Key Features:
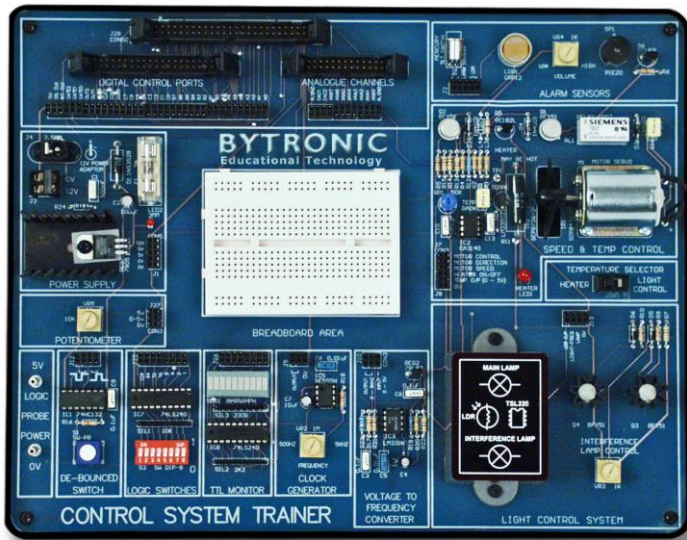
- Building control circuits and PC control programming

- Introduces electronic control techniques

- Bread board area allows expansion of project ideas

- Control of a D.C. motor for temperature, speed and direction control

- Light control system

- Seven other projects with varying complexity

- Connection for control from a PC using program development software

- Comprehensive labworks for control circuits and programming software

The Control System Trainer (CST) is designed for the study of digital and analogue control engineering using fundamental control theory with simple direct connections or the use of programming software. The CST can be used to carry out the various experiments using the elements and breadboard to design a control application to a specification. Simple or complex experiments are possible by linking the range of devices and sensors on the CST.

The CST has two main project areas and a range of digital logic building blocks with a prototyping area. The first project area has a D.C. motor, for speed and direction control combined with a heater for temperature control. Consisting of a 5V dc motor; this is used in a closed-loop to drive a fan that cools a heater to a set temperature or can be used to break an infra-red beam for speed control. The second, main project area is a light control system; a controller is required to maintain a set luminance when an external interference from a second lamp is introduced, it uses two light sources, one source of light and one source of light disturbance.

There are a variety of projects to undertake using the range of sensors and devices on the CST. These elements are a bread board area, voltage to frequency converter, light dependant resistor (LDR), a de-bounced switch, a tilt switch, Piezo buzzer, TTL monitor, a bank of logic switches, a logic probe and a clock source. Headers that accept standard solid core wires are used to connect each element of the CST. Connection to a PC is possible using a suitable interface card through digital and analogue connections.

Curriculum Coverage

- Introduction to the control system trainer
- The control system trainer electronics
- Exploring the CST
    - The logic switches, the TTL monitor, the de-bounced switch, the clock generator, analogue signals, potentiometer, the voltage to frequency converter, light control system, speed and temperature control system, the DC motor, motor speed, the heating element, the alarm sensors

- Computerised control and automation
    - Applications of control, data acquisition, open and closed loop control, feedback in close loop control, signal conditioning, comparator circuit, heating controller, connecting a PC to the real-world, digital and analogue inputs and outputs, interface devices and interface boards, binary data, number and codes, serial and parallel I/O

Labworks

- Generic courseware for the CST
    - Generate digital outputs
    - Read in digital inputs
    - Read in digital inputs on port B and output them on port A
    - Sound Piezo buzzer when CST is tilted
    - Pulse an output at a rate specified by user
    - Sense closure of the de-bounced switch and keep a count of the occurrences
    - Sense closure of the de-bounced switch and keep a count of the occurrences over a specified time interval

- Count input pulses from the clock generator, via a timer/counter channel
- Implement software generated PWM signal
- Implement hardware generated PWM signal using two timer/counter channels and clock generator
- Implement hardware generated PWM signal using two timer/counter channels and user input
- Generate an analogue voltage in the range 0-5V
- Read an analogue voltage in the range 0-5V
- Generate triangular wave output
- Calibrate the LDR circuit in the light control box

LabVIEW Labworks

- Courseware for CST using interface card and LabVIEW
  - Introductory digital VIs
    - single line digital output
    - Single line digital output with correct initialisation
    - Port functions
    - Using arrays with digital outputs
    - Single line digital input; tilt alarm
- Counting and timing
  - Counting events; using a sub VI; an event counter
  - Counting and timing
  - Generating a digital signal; counter timers
  - Frequency measurement using a counter/timer
    - Pulse Width Modulation
    - Generating PWM using software timing
    - Generating PWM using the CTC chip
- Analogue input and output
  - Analogue conversion
    - Basic analogue input
    - Controlling and measuring illumination levels
    - Using LabVIEW to plot the calibration chart
- Heating and cooling control
  - Logging the temperature
  - Controlling heating and cooling
  - Motor and temperature controller VI

Specification

Inputs	8 x digital inputs; 2 x analogue inputs
Outputs	8 x digitals outputs; 5 x analogue outputs
	3x Counter Timer Channels (CTC)
Motor speed/direction control	Direction control and Pulse Width Modulated speed control, from counter timer chip
Motor specification	12V d.c.
Temperature element	Vitreous enamel wire-wound resistor 6W, maximum surface temperature: 80ºC
Temperature sensor	LM35DZ linear. Output is amplified to a 0-5V temperature to voltage linear scale
Voltage to frequency converter	Maximum frequency 2.5KHz. Resolution KHz per volt
Clock generator frequency	500Hz to5KHz
TTL monitor	8-Bit, LED indication
Logic switches	8-bit DIP selector switch
Tilt switches	Mercury tilt, 12V operation
De-bounced switch	Mono-stable - resistor, capacitor and NOR logic
Piezo buzzer	12V sounder
Logic probe	High and Low indication
Connectors	1 x 40-way IDC digital connection
	1 x 26-way IDC analogue connection
	2.5mm power jack socket
Power supply requirement	12v d.c. @ 3A fused

Required

For use with a PC a suitable PC with minimum; Pentium processor, 1GB RAM, 20GB HDD, CDROM Drive, and Windows XP or above

Ordering Information

Model Number:	**CST**
Consists of:	1 x Control system trainer
	1 x 12v d.c power supply unit
	1 x Coursework manual
	1 x Software CD

Weights and Dimensions

Un-Packed		Packed	
Approximate Dimensions (mm)	285W x 225D x 95H	Approximate Dimensions (mm)	400W x 300D x 300H
Approximate Weights	1.2Kg	Approximate Weights	6Kg