-485 connector (Profibus DP).
  - Analog Profibus DP Outputs module:
    - 4 analog output connectors.
    - RS-485 connector (Profibus DP).
  - Digital Profibus DP Inputs/Outputs module:
    - 4 digital inputs simulated by four switches.
    - 4 digital outputs leds indicators.
  - Digital voltmeter:
    - Range: 0 to 10Vdc.
    - Resolution: 10mVdc.
  - All process variables are accessible as analog signals at lab jacks.
  - Possibility of connection of external instruments via lab jacks (for example: line recorder, oscilloscope, etc).
- Interface card, with RS-485 connector, to connect the industrial controller through a field bus (Profibus DP) with the computer (PC).
- Trainer software: it includes the OPC server drivers and the Control Configuration Software for the Industrial Controller.
- Cables and Accessories, for normal operation.
- Manuals: This unit is supplied with the following manuals: Required Services, Assembly and Installation, Starting-up, Safety, Maintenance & Practices Manuals.

## EXERCISES AND PRACTICAL POSSIBILITIES

1.- Installation, connection and familiarization with the software.

2.- Study of the transfer function (static and dynamic).

3.- Familiarize with the Set point generator, generation of a square signal using two analog signals.

4.- Familiarization with the navigation of an industrial controller (operator page screen, trend display screen, etc).

5.- Setting alarms and diagnostics generation.

6.- Familiarization with the field bus stations.

7.- Familiarization with the device master file "DMF".

8.- Operation and function of a digital industrial controller.

9.- Layout of a field bus system using the Profibus DP field bus.

10.-Defining the bus technology with the stations.

11.-Communication protocols.

12.-Function of an Analog Profibus DP Inputs/outputs module.

13.-Function of a Digital Profibus DP Inputs/outputs module.

14.-Study of OPC (OLE for Process Control) server function.

15.-Access to the OPC database from the control configuration software (trainer software).

16.-Setting and configuration of tags.

17.-Setting of an industrial controller using the front panel (configuration level, parameter level, operation control level, etc.).

18.-Remote setting of an industrial controller using the control configuration software (configuration level, parameter level, operation control level, etc.).

19.-Reading control variables and PID parameters and displaying them on computer (PC) monitor.

20.-Reading inputs and outputs data, and displaying of analog and digital process variables on computer (PC) monitor.

## REQUIRED SERVICES

-Electrical supply: single-phase, 220V. / 50Hz. or 110V. / 60 Hz.

-Computer (PC).

## DIMENSIONS & WEIGHT

-Dimensions: 490 x 330 x 310 mm. approx.
(19.29 x 12.99 x 12.20 inches approx.).

-Weight: 10 Kg. approx.
(22 pounds approx.).

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

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