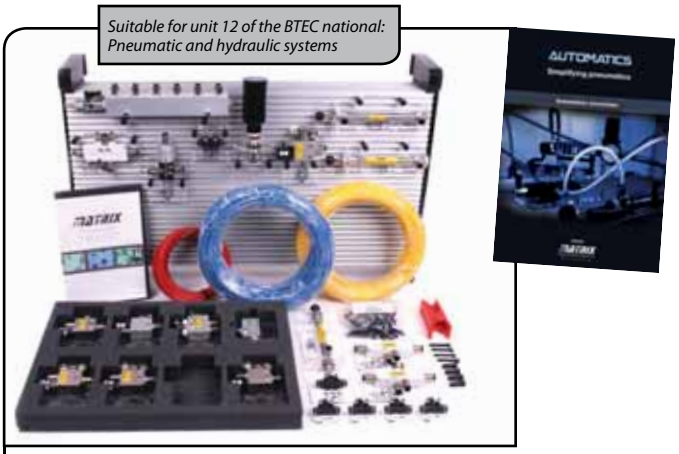
Suitable for unit 12 of the BTEC national: Pneumatic and hydraulic systems



The Automatics essentials solution

This kit provides a complete introduction to pneumatic circuit design and construction. The curriculum pack includes a comprehensive set of worksheets that allow students to progress from first principles through to circuits of moderate complexity; including reciprocating circuits and generating sequences of movements.

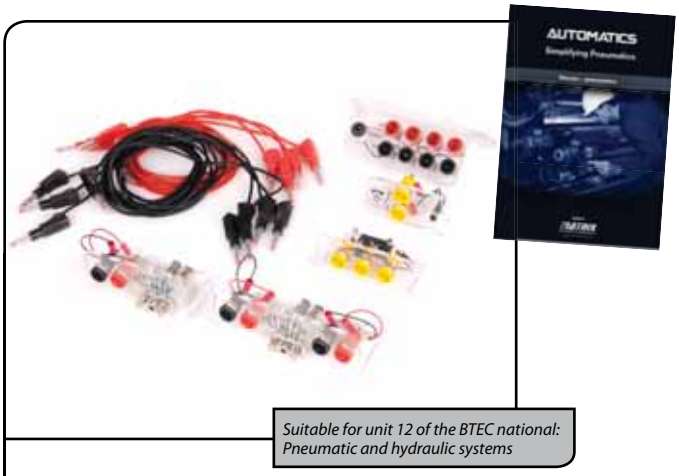
The solution is intended for students in their early teens and older who are learning technology and engineering subjects. Tasks are designed to be suitable for pairs of students sharing a single kit.
Everything you will need to teach the course is included in the solution pack, with the exception of an air compressor.

Learning objectives

- Understanding the different varieties of valves and where each is appropriate in a system
- Understanding the basic types of cylinder, controlling speed and the factors that influence power output
- Combining valves to produce logic functions
- Semi-automatic and automatic reciprocation
- Creating sequences of movements
- Using reservoirs to create time delays
- Air bleed and pilot operated circuits
- Component symbols and circuit diagrams
- Staying safe when using air at high pressure

Components included			
1	Cylinder, single acting	2	Cylinder, double acting
1	Valve, 3/2, button-spring	1	Valve, 3/2, lever-spring
4	Valve, 3/2, roller-spring	1	Valve, 3/2, diaphragm
1	Valve, 5/2, lever-spring	3	Valve, 5/2, pilot-pilot
1	Valve, shuttle	2	Valve, flow control
1	Reservoir	1	Automatics platform
1	Manifold	1	Tubing, red, 5 m
1	Tubing, yellow, 30 m	1	Tubing, blue, 30 m
4	Connector, tee junction	1	Tee bolts (pack of 50)
1	Tube cutting tool	1	Set of storage trays

Ordering information	
Automatics essentials solution	AU9020
You may also need...	
Compressor	AU1050



Suitable for unit 12 of the BTEC national: Pneumatic and hydraulic systems

Electro-pneumatics add-on kit

This kit supplements the Automatics essentials solution by adding a selection of electrically operated valves and a range of sensors. By following the curriculum, students will learn how to use these new components to create systems in which pneumatics and electrical circuits are combined into complete systems.

The electrical components are connected together quickly and reliably using 4mm connectors, for which all of the necessary leads and accessories are provided. Electrical components are robustly mounted to the Automatics platform using the same 'tee' bolt system used for the pneumatic parts and are printed with standard circuit symbols.

Working two to a kit, students follow the detailed worksheets to gain a comprehensive understanding of electro-pneumatics. By the end of the course, students will be able to create reciprocating and sequential circuits, and will have an understanding of how these are used to solve real world engineering problems.

Learning objectives

- Understand the operation of electrically controlled pneumatic valves
- Use of electrical switching to control circuit operation
- Using microswitches to sense cylinder position
- Sensing position without physical contact using reed switches
- Expressing electrical circuits using ladder diagrams
- Electrically operated reciprocal circuits
- Sequential control circuits
- Analysing real world problems and formulating solutions

Components included			
2	Reed switch and holder	2	Switch, push to make
2	Microswitch	1	Valve, 3/2, solenoid-spring
1	Valve, 5/2, solenoid -spring	2	Valve, double solenoid
6	Lead, 4mm plugs, black	6	Lead, 4mm plugs, red
1	Power supply		

Ordering information	
Electro-pneumatics add-on kit	AU9015
You may also need...	
Automatics essentials solution	AU9020

Suitable for unit 12 of the BTEC national: Pneumatic and hydraulic systems

Pneumatics control add-on kit

This kit extends your Automatics pneumatics solution by adding a powerful programmable microcontroller unit, the MIAC, together with the pneumatic components necessary to put it through its paces.

By following the included curriculum, students will learn how the combination of a controller and custom software can create powerful and flexible pneumatic systems.

Students will learn how to establish the state of a pneumatic machine using sensors, the use of logic to process that data and the issuing of commands to the included solenoid valves.

Two versions of the curriculum are supplied. In the first, students use pre-programmed control systems supplied in the MIAC's built in memory. A more advanced course, Control plus, teaches students how to write their own programs for the controller.

Learning objectives

- Reading sensors and switches
- Issuing commands to the pneumatic circuits
- Learning the difference between digital and analogue signals
- Using flowcharts to visualise programs
- Program flow and decision making
- Programming sequences
- Using feedback to enhance reliability and improve safety

Control Plus

This curriculum introduces students to writing their own programs for the control system.

This is done using our Flowcode software - which makes programming easy by using graphical flowcharts. Note that you may need to purchase Flowcode separately.

Components included			
1	MIAC controller	2	Switch, push to make
1	Reed switch and holder	2	Valve, flow control
1	Light sensor	4	Valve, 3/2, solenoid-spring
1	Power supply	1	Power distribution carrier
6	Lead, 4mm plugs, red	6	Lead, 4mm plugs, black
2	Lead, 4mm plugs, yellow		

Ordering information	
Automatics control add-on kit	AU9010

You may also need...	
Automatics essentials solution	AU9020
Flowcode	See page 62

Unit 24 of the BTEC Higher National award in Engineering : Applications of pneumatics and hydraulics

NEW

Unit 36 of the BTEC National: Programmable logic controllers.

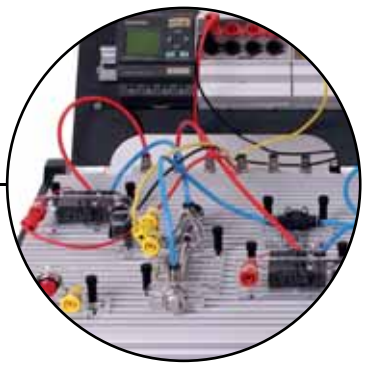
Unit 22 of the BTEC Higher National award in Engineering : Prorgammable logic controllers

Programmable logic controllers

We are now able to supply pneumatics training equipment which can be used with any PLC with the Automatics PLC adaptor rail. The Adaptor rail allows students to connect to relay and motor outputs using standard 4mm connectors which connect directly to other Automatics components. This pack combines standard pneumatics components with Control pneumatics components to provide a complete learning platform for pneumatics and PLC programming in one package. A PLC is not included. Any programming language - including ladder logic - can be used. Worksheets are based on flow charts. PLC adaptor modules included: power distribution, inputs (8), motor outputs (8), relays (4).

Learning objectives

- Pneumatic components, circuits and circuit diagrams
- Sensors and switches in pneumatic systems
- Digital and analogue signals
- PLC programming with ladder logic or block diagrams
- PLC inputs and outputs
- Logic functions



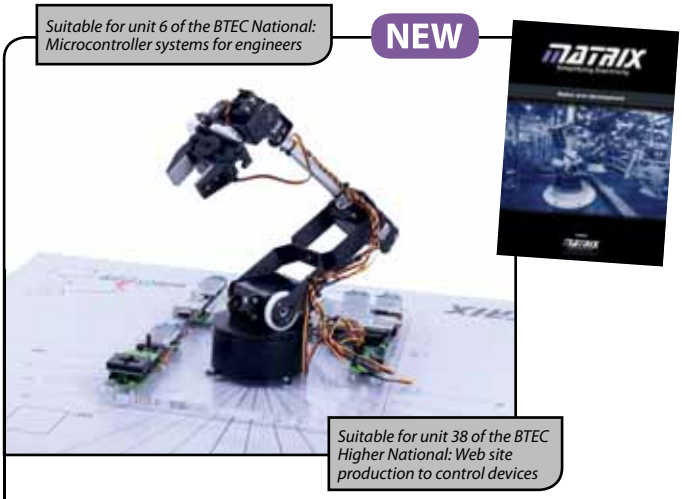
Works with Siemens S7, Mitsubishi, Omron or any standard PLC which fits onto a 50mm DIN rail.

MITSUBISHI SIEMENS OMRON A-B QUALITY

Ordering information	
Automatics Essentials	AU9020
PLC Adaptor - Input module	HP6700
PLC Adaptor - Power module	HP6711
PLC Adaptor - Motor module	HP6723
PLC Adaptor - Relay module	HP6752
PLC adaptor - mounting bracket	HP6785

Suitable for unit 6 of the BTEC National: Microcontroller systems for engineers

NEW



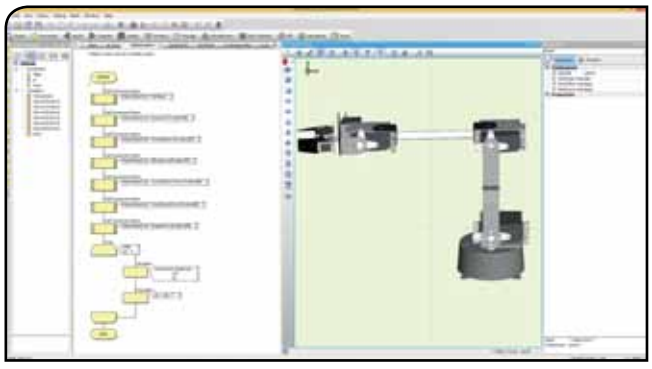
Suitable for unit 38 of the BTEC Higher National: Web site production to control devices

Robot arm production cell

Our new robot arm production cell consists of a rugged servo-controlled 6 degrees of freedom arm bolted to a base plate and mat that provides a range of exercises mimicking industrial robot arm production cells. The arm itself delivers fast, accurate, and repeatable movement with base rotation, single plane shoulder, elbow, wrist motion, a functional gripper, and a wrist rotator. The arm is controlled by a dsPIC microcontroller with combo board (16 switches, 16 LEDs, 2 line 16 character LCD, quad 7-seg display and sensors), colour sensor board and wi-fi board from our E-blocks range. The board can be programmed directly from Flowcode for dsPIC, or Microchip's MPLAB. A full Flowcode simulation is available free of charge. The control system is also shipped with a full Application Program Interface so that the robot can be controlled using any wi-fi enabled device such as a PC, Android, or Apple device using a range of software applications including C++, LabView, Python, and App Inventor as well as remote applications over the web. The kit is supplied with a number of coloured wooden blocks which can be moved by the arm into different locations in the work cell. A teacher's guide is available for download from our web site.

Learning objectives / experiments

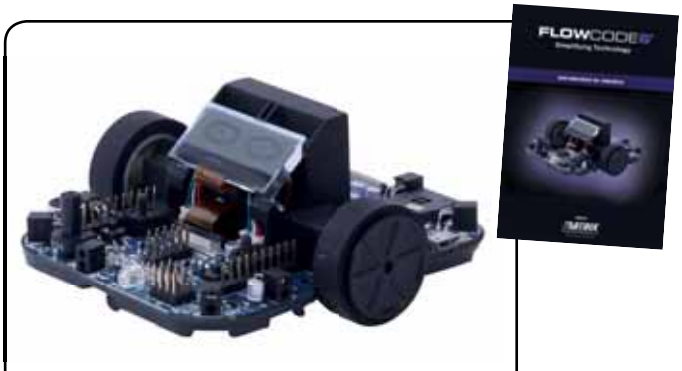
- Robot cell design and programming
- Microcontroller programming
- Sensors and actuators in robotics
- Kinematics: 3D movement in robotic systems
- Web based control
- Programming in many languages



Using Flowcode to simulate and program the robot arm

For an explanation of icons please see page 6

Ordering information	
Robot arm cell	RB6231
Corresponding curriculum	CP8656
Wi-fi add-on board	EB069
Bluetooth add-on board	EB024



Suitable for unit 6 of the BTEC National: Microcontroller systems for engineers

Introduction to Robotics

This training solution provides a course in robotics with a sequence of staged exercises including line following and maze solving. The course makes use of the high specification Formula AllCode robot which can be programmed with a number of languages on various operating systems including Flowcode, App Inventor, Python and LabView. This is great for introducing students to programming and robotics in a fun and motivating way with huge scope for further work and competitions. The solutions are supplied with a large double-sided task mat and a set of maze walls.

Learning objectives /experiments

- Microcontroller programming and robotics
- Programming concepts: input, system, output, loops, decision, subroutine, go to, calculations, delays, simple variables, A/D conversion
- Robotic components: switches, LEDs, light sensors, distance sensors, infrared sensors, audio level sensors, speaker, motor drivers, motors and gearboxes
- Robotic tactics including logo-like commands, power control, motion control and steering, motor characterisation, obstacle avoidance
- Progressive exercises include: light following, line following, song and dance, time trials, races, simple maze solving, creating custom mechanics

Playing robot football with Android phones.

See Formula AllCode section for full details

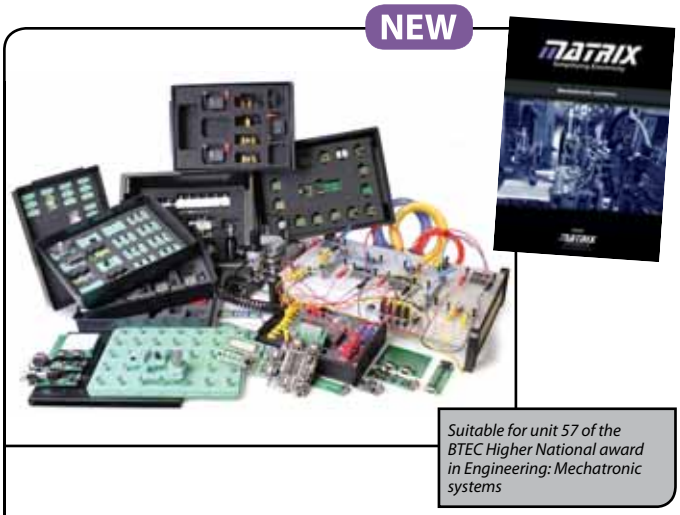
For an explanation of icons please see page 6

Ordering information	
Formula AllCode deluxe kit	RB7971
Formula AllCode standard class set	RB7240
Formula AllCode deluxe class set	RB7518
Corresponding curriculum	CP5894

Instrumentation included
Ghost and Flowcode provide:
- In-Circuit-Debug
- In-Circuit-Test
- Multi channel oscilloscope
- Multi channel logic analyser
- Multi channel packet decoder
- Data console display

See page 84

NEW



Suitable for unit 57 of the BTEC Higher National award in Engineering: Mechatronic systems

Mechatronic systems

This pack contains products from three of our ranges of equipment: Locktronics, E-blocks and Automatics. The pack includes a wide variety of resources suitable for studying mechatronics using three types of control system: a PIC microcontroller, a micro PLC, and a PC. Students can learn the basics of control using flow charts before progressing to other languages like C++ or LabView software (C++ and LabView not included). A wide range of curriculum is included in the packs covering Industrial sense and control, flow chart programming of microcontrollers, Industrial sense and control with C++ or LabView programming, and design of pneumatic control systems. Further curriculum options for programming in C or Assembly are available.

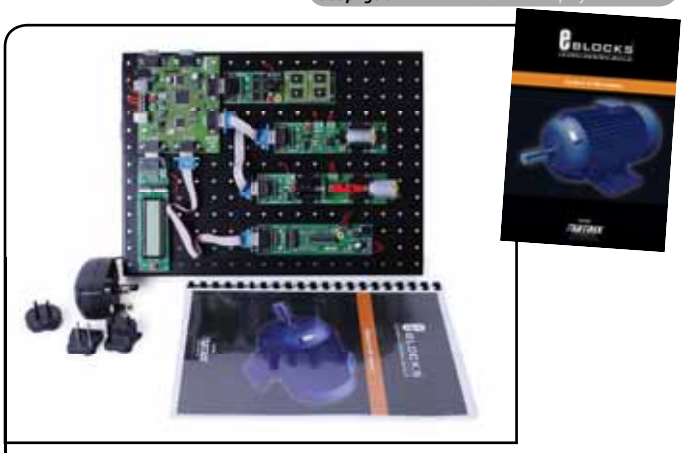
Learning objectives

- PIC and controller programming using flow charts
- Programming options: Embedded C, Assembly, C++ or LabView
- Mathematical models of sensors
- PID control of DC motors with speed and position (2nd order)
- Sensors: thermistor, light, thermocouple, rotary, Gyroscope, Hall effect, PIR, Cap touch, Magnetometer, Ultrasonic, Colour
- Actuators: relays, stepper motors, DC motors with feedback, servo motors

For an explanation of icons please see page 6

Components included			
1	Locktronics Industrial sense and control kit	1	DMOS motors power board
1	Sensors add-on pack	1	Compressor
1	Automatics essentials kit	1	Introduction to microcontrollers (online)
1	Automatics Control add-on kit	1	DC motor position training board (PID)
1	Standard PICmicro starter pack	1	DC motor speed training board (PID)

Ordering information	
Industrial sensors, actuators and control applications kit	FC6AC01NE
Mechatronic systems	HP4550



Motor control training course

This solution provides a practical and low cost way of allowing students to understand the techniques of controlling DC motors. The solution is based on dsPIC technology. The equipment consists of a number of E-blocks boards mounted on a metal backplane, a programmer board, a switch board, an LCD board, a motor power board, a DC motor velocity control board and a DC motor position control board. Students can undertake a range of exercises from simple speed and direction control through to complex control using PID techniques with velocity and position as key parameters.

Learning objectives / experiments

- Simple motor control – direction, speed
- Sensors in motor control systems: IR, F to V conversion, resistive
- PID control of velocity
- Servo systems
- PID control of position
- First and second order functions
- Flowchart programming using Flowcode
- Programming using C/C++

Instrumentation included
Ghost and Flowcode provide:
- In-Circuit-Debug
- In-Circuit-Test
- Multi channel oscilloscope
- Multi channel logic analyser
- Multi channel packet decoder
- Data console display

See page 84

For an explanation of icons please see page 6

Components included			
1	Backplane	1	Flowcode v6 academic license
1	Motors power board	1	DC motor velocity control board
1	DC motor position control board	1	dsPIC board
1	Sensors board	1	LCD board

Ordering information	
Motor control training course	EB8493
Corresponding curriculum	HP3096

NEW

Dynamic seat

This full size electronic seat allows students to make a study of electromechanical system design from the perspectives of the mechanics, the electronic control system, the energy and the programming. The bucket seat is constructed from rugged metal sections and is powered by two DC motors.

The system is controlled using E-blocks based on PIC technology housed in a metal cabinet fitted with basic controls. Workbooks provide around 40 hours of study across a number of separate engineering disciplines which gives students a good understanding of the key issues in the design of electromechanical systems. Requires 220VAC.

Learning objectives / experiments

- Mechanics: Mechanical design and system modelling using Solidworks (not supplied)
- Sensors: feedback using data from Hall sensors, accelerometers, encoders and potentiometers. Use accelerometer feedback to determine position
- Actuators: PWM control of motors speed and acceleration.
- Kinematics: simulation of systems and analysis of movement and degrees of freedom
- Energy: function of energy pathways, energy storage and usage
- Control: using a PC with LabView (not supplied) or with a PIC using Flowcode (supplied)
- Modelling of complete electromechanical systems using Flowcode
- Electromechanical control using Lab-View

For an explanation of icons please see page 6

Ordering information	
Dynamic seat	HP8834