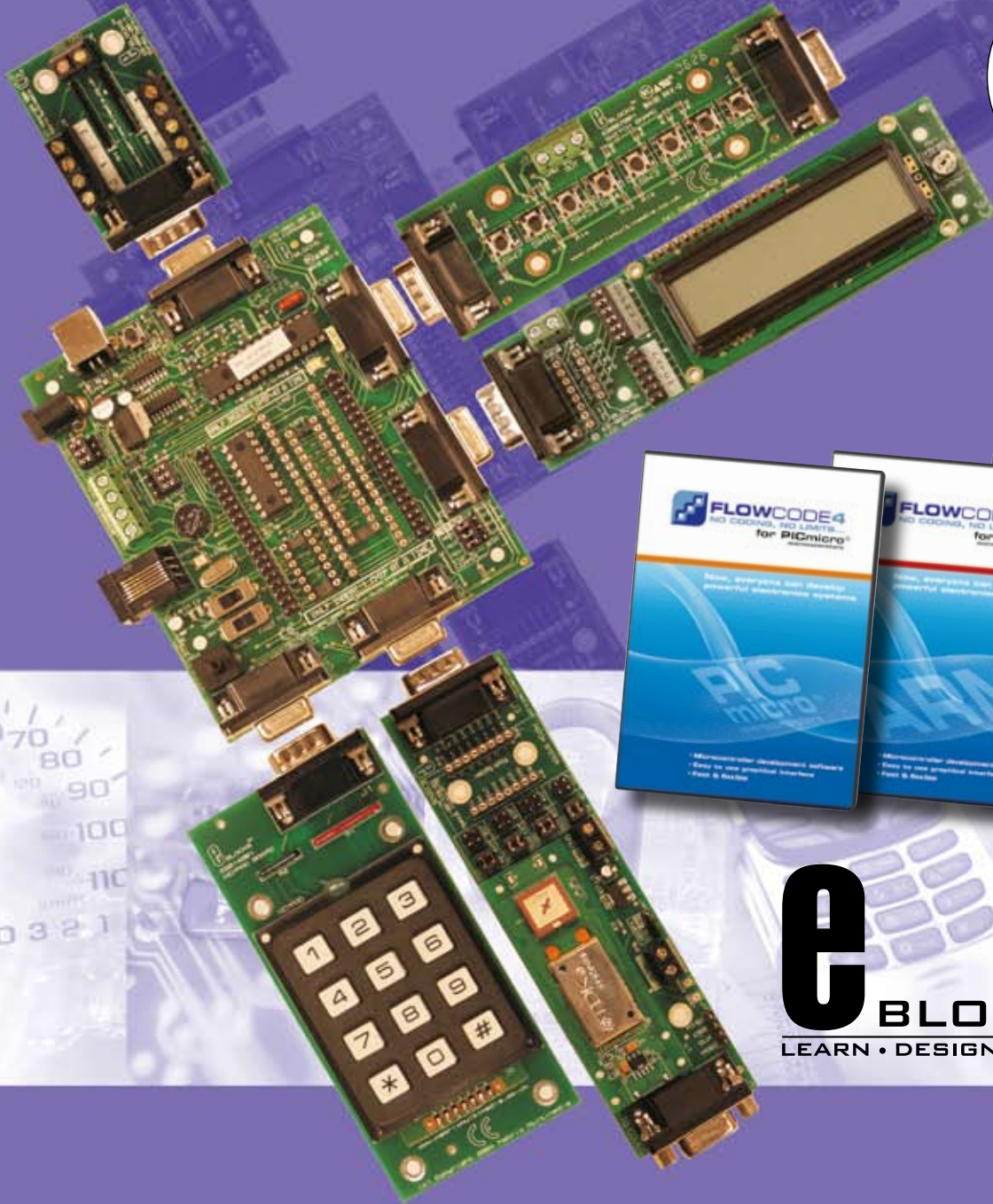
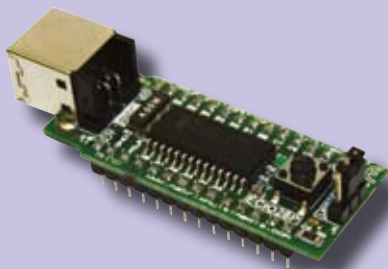


MATRIX

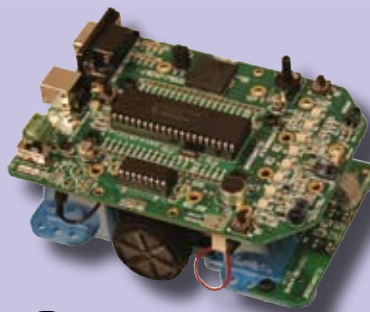
modern electronics teaching resources



e BLOCKS[®]
LEARN • DESIGN • BUILD



ecio



**FORMULA
FLOWCODE**



MIAC





Over the last couple of years we have sold E-blocks and Flowcode to more and more institutions across the world. With the increasing number of customers have come more requests for solving new problems:

The most numerous of these was how to allow students to carry on learning at home: as far as the software is concerned this was easily solved by function-limited free versions of software. The hardware posed a greater problem with traditional development boards and E-blocks being beyond the budget of many students. To get round this we have developed the ECIO range of products. These require students to wire up simple systems by hand on a prototype board - a more time consuming way of learning but a good skill to practice - and start at less than £15.

Secondly many customers have started to use Flowcode as a tool for teaching logical thinking in a range of disciplines - not just electronics - from automotive technician training to mechanical engineering. To cater for these new markets we have developed a rugged PICmicro microcontroller - the MIAC. This flexible controller will allow us to create a wide range of new learning packages for technical education. You can see the MIAC on page 31 and it is available in the first quarter of 2009.

Regards

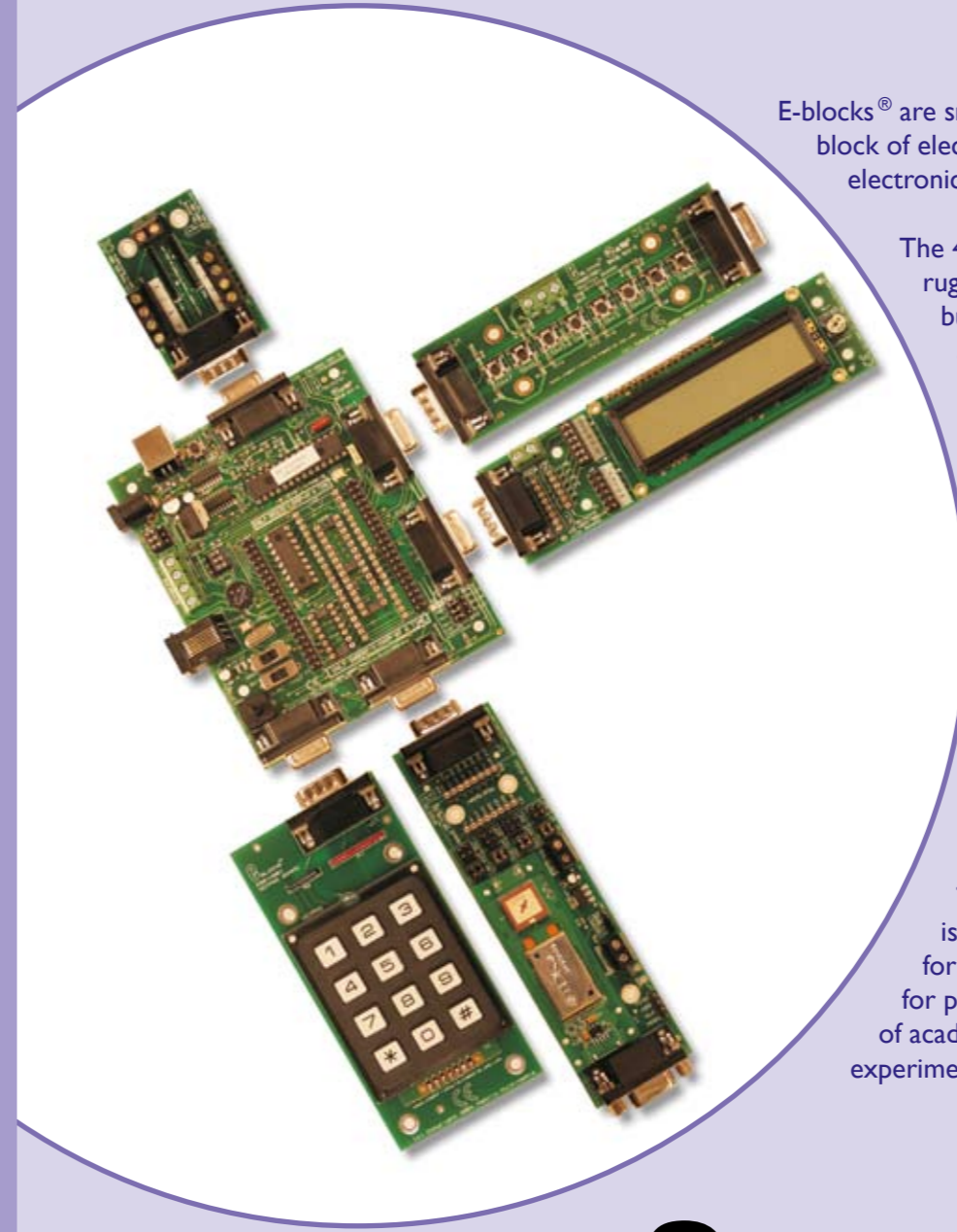
John Dobson
 Managing director
 Matrix Multimedia Limited
 john@matrixmultimedia.co.uk



We are pleased to announce that this year Flowcode and E-blocks were awarded the world's most prestigious prize for educational training products - the World Didac award. See www.worlddidac.org

Contents

- 3 Learn about E-blocks and Flowcode and how you can use them to motivate and teach students
 Products: E-blocks, Flowcode
- 6 Find out how you can use robotics to motivate students to learn electronics
 Products: Formula Flowcode robot
- 7 See our resources for starting courses on e-system design and programming
 Products: E-blocks starter kits with software and curriculum
- 10 Find out how you can teach Programmable Logic technology as part of your Digital Electronics course.
 Products: CPLD and FPGA starter kits including courseware for learning Verilog and VHDL programming
- 11 Learn more about how you equip your students with the skills for 32 bit microcontroller system design
 Products: learning solutions based on ARM 7 technology
- 12 See our low cost programmers which allow students to learn at home
 Products: ECIO devices
- 13 See how you can give your students practical experience of a range of technologies using our ready-built solutions.
 Products: Solutions for CAN bus, LIN bus, Bluetooth, Mobile telephony, TCP/IP, Zigbee, and RFID
- 21 View further details on all the individual products in the E-blocks range
 Products: hardware modules, software and courseware
- 30 See our range of sensors that you can use for project work and investigation
 Products: Sensors
- 31 Learn more about our new low cost, PICmicro MCU rugged controller
 Products: MIAC

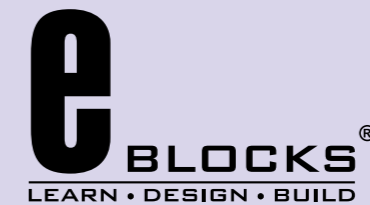


E-blocks® are small circuit boards each of which contains a block of electronics that you would typically find in an electronic system.

The 40 circuit boards in the E-blocks range use rugged 9 way D-type connectors as a connection bus for 8 signal lines and earth. Power (5V or 3.3V) is wired separately. This allows a complete system to be assembled in a matter of minutes. The system's functionality can be enhanced further by the addition of more than 40 sensors and accessories.

Systems based on microcontrollers can be programmed using flowcharts, C, or Assembly. Systems based on CPLD/FPGA technologies can be programmed in block diagrams, VHDL or Verilog. A range of CD ROM tutorials, which includes compilers, development tools and manuals, provides support to students who are new to any of these technologies.

The great advantage of E-blocks in education is that they provide a very flexible set of parts for learning a range of technical disciplines, and for project work. E-blocks are used by a variety of academic courses: from learning in schools to experimentation as part of a PhD.



Benefits

- ▶ Saves time and money
- ▶ Well supported and documented
- ▶ Flexible and expandable

Programmer boards

- PICmicro® microcontroller
- ARM® microcontroller
- Atmel AVR® microcontroller
- Altera CPLD and FPGA

Comms. compatibility

- CAN, LIN, Bluetooth,
- Mobile telephony, X10,
- RS232, IrDA, PS2,
- USB, TCP/IP, MIDI, SPI, I²C,
- Zigbee, RFID, VGA,
- USB, GPS, SD card/FAT16

Introducing Flowcode® version 4



What does it do?

Flowcode 4 is one of the World's most advanced graphical programming languages for microcontrollers. The great advantage of Flowcode is that it allows those with little experience to create complex electronic systems in minutes.

Flowcode's graphical development interface allows students to construct a complete electronic system on-screen, develop a program based on standard flow charts, simulate the system and then produce hex code for PICmicro® microcontrollers, AVR microcontrollers and ARM microcontrollers.

Flowcode includes 'drivers' for a wide range of hardware elements - from simple switches and LEDs, through to more complex subsystems like CAN bus and TCP/IP web modules. Flowcode is well supported with a range of courses and applications, and is tightly integrated with the E-blocks range of hardware modules which minimises construction and development time.

Flowcode is available in more than 20 languages.

Benefits of Flowcode

- ▶ Allows students to understand programming without getting bogged down in coding details.
- ▶ Provides access to electronic technology for all levels of students
- ▶ Gives students basic programming and logical thinking skills

Supported design elements

Flowcode is based on the internationally standardised flowchart symbols which users drag and drop onto the workspace, and then fill in dialogue boxes to set program actions. A wide variety of standard electronic components can be incorporated into Flowcode projects, and a number of communications subsystems can be included in designs.

Components supported: LEDs, Switches, Keypad, LCD displays, 7-segment displays, graphical LCD displays, ADC, EEPROM, PWM, GPS, phoneme speech, servo and more

Comms components: I2C, SPI, LIN master, LIN slave, CAN bus, IrDA, RS232, TCP/IP, Web server, Bluetooth, USB, SD card with FAT16

Simulation and debug

Flowcode 4 includes a new Panel designer which allows users to create a model of the system they are designing. Students drag and drop the standard components onto the Panel designer to customise it to reflect their system, then step through the program and see its effects on their design.

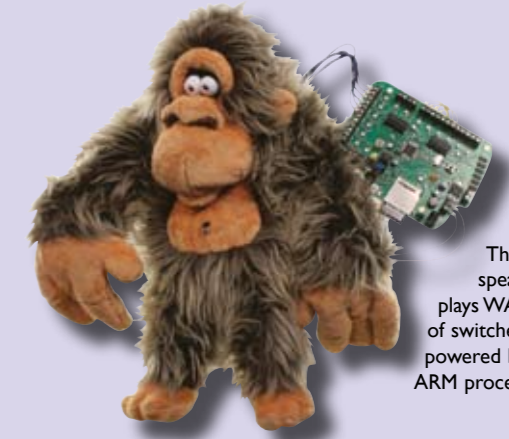
Students can take simulation a step further with a new In Circuit Debug feature which allows them to step through the program whilst it executes on the hardware.

A range of separate communications protocols can also be simulated using multiple instances of Flowcode running on the same PC or over your computer network. This allows students to learn about communications protocols and to develop systems with more than one processor.

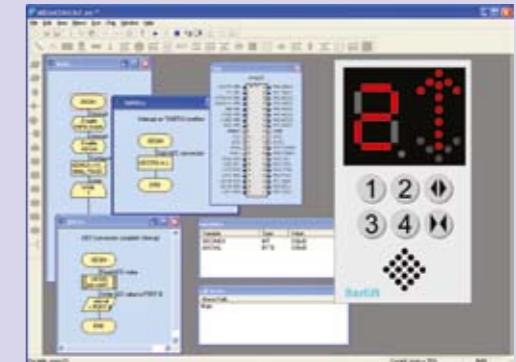
- ▶ Panel designer allows design to be fully customised
- ▶ In Circuit Debug facility allows students to step through the program using real hardware
- ▶ Multiple Flowcode instances allow simulation of multiple processors for Communications work

Supported targets

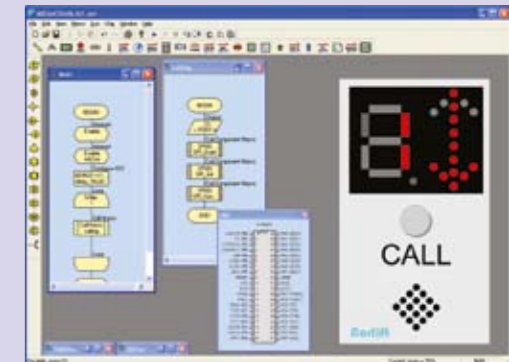
- Processors supported:
- ▶ PICmicro microcontroller: 12, 16, 18 series
 - ▶ AVR: AT90, ATtiny, ATmega
 - ▶ ARM: Atmel AT91 series
- Other targets supported:
- ▶ Formula Flowcode buggy
 - ▶ ECIO series
 - ▶ MIAC controller



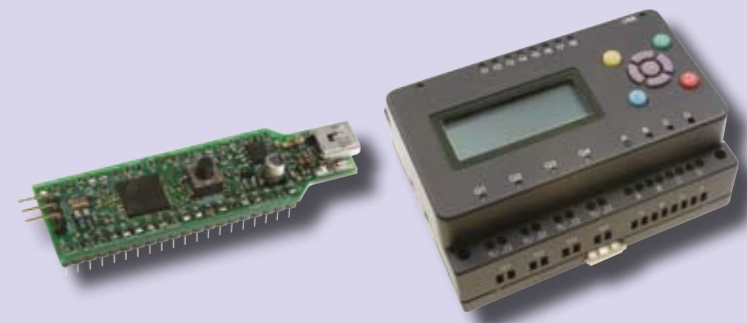
This educational project speaks with phonemes and plays WAV files, under control of switches in the hands - all powered by Flowcode and an ARM processor.



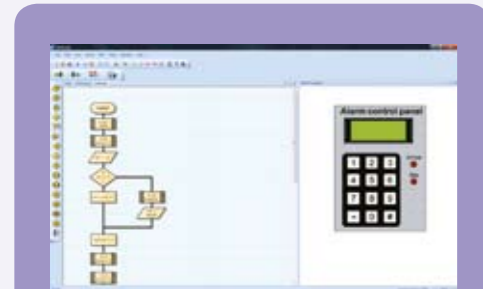
Lift panel controller simulation connected by virtual CAN bus to...



...floor display and call button controller.



New targets include the ECIO ARM chip and the MIAC controller.



Design

Flowcode contains standard flow chart icons and electronic components that allow you to create a virtual electronic system on screen. Drag icons and components onto the screen to create a program, then click on them to set properties and actions.

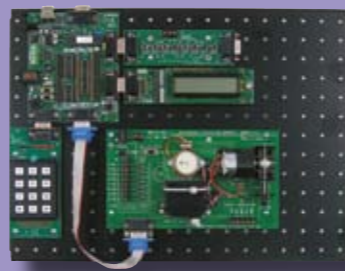
- ▶ Easy to use interface
- ▶ Allows complex programs to be developed and managed quickly



Simulate

Once your system is designed you can use Flowcode to simulate it in action. Design your system on screen, test the system's functionality by clicking on switches or altering sensor or input values, and see how your program reacts to the changes in the electronic system.

- ▶ Simulation aids understanding
- ▶ Debug before download
- ▶ Shorten the design cycle



Download

When you are happy with your design click one button to send the program directly to your microcontroller based target. Targets include a wide range of microcontroller programmers, upstream E-blocks boards, the Formula Flowcode robot, the MIAC industrial controller, or your own system based on ECIO technology.

- ▶ One button download
- ▶ Fast action
- ▶ Flexible and expandable

Ordering information			
	PICmicro	AVR	ARM
Single user	TEFLCS14	TEVRS14	TERMS14
10 user	TEFLC104	TEVRI04	TERMI04
Site licence	TEFLCSL4	TEVRSL4	TERMSL4

Motivating, recruiting and challenging

What does it do?

The Formula Flowcode maze solving robot vehicle can be used for a wide range of learning activities for students aged 12+.

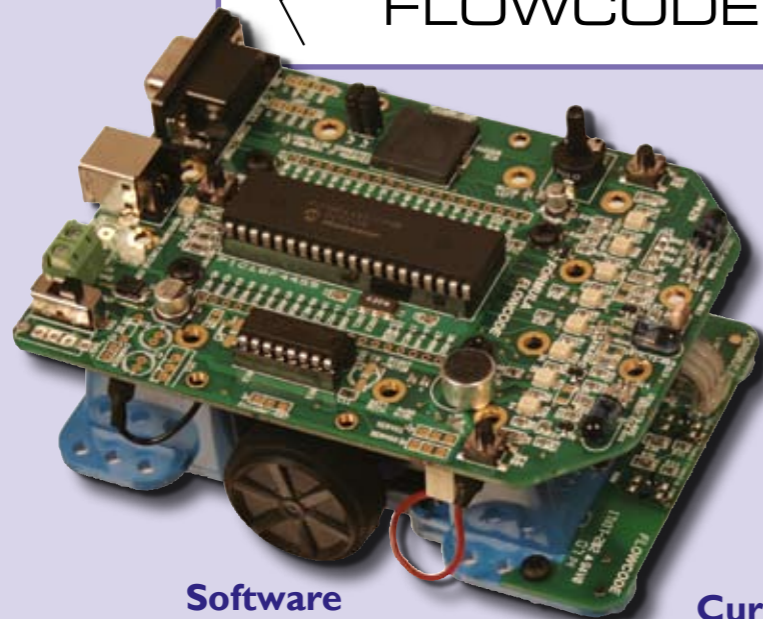


Benefits

- ▶ A low cost, all-inclusive solution for technology students
- ▶ Great for motivating students to learn more

Features

- ▶ Includes a cut down version of Flowcode graphical programming software
- ▶ Superb technical specification
- ▶ E-blocks compatible
- ▶ Micromouse competition compatible



Description

This robot vehicle has been designed to address the requirements of the technology education curriculum between the ages of 12 to 16. It is also used up to university level for motivation, learning and project work. The robot is great for running competitions, and for open days where you can motivate students to want to learn more about electronics and technology in just a few hours.

Hardware

The robot vehicle is based on a plastic moulded chassis with two wheels, gearboxes and motors and is powered by AA batteries. The circuit board connects directly to a PC using the USB port, and provides a high specification PIC18F4455 controller with many features including 2 user switches, 8 LEDs, sound level sensor, light sensor, buzzer, motor controller (inc. Pulse Width Modulation) line follower sensors, and distance sensors.

Software

The robot is supplied with a reduced functionality version of our Flowcode software. Students develop the program, simulate its functionality on-screen and then click on a button to download the program to the robot. Flowcode is compatible with most E-blocks add-ons and a full version can be bought separately. The buggy can also be programmed with C and Assembler.

Curriculum / learning objectives

A set of teacher's notes is available that describes a sequence of learning opportunities from getting an initial output through to line following and maze solving tasks. The range of tasks can be extended into the mechanical engineering where students make their own precision chassis which includes higher specification motors with wheel encoders for full maze solving.



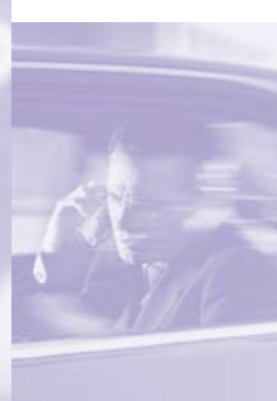
Activities include line following....

...and maze solving using the left hand wall following technique.

Ordering information

Formula Flowcode micromouse.....	HP794
Maze walls.....	HP458
Pro class starter pack.....	HP454

Note that the Pro class starter pack consists of 10 Formula Flowcode robots, a Site licence of Flowcode, 5 LCD displays, IDC cables, and storage trays.



Purchasing options for E-blocks are flexible - you can buy just one E-blocks board, buy a ready made solution for teaching a particular subject, or you can buy one of our starter packs as shown on the following pages.

With some starter packs you need to make some choices: for example which microcontroller you want to use, which programming language you want to teach, etc.

With our starter packs you get everything you need: E-blocks programmer boards and application boards, cables, mounting panels, quick snap mounting pillars, nuts and bolts, storage trays, and download utilities.

For some packs compilers, assemblers and high quality screen based tutorials with tests exercises and worksheets are ordered separately.

If you prefer to make up your own starter packs you can select individual items from the range - see page 21.

Further information

Details on all hardware and software are given below. Technical datasheets are available on our web site.



Starter packs include everything you need including rugged plastic trays for storage and transport.



What does it do?

This E-blocks starter pack includes a selection of boards, Flowcode graphical programming software, and a beginners' course in microcontroller programming.

Benefits

- ▶ Prepares students for a course in C or assembly
- ▶ Introduces students to the concepts to programming

Features

- ▶ Includes a free 50 hour course in e-system development
- ▶ Can be used for learning and projects
- ▶ Based on PICmicro microcontrollers
- ▶ An ideal pre-cursor to learning C programming

Description

This starter pack is designed to allow you to deliver a beginners' course in microcontroller programming and system

development. It can also be used for more advanced courses and for project work. Packs are offered at a discount to the sum

of the parts. Packs are supplied with a free CD ROM containing an introduction to microcontroller programming

Hardware

E-blocks starter packs contain a metal backplane for mounting E-blocks, a power supply, a collection of individual E-blocks and utility software, rugged plastic storage trays and accessories. These starter packs include a selection of E-block boards which can be used to form a large number of electronic systems, for learning or for project work. Plastic covers for all boards are available.

Software

We recommend that a full version of Flowcode is purchased with these systems. In addition a considerable amount of work can be carried out with the free version of Flowcode which is available as a download from our web site. (Ideal for student use at home.)

Curriculum

The CD ROM 'An introduction to microcontroller programming' (page 22) is included with these packs. This teaches many aspects of microcontroller system design and is an ideal introduction for students who need to learn C or assembly code programming.



Hardware



Image shows standard starter pack which also includes storage trays and other accessories.

Learning objectives

These are flexible kits that can be used for both learning and project work. When used with 'An introduction to microcontroller programming' the packs have many learning objectives including:

- ▶ To introduce students to microcontrollers and their operation in electronic circuits
- ▶ To teach students the fundamentals of microcontroller based circuits
- ▶ To provide a good understanding of fundamental programming constructs including Outputs, Delays, Loops, Inputs, Decisions, LCD displays, Keypad, Analogue inputs, Subroutines, and Interrupts
- ▶ To teach students the fundamentals of e-system design and development

Ordering information

Standard PICmicro starter pack	EB215
Flowcode single user	TEFLCS14
Introduction to microcontroller programming CD ROM	Included

What does it do?

These starter packs provide a complete solution to learning and teaching assembly code and C code programming for 8 bit microcontrollers.

Benefits

- ▶ Complete solutions saves teaching time and preparation time
- ▶ Can be used for learning and for projects
- ▶ Complete courses for teaching programming are available

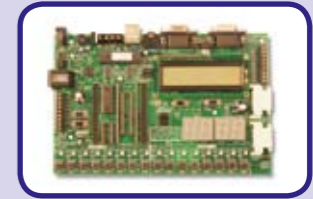
Features

- ▶ PICmicro and AVR microcontrollers are supported
- ▶ Comprehensive courses with compilers, IDEs and download utilities available
- ▶ Several hardware options available
- ▶ Free Flowcode starter course for beginners included in some hardware options

Description

These starter packs provide all of the resources you need for delivering a traditional 50 hour module in C or assembly code programming. The emphasis

here is on student-centred learning with the CD ROMs providing all of the resources students need to teach themselves whilst you provide tutorial support on a one-to-one basis.



Version 3 development board (page 25)

Hardware

E-blocks™ starter packs contain a metal backplane for mounting E-blocks™, a power supply, a collection of individual E-blocks™ and utility software, rugged plastic storage trays and accessories. These starter packs include a selection of E-blocks™ boards which can be used to form a large number of electronic systems, for learning or for project work. Plastic covers for all boards are available. Alternatively a version 3 microcontroller development board (page 25) can be used for PICmicro related studies.

Software

Download software is supplied with all packs. All CD ROMs include full compilers/assemblers required as well as Integrated Development Environments.



Hardware



Image shows standard starter pack which also includes storage trays and other accessories.

Curriculum

Each CD ROM contains a 50 hour course in C or assembly programming and includes simulations which aid understanding, tutorials, tests and exercises. The curriculum supplied is tightly integrated with the E-blocks and development board hardware. E-blocks starter packs are supplied with a free CD ROM 'An introduction to microcontroller programming' for remediation and novices.

Learning objectives

- ▶ Gain a thorough understanding of the operation of 8 bit microcontrollers, and understand programming in the relevant language from basic techniques through to advanced concepts such as serial communication, and interrupts.
- ▶ Develop the skills and techniques required to write programs of some complexity
- ▶ Develop the skills to design the hardware and software for electronic systems based on 8 bit processors

Ordering information

Standard PICmicro starter pack	EB215
Deluxe PICmicro starter pack	EB110
Standard AVR starter pack	EB343
Deluxe AVR starter pack	EB219
Assembly for PICmicro microcontrollers CD ROM	EL629S14
C for PICmicro microcontrollers CD ROM	EL543S14
C for AVR microcontrollers CD ROM	ELCVRSI

What does it do?

These starter packs provide flexible training solutions for learning programmable logic technology and for project work.

Benefits

- ▶ Complete solution available including courseware, hardware, and programming software
- ▶ Students use on-screen tutorials to teach themselves which saves preparation and teaching time

Features

- ▶ Two starter packs are available – one for studying CPLD technology and one for FPGA+CPLD technology
- ▶ 128 macrocell CPLD board / 6000 Logic Element FPGA board
- ▶ Ideal for projects and learning
- ▶ Free CD ROM includes software and courseware for teaching VHDL and Verilog

Description

These CPLD/FPGA starter packs allow your students to investigate modern

programmable logic technology using the superb Quartus II design software from Altera. The packs include a free version of

our Programmable logic techniques CD ROM as well as a free copy of Quartus II web edition design software.

Hardware

The CPLD and FPGA starter packs contain a metal backplane for mounting E-blocks, a power supply, a collection of individual E-blocks and utility software, rugged plastic storage trays and accessories. These starter packs include a selection of E-blocks boards which can be used to form a large number of electronic systems, for learning or for project work. The CPLD solution is based on a 512 macrocell Altera device, and the FPGA solution is based on a 6000 logic element Altera device.

Software

The recommended software is Altera's Quartus II web edition. This is provided free of charge with the equipment - periodic registration is required.

Curriculum

Each pack includes a copy of Programmable logic techniques. This student-centred 40 hour screen based resource teaches students the fundamental principles of programmable logic in block diagram, VHDL and Verilog. See page 23 for details.

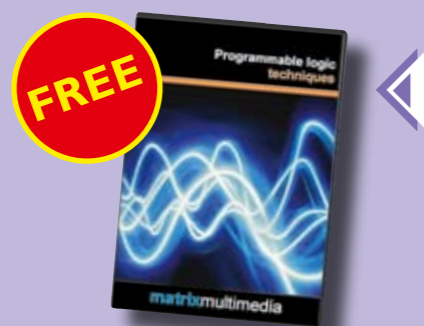
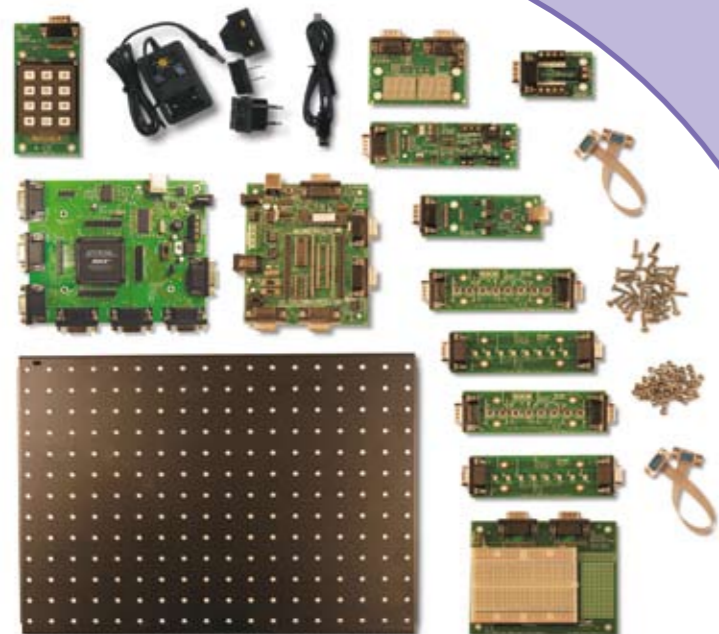
**Hardware**

Image shows EB940 which also includes storage trays and other accessories.

Ordering information

CPLD solution.....	EB287
FPGA solution.....	EB940
Programmable logic techniques CD ROM.....	Included

FPGA = Field Programmable Gate Array
CPLD = Complex Programmable Logic device

What does it do?

The ARM starter packs provide a complete solution to learning and teaching C code programming for 32 bit ARM microcontrollers.

Benefits

- ▶ Complete solution saves teaching time and preparation time
- ▶ Can be used for learning and for projects

Features

- ▶ Atmel SAM7 ARM chip with 5 E-blocks ports
- ▶ USB programmable
- ▶ Comprehensive course with C compiler, simulation and IDE available
- ▶ Kits are supplied in rugged storage trays with all necessary cables, backplane and accessories

Description

This equipment is designed to support those who have some experience of 8 bit

microcontrollers and who need to learn C programming for the popular ARM 7 core. The equipment is based on the Atmel

AT91SAM7128S processor which has 128K ROM, 32K RAM and many internal peripherals.

Hardware

The ARM starter packs contain a metal backplane for mounting E-blocks, a power supply, a collection of individual E-blocks and utility software, rugged plastic storage trays and accessories. These starter packs include a selection of E-blocks™ boards which can be used to form a large number of electronic systems, for learning or for project work. Plastic covers for all boards are available.

Software

The C for ARM microcontrollers CD ROM includes a full C compiler and Integrated Development Environment. Download software is supplied with all packs.

Curriculum

The CD ROM contains a full 50 hour student-centred course in ARM 7 microcontroller programming in C code. The course includes a host of on-screen tutorials with simulations, which aid understanding, tutorials, tests and exercises. The curriculum supplied is tightly integrated with the E-blocks hardware.

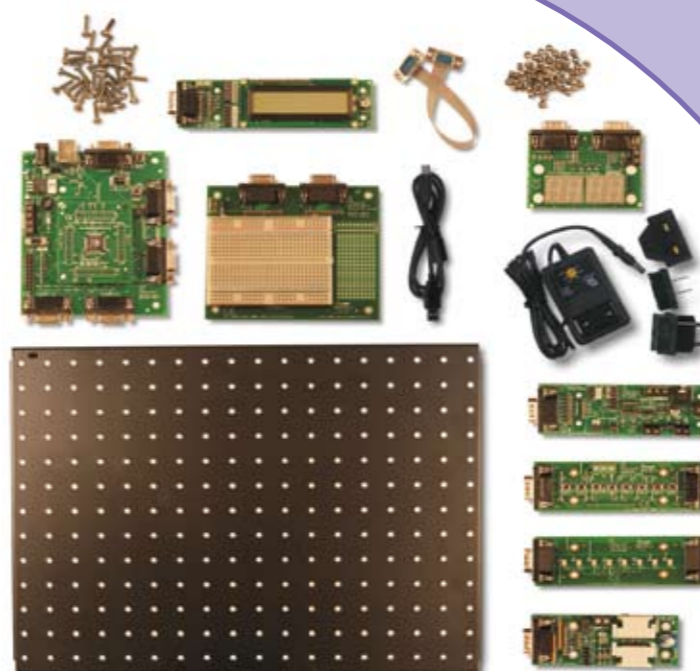
**Hardware**

Image shows standard ARM pack which also includes storage trays and other accessories.

Learning objectives

- ▶ Understand how to implement combinational and sequential logic in a programmable logic device
- ▶ Understand how to program in the VHDL language
- ▶ Understand how to program in the Verilog language
- ▶ Understand how to design and construct e-systems using programmable logic devices

Learning objectives

- ▶ Gain a thorough understanding of C programming for ARM microcontrollers from basic techniques through to advanced concepts such as serial communication, and interrupts.
- ▶ Develop the skills and techniques required to write C programs of some complexity from scratch
- ▶ Develop the skills to design e-systems based on 32 bit processors from scratch

Ordering information

Standard ARM starter pack.....	EB139
Deluxe ARM starter pack.....	EB131
C for ARM microcontrollers.....	ELRMSI

What does it do?

ECIO devices are powerful USB programmable micro-controllers with 28 and 40 pin DIL (0.6") footprints. They are perfect for student use at home and for project work.

Description

The ECIO family of USB programmable microcontroller modules device behaves just like a normal microcontroller - but when you plug the USB lead in and press the reset switch you can send a new program to the device. This, and the low

Benefits

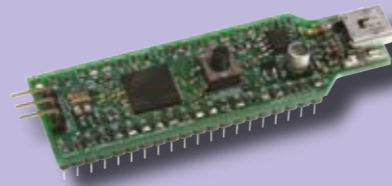
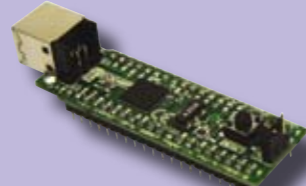
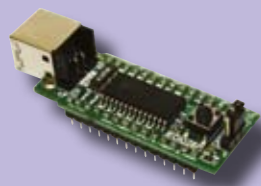
- ▶ Student budget, professional capability
- ▶ Ideal for student work at home
- ▶ Adds USB reprogrammability to your own circuit boards

Features

- ▶ Programmable from USB, power from USB
- ▶ Compatible with a free version of Flowcode
- ▶ Includes bootloader software

cost, makes ECIO ideal for student work at home and for incorporating into student circuit boards. ECIO microcontrollers are pre-programmed with a bootloader program which allows you to send a new program to the microcontroller

via USB. ECIO is compatible with hex code from any appropriate compiler including Flowcode, C compilers and MPLAB. ECIO is well supported with a wide range of learning and development tools including Flowcode and E-blocks.

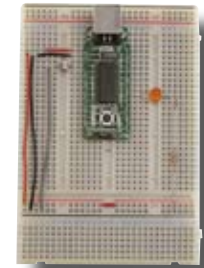


Processor	8 bit 18 series PICmicro
Base chip:	PIC18F2455
Oscillator:	4MHz ext., 48MHz internal
IO lines:	19
A/D:	10 x10 bit
A/D sample rate	100ksps
Program memory	24K Bytes
RAM	2K bytes
EEPROM	256 bytes
Power	5V, USB or external
PWM channels	2
Timers	1 x 8 bit, 3 x 16 bit
Interfaces	EUSART, MI2C, SPI, USB2.0
Package	28 pin, 0.6", DIP compatible

Processor	8 bit 18 series PICmicro
Base chip:	PIC18F4455
Oscillator:	4MHz ext., 48MHz internal
IO lines:	30
A/D:	13 x10 bit
A/D sample rate	100ksps
Program memory	24K Bytes
RAM	2K bytes
EEPROM	256 bytes
Power	5V, USB or external
PWM channels	5
Timers	1 x 8 bit, 3 x 16 bit
Interfaces	EUSART, MI2C, SPI, USB2.0
Package	40 pin DIP, 0.6", compatible

Processor	32 bit, AT91 ARM 7 core
Base chip:	AT91SAM7S128
Oscillator:	18.43MHz ext, 47.92MHz int
IO lines:	34
A/D:	8 x10 bit
A/D sample rate	300ksps
Program memory	128K Bytes
RAM	32K bytes
EEPROM	0 (internal ROM overwrite)
Power	5V, USB or external
PWM channels	4
Timers	3 x 16 bit, 2 x 32 bit
Interfaces	2 x EUSART, MI2C, SPI, USB2.0
Package	40 pin DIP, 0.6", compatible

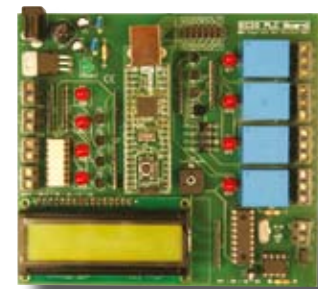
Hardware



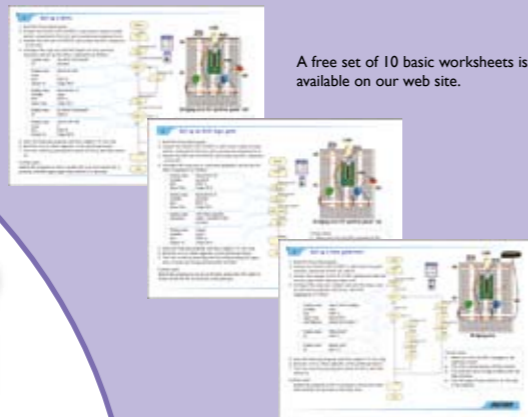
Use ECIO modules with a prototype board ...



... with the E-blocks application board



... or build it into your own circuit board.



A free set of 10 basic worksheets is available on our web site.



The ECIO student starter kit consists of an ECIO28P, a breadboard, and 13 electronic components which are used with the worksheets.

Ordering information

28 pin PIC18 ECIO	ECIO18P
40 pin PIC18 ECIO	ECIO40P
40 pin ARM 7 ECIO	ECIOARM
E-blocks application board	EB06I
Wide prototype board	HPAD0I
Student ECIO starter kit	EC296I

E BLOCKS®

The real benefit of buying a ready-made learning solution is that you get everything you need to lay on a course in the chosen topic 'out of the box'.

These solutions have some common features:

Hardware

- ▶ Solutions are made up from our E-blocks hardware modules bolted onto strong metal backplanes. Each module has a clear plastic cover to prevent students changing link setting and removing chips. All cables and accessories are supplied, and hardware is supplied in rugged plastic trays for storage and transport.



Software

- ▶ A full copy of Flowcode is included with each solution. Flowcode allows students to concentrate on learning about the system, without getting bogged down in the coding. In some solutions additional software for analysis is provided.



Curriculum

- ▶ Each solution has a full teacher's manual including exercises, and a CD ROM with worked examples. In addition a copy of 'An introduction to microcontroller programming' CD ROM is provided as a refresher to those not familiar with Flowcode or for remediation.



CAN bus training solution



What does it do?

The CAN bus training solution provides a resource for teaching and learning about CAN bus technology for all levels of student - Automotive and beyond.

Benefits

- ▶ Allows students to investigate CAN at a high level without getting bogged down in programming detail
- ▶ Flowchart software allows students to concentrate on CAN strategy and protocol

Features

- ▶ Allows rapid development of CAN systems
- ▶ Suitable for investigation of the CAN protocol
- ▶ Includes full CAN diagnostic and message generation tools

Description

This training solution is designed to facilitate the development and investigation of systems that use the CAN bus protocol.

The solution is suitable for automotive students who simply need to understand how CAN works, and for electronics

undergraduate students who want to understand more details of the CAN protocol.

Hardware

The solution is comprised of four fully programmable CAN nodes which mimic Electronic Control Units in an automotive application. These are mounted on rugged backplanes and are fitted with ancillary circuit boards which mimic the functions of indicator lamps, switches and sensors. A CAN bus analyzer and message generator is supplied with the solution so that students can 'see' the traffic on the bus. The product is shipped in rugged plastic trays for storage and transport.

Software

Flowcode and its associated CAN macros allow students to program each of the four nodes in flow charts to form a fully functioning CAN system. The software supplied operates at several levels so that different types of student are only exposed to the relevant details of the CAN system.

Curriculum

An 80+ page teacher's manual is included with a range of exercises for Automotive technicians upwards – including fault finding exercises.

Solution



Learning objectives

CAN for automotive technicians

- ▶ To understand what a microcontroller is and that it can be programmed with software to perform different tasks
- ▶ To understand what an ECU is, and how ECUs are networked in CAN systems and that software can change the way an ECU operates
- ▶ To understand and diagnose faults in a CAN bus system
- ▶ To understand the nature of CAN, the basic CAN protocol, and the structure of a CAN network

CAN for electronics engineers

- ▶ To gain an full understanding of CAN technology and construct networks which communicate using higher level protocols
- ▶ To understand CAN protocols, and CAN message structure
- ▶ To gain an insight into higher level protocols like DeviceNET and CANOPEN

Ordering information

CAN solution EB237

CAN = Controller Area Network
ECU = Electronic Control Unit



LIN bus training solution



What does it do?

The LIN bus training solution provides a resource for teaching and learning about LIN bus technology for all levels of student - Automotive and beyond.

Benefits

- ▶ Allows students to investigate LIN at a high level without getting bogged down in programming detail
- ▶ Flowchart software allows students to concentrate on LIN strategy and protocol

Features

- ▶ Allows rapid development of LIN systems
- ▶ Suitable for investigation of the LIN protocol
- ▶ Complete suite of hardware modules and sensors
- ▶ Works together with the CAN solution to provide a complete CAN/LIN system

Description

This training solution is designed to facilitate the development and investigation of systems that use the LIN bus. The

solution is suitable for automotive students who simply need to understand how LIN works, and for electronic engineering

students who need to have a good understanding of the details of the LIN protocol.

Hardware

The solution is comprised of four fully programmable LIN nodes which mimic Electronic Control Units (ECUs) in an automotive application. These are mounted on a rugged backplane and are fitted with ancillary circuit boards which mimic the functions of indicator lamps, switches and sensors. The product is shipped in rugged plastic trays for storage and transport.

Software

Flowcode and its associated LIN macros allow students to program each of the four nodes in flow charts to form a fully functioning LIN system. The macros supplied with Flowcode allow students to construct fully working LIN bus systems.

Curriculum

A 30 page teacher's manual is included with a range of exercises. Automotive technicians can download these to the LIN systems and observe system behaviour. More advanced students can be tasked with creating a fully functioning LIN bus.

Solution



Learning objectives

LIN for automotive technicians

- ▶ To understand the nature of LIN, the basic LIN protocol, and the structure of a LIN network
- ▶ To understand message exchange in a LIN network
- ▶ To see how LIN differs from CAN

LIN for electronics engineers

- ▶ To understand LIN message structure
- ▶ To understand and construct a fully operational LIN system with four nodes working simultaneously
- ▶ To construct a complete CAN/LIN system – requires CAN bus solution

Ordering information

LIN solution EB413

LIN = Local Interconnect Network





What does it do?

Provides a motivating platform for learning about Bluetooth communication protocols and practice.

Benefits

- ▶ Highly motivating
- ▶ Accessible to many levels of student
- ▶ Teaches about Bluetooth from a practical point of view
- ▶ Provides rapid access to Bluetooth technology

Features

- ▶ Complete Bluetooth training solution
- ▶ Allows investigation of Bluetooth protocols and stack
- ▶ Programmable with Flowcharts - key macros supplied
- ▶ Sample programs in easy to read flowcharts are provided

Description

This training solution allows students to carry out investigations into the Bluetooth standard using high level macros written in

Flowcode. Students use hardware, software and curriculum materials to investigate various Bluetooth protocols and functions

including the serial protocol (SPP), local area protocol (LAP), and the headset profile (HPP).

Hardware

The solution consists of two fully working Bluetooth systems - made up from E-blocks - with Bluetooth transceivers and CODEC boards. A CODEC interface for transmitting digital audio signals is included in each system.

Software

A full copy of Flowcode is provided. Flowcode includes a Bluetooth component which allows students to control the Bluetooth board using scripting macros to issue sequential AT command strings.

Curriculum

An 80 page teacher's manual is provided with the system which covers system set up, Bluetooth theory, and a range of exercises for students to work through. A CD ROM is included with a number of example files and solutions to exercises.

Solution



Learning objectives

- ▶ Data communication between microcontroller and Bluetooth modules
- ▶ AT command structure and programming strategy in AT controlled systems
- ▶ Bluetooth visibility
- ▶ Device discovery, pass keys and addresses
- ▶ Responses - sequence flow and error checking
- ▶ Connecting and pairing
- ▶ Data communication
- ▶ Using Bluetooth for control applications
- ▶ Audio and implementation of the audio gateway
- ▶ Headset and telephone profiles
- ▶ Security

Ordering information

Bluetooth solution..... EB860

CODEC = COder, DECoder



What does it do?

Provides a motivating solution for learning about communications technology, system construction, and project development.

Benefits

- ▶ Provides understanding of digital communications strategy, practice, and implementation
- ▶ A great introduction to the development of projects involving communications systems

Features

- ▶ Fully working mobile phone constructed from E-blocks
- ▶ Includes Flowcode Professional software.
- ▶ Full curriculum support
- ▶ A great introduction to communications practice

Description

This solution can be used to provide a complete course in developing communication systems from a standing

start. In completing the 20 hour course students will learn about communications systems, the AT command protocol,

communications strategies, and many aspects of project development and management.

Hardware

The solution includes a fully working mobile phone based on E-blocks. All E-blocks boards are fitted with clear acrylic covers which prevent links and chips from being removed. The solution is assembled and tested in the factory, and is shipped in rugged plastic trays for storage and transport.

Software

A full copy of Flowcode graphical programming software is provided. Flowcode allows students to understand communications programs and strategies without getting bogged down in the complexity of C or Assembly code. The system can also be used with C and Assembly code (software not provided).

Curriculum

A 50+ page printed and bound manual with student exercises is included. This is also available in electronic form (Word and PDF) along with fully worked examples on CD ROM. This pack is also supplied with a free CD ROM 'An introduction to microcontroller programming' for remediation and Flowcode novices.

Solution



Learning objectives

Programming outcomes:

- ▶ Programming of systems including LCD, keypad etc., RS232 protocol and programming, string construction and deconstruction, state machines

Communications outcomes:

- ▶ RS232 communications and handshaking protocols, ASCII representation, AT commands & command protocols, Sending and receiving text messages, Modem control and messaging

Project management and development outcomes

- ▶ Flowcharts and state diagrams in planning systems, a modular approach to developing electronic systems

Ordering information

Mobile phone solution EB118



What does it do?

The digital communications solution allows students to learn, and implement, TCP/IP communications and understand the OSI model.

Benefits

- ▶ Extremely economical solution to learning internet protocol and digital communications.
- ▶ Teaches many aspects of OSI model technology in an electronics context
- ▶ Highly motivating resource that allows surprisingly functional systems to be created

Features

- ▶ Includes two web server boards
- ▶ Allows students to explore MAC, IP, ARP, UDP and TCP protocols
- ▶ Allows students to create a hardware firewall

Description

This extraordinary training solution allows students to carry out a range of experiments that builds understanding of

modern digital communications protocols including Ethernet, DLC, MAC, ARP, TCP, IP, UDP, ICMP, HTTP and POP3 protocols and

their relative position in the OSI model. Students can build advanced programs including email server and a firewall.

Hardware

The solution consists of a set of E-blocks that form an embedded internet solution: including two web server modules. The solution is assembled and tested in the factory, and is shipped in rugged plastic trays for storage and transport.

Software

A full copy of Flowcode is provided. Flowcode includes components that allow rapid development of web pages, and a complete suite of additional macros that allows students to construct and receive packets at the MAC, UDP, TCP and IP layers.

Curriculum

An 80 page teacher's manual is provided with the system which covers system set up, some digital communications theory, and a range of exercises for students to work through. A CD ROM is included with a number of example files and solutions to exercises.

Solution



Learning objectives

Programming outcomes

- ▶ General programming of systems including LCD, keypad etc.
- ▶ Packet construction and deconstruction using flowcharts
- ▶ Embedded internet solution development

Communications outcomes

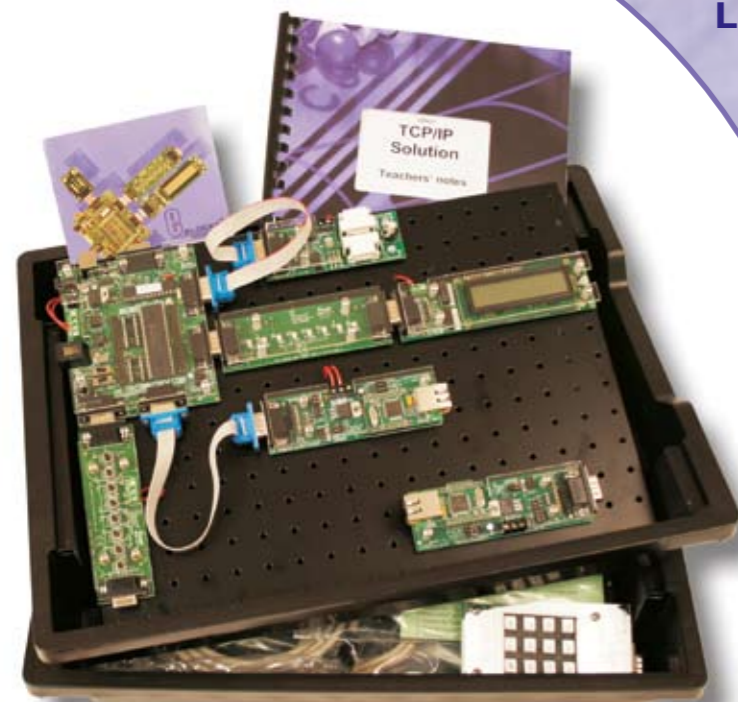
- ▶ In-depth understanding of OSI model layers and structure
- ▶ Packet/frame structure at MAC and higher levels
- ▶ Protocols used at MAC and higher levels in the OSI model
- ▶ Understanding of the use of packet analysers and injectors
- ▶ Network monitoring and debugging
- ▶ The use of firewalls in filtering data

Project management outcomes

- ▶ The use of flowcharts in planning projects
- ▶ Implementation of electronic systems from a brief

Ordering information

Embedded Internet solution EB643



What does it do?

Provides a motivating solution for learning about wireless area network RFID (Radio Frequency IDentification) technology, system construction, and project development.

Benefits

- ▶ Provides understanding of RFID systems

Features

- ▶ Fully working RFID system constructed from E-blocks
- ▶ Includes Flowcode Professional software
- ▶ Full curriculum support
- ▶ A great introduction to practical RFID implementation

Description

This solution can be used to provide a complete 20 hour course in developing RFID systems. This will give students

who are familiar with microcontrollers an understanding of the programming techniques involved in developing RFID systems, as well as an understanding of how

these systems are developed from scratch. An E-blocks RFID board and four RFID tags embedded into credit cards are included.

Hardware

The solution includes a fully working RFID system based on E-blocks™. All E-blocks boards are fitted with clear acrylic covers which prevent links and chips from being removed. The solution is assembled and tested in the factory, and is shipped in rugged plastic trays for storage and transport.

Software

A full copy of Flowcode graphical programming software is provided. Flowcode allows students to understand communications programs and strategies without getting bogged down in the complexity of C or Assembly code. The system can also be used with C and Assembly code (software not provided).

Curriculum

A 50+ page printed and bound manual with student exercises is included. This is also available in electronic form (Word and PDF) along with fully worked examples on CD ROM. An additional CD ROM - 'An introduction to microcontroller programming' - is provided for those who need a refresher course in programming.

Hardware



Learning objectives

- ▶ This equipment is used to give students a complete understanding of the how RFID systems are constructed. The theory of RFID system development is understood through a series of 9 exercises carried out with Flowcode and the E-blocks hardware. These include:

- ▶ Icode mode:
 - ▶ Transponder unique ID
 - ▶ Reading transponder data
 - ▶ Writing transponder data
- ▶ Mirfare mode:
 - ▶ Transponder unique ID
 - ▶ Reading transponder data
 - ▶ Writing transponder data

Ordering information

RFID solution EB699



What does it do?

Provides a motivating solution for learning about wireless area network (Zigbee) communications technology, system construction, and project development.

Description

This solution can be used to provide a complete 20 hour course in developing wireless area networks based on the

Hardware

The solution includes a four fully working Zigbee nodes based on E-blocks™. All E-blocks boards are fitted with clear acrylic covers which prevent links and chips from being removed. The solution is assembled and tested in the factory, and is shipped in rugged plastic trays for storage and transport.

Benefits

- ▶ Provides understanding of Zigbee communications and networks

Zigbee standard. This will give students who are familiar with microcontrollers an understanding of the programming techniques involved in developing Zigbee

Features

- ▶ Fully working Zigbee network (4 node) constructed from E-blocks
- ▶ Includes Flowcode Professional software
- ▶ Full curriculum support
- ▶ A great introduction to practical Zigbee implementation
- ▶ Includes a Zigbee analyser

wireless communication systems, as well as an understanding of how these systems are developed from scratch. A Zigbee packet analyser is included.

Software

A full copy of Flowcode graphical programming software is provided. Flowcode allows students to understand communications programs and strategies without getting bogged down in the complexity of C or Assembly code. The system can also be used with C and Assembly code (software not provided).

Curriculum

A 50+ page printed and bound manual with student exercises is included. This is also available in electronic form (Word and PDF) along with fully worked examples on CD ROM. An additional CD ROM - 'An introduction to microcontroller programming' - is provided for those who need a refresher course in programming.

Learning objectives

- ▶ This equipment is used to give students a complete understanding of the Zigbee wireless areas network protocol through the following topics:
 - ▶ Moulding the network
 - ▶ Adding a node
 - ▶ Expanding the network
 - ▶ Reducing power consumption
 - ▶ Dynamic networks
 - ▶ Message routing
 - ▶ Data logging gateway
 - ▶ A complete modular fire and burglar alarm
 - ▶ Improving network security

Ordering information

Zigbee solution EB284

Hardware



E-BLOCKS®

This section describes in more detail some of the 150 separate items in the E-blocks range.



Hardware

Choose from our 40 E-blocks boards...



Software

...our range of compilers and editors...



Curriculum

...and our CD ROM learning resources.

What does it do?

This CD ROM is a computer based learning resource for learning about the development of microcontroller based systems using E-blocks and Flowcode.

**Benefits**

- ▶ Students learn at their own pace
- ▶ Saves class time and preparation time

Description

This new CD ROM provides a complete course in developing microcontroller based systems using Flowcode and E-blocks. The course contains a suite of 13 labs each of which has an accompanying Word worksheet. Students print a worksheet and then work through the contents of the CD ROM, developing systems using Flowcode and E-blocks to complete each lab. Each

Features

- ▶ A full course in microcontroller programming using Flowcode
- ▶ Includes worksheets and grading system
- ▶ Step-by-step construction guide
- ▶ Includes project hints and tips
- ▶ Most exercises can be done with the free version of Flowcode

worksheet has a number of tasks, graded to cater for mixed ability classes. Supervisors can use the accompanying Excel marking scheme to track the progress of students as they work through the material. This CD ROM is an excellent introductory course to microcontrollers that will be ideal for preparing students for more complex system development or for learning C programming.

Learning objectives

Study of the CD ROM will achieve the following objectives:

- ▶ Gain a thorough understanding of the concepts of programming microcontrollers: from basic techniques through to interrupts.
- ▶ Develop the skills and techniques required to develop electronic systems based on microcontrollers

This CDROM is FREE when you buy one of our starter packs - see page 8.

Ordering information

Single user	ELFCSS13
10 user	ELFCSS103
Site licence	ELFCSSL3

Tutorial screens contain information on using E-blocks....

...and step-by-step instructions on building flow chart programs using Flowcode.

Solution**What does it do?**

Provides a complete course in assembly code programming.



Typical tutorial screen



The Virtual PICmicro microcontroller

Benefits

- ▶ Supports a tutorial system of teaching assembly programming that saves hours of preparation and chalkboard time
- ▶ Unique simulation tools shorten the learning cycle

Features

- ▶ Comprehensive instruction through 39 tutorial sections
- ▶ Includes a Virtual PICmicro MCU: a fully functional graphical simulator
- ▶ Includes programming software, tests and exercises

Description

This CD ROM contains a complete 50 hour course in programming the PICmicro microcontroller. The tutorials start with fundamental concepts and extend up to complex programs including watchdog timers, interrupts and sleep modes. The CD ROM includes unique simulation tools which help students overcome key problems in programming in assembly code, and a simplified development environment is included.

Ordering information

Single user	EL629S14
10 user	EL629104
Site licence	EL629SL4

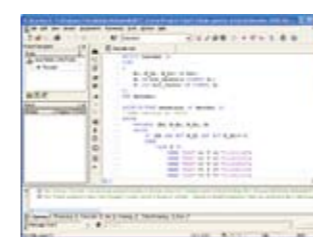
Programmable logic techniques CD ROM

What does it do?

Provides a complete course in CPLD / FPGA programming.



Typical course screen



Quartus II Web edition design software

Benefits

- ▶ Supports a tutorial system of teaching CPLD programming in block diagrams, VHDL and Verilog
- ▶ Includes all software and courseware needed

Features

- ▶ Complete guide to logic design using Quartus II (web edition included)
- ▶ Includes example projects and exercises
- ▶ Includes courses in both Verilog and VHDL
- ▶ A modern way to learn digital electronics design

Description

This CD ROM gives a thorough introduction to CPLD and FPGA programming using Altera's Quartus II Web Edition software in a 40 hour practical course. The CD starts with an introduction to designing with Quartus II using block diagrams, at basic and intermediate levels. Then the CD ROM takes students through the process of developing combinational and sequential logic designs using either Verilog or the VHDL descriptor language. The CD is suitable for those who have some experience of digital logic and want to get to grips with modern CPLD and FPGA techniques. A number of example projects in block diagrams, Verilog and VHDL are included.

FREE with our CPLD starter pack see page 10.

Ordering information

Single user	ELPLDS1
10 user	ELPLD10
Site licence	ELPLDSL

What does it do?

These three CD ROMs contain complete tutorial courses on programming microcontrollers in C. They also include C compilers and IDEs.



Benefits

- ▶ Simulations shorten learning curves
- ▶ Complete solution - including all software utilities needed

Description

These CD ROMs provide you with a complete solution to teaching and learning C programming for the PICmicro, Atmel AVR and Atmel ARM microcontrollers.

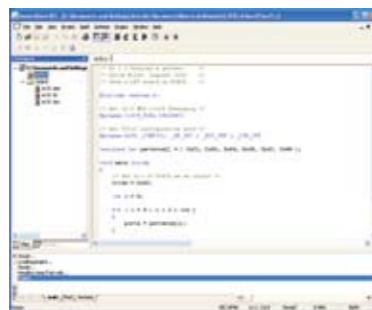
The courses are structured in two parts: firstly students are taken through the fundamentals of C programming in a series of on-screen tutorials that makes use of our virtual microcontroller to explain to students how C works. This well proven methodology centres around a simulation

Features

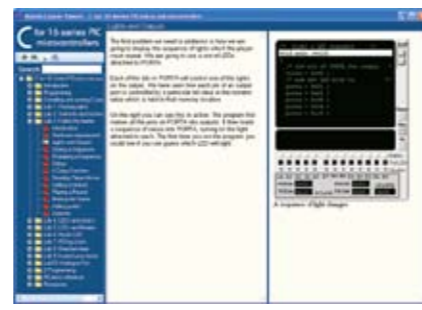
- ▶ Includes a HTML based course in C programming
- ▶ Include full C compilers and IDE
- ▶ Examples and exercises included
- ▶ Integrate tightly with E-blocks

of the microcontroller which allows students to clearly see the effects on the chip and internal variables and registers as each line of C code executes.

Once students have understood the basics they carry out a series of labs using the Integrated Development Environment (IDE) and compiler provided. Tests and exercises to reinforce learning are provided. The software tools supplied on the CD are suitable for a wide range of projects.



IDE / Compiler



Typical tutorial screen

How the virtual microcontroller helps learning...



Students read through the tutorials...

2



...then they simulate the program on-screen...



... compile the source code in the IDE...

4



...and verify the program on the hardware.

Ordering information

C for 16 series PICmicro microcontrollers	
Single user	EL543S1
10 user	EL543I0
Site licence	EL543SL
C for ARM microcontrollers	
Single user	ELRMS1
10 user	ELRM10
Site licence	ELRMSL
C for AVR microcontrollers	
Single user	ELCVRS1
10 user	ELCVRI0
Site licence	ELCVRSL

Note that the C compiler on the C for 16 series PICmicro microcontrollers CD ROM is only licensed for educational use.

PICmicro® microcontroller Multiprogrammer



- USB programmed and powered
- 5 E-blocks ports
- Removable crystal
- Programs a wide range of PICmicro devices
- Programming software provided

The PICmicro multiprogrammer connects to your PC via USB to provide you with a high speed, low cost PICmicro MCU programmer for development and programming use. This board can be used with Assembly, C or Flowcode and most third party compilers. The board programs a range of 8, 14, 18, 28 and 40 pin PICmicro® microcontroller devices from the 12, 16, and 18 series and presents all 5 ports on separate D-type sockets. As soon as the on-board chip is programmed the program inside the chip is reset and executed. The board takes power from an external power supply or from the USB port. The new version 7 (Feb. 2009) is compatible with Flowcode 4's In Circuit Debug features.

EB006

AVR® microcontroller Multiprogrammer



- A complete AVR development solution
- 4 E-blocks ports
- Removable crystal
- Programs a range of AVR devices
- Full IDE provided

The AVR Multiprogrammer includes everything you need to both program an AVR microcontrollers as well as to develop AVR projects. This product contains several items: a CD ROM containing development tools, an in-system programmer and an E-blocks AVR board. The ISP programmer connects to your USB port and to the board which is compatible with 8, 20, 28 and 40 pin AVR devices. The board supplies 4 full E-blocks ports and all pins are available on a 40 pin header. The CD ROM includes a range of development tools including an Integrated Development Environment for code writing in assembly and debugging, and the ISP programming software. A free GNU C compiler can be added to the IDE for those wanting to write programs in C.

EB194

CPLD and FPGA programmer boards



- 7 E-blocks ports
- CPLD or FPGA programmer
- USB programming

The CPLD board contains a 128 macrocell 7000 series CPLD from Altera which can be programmed using the parallel port on your PC. The board has 7 E-blocks ports which can be used to interface to other E-blocks components. A 6000 Logic Element FPGA daughter board plugs onto the top of the CPLD board (not shown in the photograph) to provide a development platform for FPGA projects. CD ROM courses and compilers for this board are available.

CPLD board: EB020
FPGA add-on: EB049

ARM® microcontroller programmer

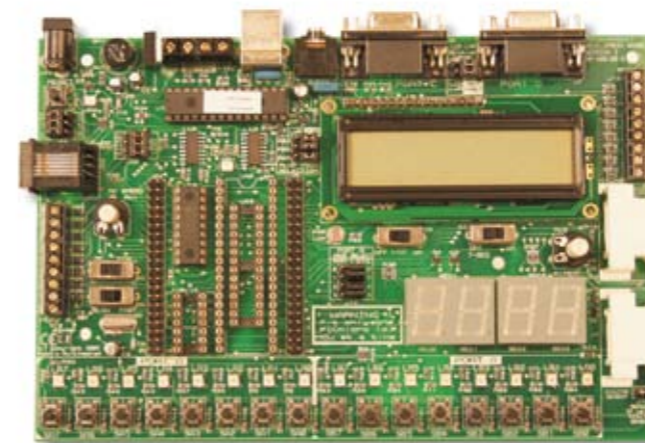


- 32 bit ARM processor with 128K ROM and 32K SRAM
- USB programmable with boot loader
- 5 E-blocks ports, 32 I/O lines
- Native USB and SPI buses
- Compatible with most downstream boards

This E-blocks board is a development tool for the powerful AT91 SAM 7 microcontroller from Atmel. The SAM 7 is a 32 bit RISC device running at an internal frequency of 80MHz, and having 128k ROM and 32k static RAM as well as 2 USARTs, 4 x 10 bit A/D converters and a native USB bus. This incredibly powerful microcontroller can be used for a range of advanced E-blocks projects. The board has 5 E-blocks ports and the processor itself is housed on a removable daughter board (Atmel ARM processors are only available in SMD technology) so that the ARM can be incorporated into custom PCBs. A full course (C for ARM Microcontrollers) is also available. This board uses a 3.3V power supply - please check the downstream boards you need are 3.3V compatible.

EB185

Version 3 PICmicro® microcontroller development board



- Programmed and powered from USB
- Low cost and small footprint
- Two E-blocks ports (ports C and D)
- Removable crystal
- Programs a wide range of PICmicro devices.
- Programming software provided

This flexible development board is an ideal platform for learning and project development. The board will program a range of 8, 14, 18, 28 and 40 pin PICmicro® microcontroller devices from the 12, 16 and 18 series PICmicro microcontroller range. The board is programmed using the USB port and is supplied with a comprehensive programming utility - PPP. The board can program Low Voltage Programmable PICmicro MCUs and deliver a limited amount of power from the USB supply. An external power supply (product code HPPSU2) can be used to take maximum advantage of the board's features. The board is compatible with the range of E-blocks modules and two E-blocks ports are provided. The board is also compatible with Microchip's In Circuit Debugging (ICD2) system.

HP488

'Downstream' application boards

Terminal board EB002 3.3V 5V



This small circuit board allows connection to all 8 pins of a standard E-blocks port with bare wires using screw terminals.

Power board EB011 3.3V 5V



The Power board contains two L293 quad push pull driver chips which provide power outputs for driving lamps or motors - including stepper motors. The board supplies 8 outputs which sink or source 500mA at up to 36V. Each output is protected with an inline resettable fuse. (Clear protective acrylic cover - EB711)

Sensor board EB003 3.3V 5V



This E-blocks contains a variable resistor and a simple light sensor which can be used for simple analogue experiments. It also contains sockets which allow users to interface to our range of more than 40 professional sensors including pH, temperature, distance, g etc. (Clear protective acrylic cover - EB703)

IR / IrDA transceiver board EB012 3.3V 5V



This board provides a complete solution to infrared communications - with both standard IR and IrDA protocol for communication with laptops or PDAs. (Clear protective acrylic cover - EB712)

Flowcode macros available

LED board EB004 3.3V 5V



This board has 8 LEDs which show the status of each bit on the port. Upstream and downstream E-blocks connectors allow this board to be used in bus configuration. (Clear protective acrylic cover - EB704)

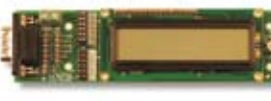
SPI bus D/A and memory board EB013 3.3V 5V



This E-blocks adds serial memory (8k) and D/A functions (8 bit with amplifier and headphone socket) to any microcontroller/ FPGA with an SPI (Serial Peripheral Interface) interface. (Clear protective acrylic cover - EB713)

Flowcode macros available

LCD board EB005 3.3V 5V



This E-blocks contains a 16 character, 2 line alphanumeric LCD display on a 5 wire serial bus. (Clear protective acrylic cover - EB705)

Flowcode macros available

Keypad board EB014 3.3V 5V



A simple 4x3 keyboard that allows data entry into bus based systems. (Clear protective acrylic cover - EB714)

Flowcode macros available

Switch board EB007 3.3V 5V



This board contains 8 push-to-make switches. Upstream and downstream E-blocks connectors allow this board to be used in bus configuration. (Clear protective acrylic cover - EB707)

RS232 board EB015 3.3V 5V



This E-blocks provides an RS232 interface which can be used to facilitate communication between a microcontroller/ FPGA and third party devices like PC serial ports, projectors etc. (Clear protective acrylic cover - EB715)

Flowcode macros available

Dual 7-segment display EB008 3.3V 5V



This board has a quad 7-segment common anode display with anodes controlled via one port and cathodes controlled by the other. (Clear protective acrylic cover - EB708)

Flowcode macros available

Prototype board EB016 3.3V 5V



This E-blocks contains a small prototype board for developing circuits and projects. Connectors for two E-block ports allow prototype wires and leads to be connected to the rows and columns on the prototype board.

'Downstream' application boards

Patch board kit EB017 3.3V 5V



This E-blocks contains a small patch board for developing circuits and projects. This E-block is used where there is a requirement to set up a permanent circuit to add to your E-blocks system. D-type connectors need to be soldered into place.

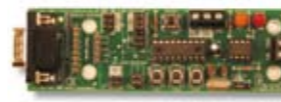
LIN board EB027 3.3V 5V



This board allows you to construct a fully working LIN bus interface from any microcontroller. (Clear protective acrylic cover - EB727)

Flowcode macros available

CAN bus board EB018 5V



This board allows you to add CAN bus functionality to any microcontroller with an SPI interface. The board includes both a CAN Controller and a CAN transceiver. (Clear protective acrylic cover - EB718)

Flowcode macros available

X10 home automation board EB028 5V



This E-blocks provides signal conditioning and protection which allow you to add X10 mains-borne communication to your system. A standard RJ11 cable provides connection between the a standard X10 transceiver and your microcontroller/FPGA.

MIDI interface EB021 3.3V 5V



With MIDI in, out and thru ports, this E-blocks allows any microcontroller to generate, process or respond to any MIDI datstream.

Voice CODEC board EB032 3.3V 5V



This audio coder-decoder board allows students to investigate Bluetooth systems that use audio. The board is based on a Freescale MC145483 linear 13 bit CODEC which allows voice digitisation and reconstruction as well as pre and post filtering. (Clear protective acrylic cover - EB732)

Motors board EB022 3.3V 5V



This E-block board is based on the L298 device which can drive two motors operating off up to 46V at up to 4A each. The board can be used in a variety of motor control configurations including PID control. (Clear protective acrylic cover - EB722)

PS2 / VGA board EB033 5V



This board allows you to connect standard keyboards, mice and VGA monitors to an E-blocks system. Whilst tricky with 8 bit processors, larger 32 bit processors and FPGA's can take advantage of low cost keyboards and old CRT based monitors to make flexible computing systems based on E-blocks.

Internet board EB023 3.3V 5V



This board adds Ethernet functionality to a microprocessor / FPGA system without the need for developing a TCP/IP software stack. It supports 10/100 connection UDP, IP, ARP, ICMP, DHCP, ARP, DLC and MAC. (Clear protective acrylic cover - EB723)

Flowcode macros available

Opto-isolator board EB035 3.3V 5V



This Opto-isolator board contains 4 separate isolated inputs to your E-blocks system for telecoms and Programmable Logic Controller applications. (Clear protective acrylic cover - EB735)

Bluetooth board EB024 3.3V 5V



The Bluetooth E-blocks allows you to add Bluetooth capability to any microcontroller with UART functionality. (Clear protective acrylic cover - EB724)

Flowcode macros available


MMC card reader board EB037 3.3V 5V



This MMC card reader sits on the serial port of a microcontroller and provides up to 512MB of memory to a an E-blocks system. A MMC card must be bought separately. (Clear protective acrylic cover - EB737)


'Downstream' application boards

Relay board **EB038** 3.3V 5V



This relay board contains 4 relays (choose high nibble or low nibble) which are each rated at 250V and 6A. This is ideal for building PLC type applications. Note that we do not recommend that you connect the relay board to mains voltages.


USB232 board **EB039** 3.3V 5V



The USB232 board allows you to connect a microcontroller with a USART back to a PC via USB. A virtual COM port driver is supplied for interfacing to PC software applications. (Clear protective acrylic cover – EB739)


Flowcode macros available

RFID **EB052** 3.3V 5V




This E-blocks board allows you to develop RFID systems based on the Mifare, ICODE and Ultralight protocols, and includes a built in antenna. (Clear protective acrylic cover – EB752)

Enhanced LCD display board **EB043** 3.3V 5V



Add an attractive visual display (with backlight) to projects with this 132x132 pixel, 65535 colour, 1.5" graphical LCD display. Only 4 i/o lines are required to drive the inbuilt controller chip, which automatically refreshes the display and provides an inbuilt character table. (Cover – EB743)


Sensor area network board **3.3V 5V**



This E-blocks board provides easy connection to an XBEE module which gives you the capability of developing 2.4GHz wireless networks based on the Zigbee standard. (Clear protective acrylic cover – EB751)

Zigbee router board.....EB051R
Zigbee coordinator board.....EB051C

GPS E-block **EB045** 3.3V 5V



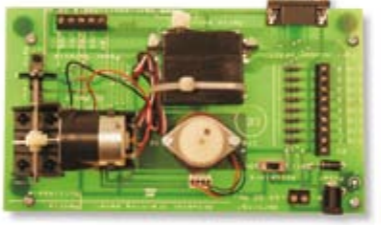
GPS is an important technology for an increasing number of applications. This E-block allows any UART-enabled microcontroller to receive configurable text-based NMEA or binary SIRF data containing various location, altitude, timing and speed information. Typical cold-start TTFF is 44s, and horizontal accuracy is 5.2m (2dRMS).



Note that if you are using ARM or FPGA boards then please make sure that the downstream boards you are using are 3.3V compatible.

Accessories

Actuators training panel **HPACT**




What does it do?
Allows students to carry out experiments with motors.

Features

- Stepper motor
- Servo motor
- DC motor with feedback

Description
This is a general purpose training panel that allows students to carry out experiments with motors. The actuators on the panel include: A 7.5 degree/step stepper motor, a 120 degree servo motor, and a bidirectional DC motor with gearbox and rotational feedback. Worksheets and operating instructions are included. An E-blocks compatible port facilitates connection with upstream boards.

Adjustable power supply **HP5328**



This switched mode power supply provides regulated outputs at 3, 6, 7.5, 9 and 13.5V. Output is selected by a small screw switch. The supply can be configured for all countries in the world by slotting on appropriate mains supply connectors.


Tray trolley



Storage trays can be mounted into one of our tray trolleys – supplied in kit form.

12 tray trolley HP2025Q
18 tray trolley HP3025N

Metal backplane **BP232**



This backplane can be used to bolt PICmicro microcontroller development tools and E-blocks together to form a rigid backplane. This will extend the life of development tools, facilitate storage and increase security. The usable area is 270 by 350mm and these backplanes fit into our standard trays.

IDC cables



The 'normal' cable connects an upstream programmer to a downstream application board - plug to socket - EB634. Use EB635 to share an upstream board with two downstream boards. Use EB251 to connect two upstream boards together - with caution!

Upstream to downstream ... EB634
Upstream to upstream EB251
Splitter EB635


Storage trays



These black trays are ideal for storage of E-blocks and accessories like leads, power supplies etc.

Plastic tray HP2045
Clip on lid HP4039
Foam layer insert HP3844
4 section insert HP2935


RFID Cards **HP089**



Two types of RFID card are available: a Mifare card and an I-code card. Each include 1k of memory and are compatible with the E-blocks RFID card board.

Mifare card HP089
I-code card HP459

M3 nuts and bolts



E-blocks boards and board covers are not supplied with fittings. If you are fitting covers then you should use 25mm bolts and 12mm spacers.

100 x M3 self locking nuts EB216
100 x M3 12mm bolts EB217
100 x M3 25mm bolts EB211
25 x M3 12mm spacers EB210

Sensors

The 40 sensors you can see here allow you to carry out a very wide range of projects with your E-blocks™ hardware and software. All sensors plug directly into our sensors board (EB003) and into the PICmicro development board (HP488). If you want to give students an experience of different sensor technologies then the sensors we recommend are the Heart rate sensor, the Temperature sensor, the Motion detector and the Photogate with smart pulley. These four sensors all use different techniques for measuring real world values.

Accelerometers +/- 5g HSLGA +/- 25g HSACG Three axis +/-5G HSJD	Barometer HSBAR Air pressure: 0.8 - 1.05 atm	Blood pressure HSBPS
Charge sensor HSCRG Charge: +/- 10V - +/- 100nC	CO2 Gas HSCO2 CO ₂ in air: 0-5000 ppm	Colourimeter HSCOL Absorbance of solutions: 0.05 - 0.550
Conductivity HSCON Conductivity of solutions: 0 - 20,000 uS/cm	Current HSDCP Current: +/- 0.6A	Differential voltage HSDVP Voltage: +/-6V
EKG sensor HSEKG	Force HSDFS Force: +/- 50N	Dissolved oxygen HSDO Current: 0-14mg/L
Force plate HSFPL Force: -800 to +3500 N	Flow rate HSFLO Flow rate: 0 - 3.5m/s	Drop counter HSDVC
Force plate HSFPL Force: -800 to +3500 N	Gas pressure HSGPS Pressure: 0 to 210 kPa	
Hand dynamometer HSHD Force: 0-600 N	Heart rate - hand grip HSHGH	Instrumentation HSINA 6 ranges from 0-20mV, to ±1 V
Heart rate - wearable HSEHR	Ion sensitive electrodes Calcium: HSCA Chloride: HSCL Ammonium: HSNH4 Nitrate: HSN03	
Magnetic field HSMG Magnetic field: -6.4 mT to +6.4 mT	Microphone HSMCA	pH HSPH pH: 0 to 14
Photogate HSPVG Accessories: Picket fence HSPF Smart pulley HSSPA Bar tape HSTAPE	Motion detector HSMDD Distance: -0.4 - 6m	Oxygen HSO2 Oxygen in air: 0 to 27% (0 to 270 ppt)
Radiation HSRM	Respiration HSRMB	Rotary motion sensor HSRMS
Salinity HSSAL Salt in water: 0 - 50 ppt (0 - 50,000)	Relative humidity HSRH	Thermocouple HSTCA Temperature: -200 to 1400C
Spirometer HSSPR	Temperature HSTMP Temperature: -40 to 135C	Turbidity HSTRB Turbidity: 0 to 200 NTU

MIAC™ - Matrix Industrial Automotive Controller



MIAC (Matrix Industrial Automotive Controller) is an industrial grade control unit which can be used to control a wide range of different electronic systems. It has a number of applications in industry and learning and is powered by an 18 series PICmicro microcontroller.

Benefits

- ▶ Flexible and expandable
- ▶ Facilitates rapid development of electrical systems

Features

- ▶ Based on an 18 series PICmicro device
- ▶ Compatible with Flowcode, C, and assembly
- ▶ 8 digital or analogue inputs, 4 relay outputs, 4 motor outputs with speed control, 4 line LCD display and control keys
- ▶ Compatible with a wide range of industrial sensors
- ▶ Fast CAN bus for networking

Description

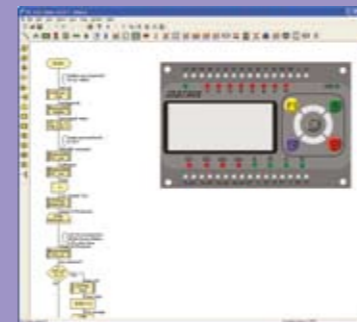
The MIAC™ is a fully specified industrial electronic controller designed to operate off 12 or 24V. It has 8 analogue or digital inputs, 4 high current relay outputs and 4 motor outputs. The MIAC is housed in an attractive, rugged, anthracite grey plastic moulding, and can be mounted

onto a 30mm 'top hat' DIN rail, or directly onto any surface using the 4 screw holes provided. The MIAC unit uses screw terminals for all I/O lines and has several input buttons and a 4 line 16 character alphanumeric display for user interaction. The unit is programmed directly from a PC's USB port and is compatible with the

Flowcode graphical programming language and can also be programmed with C, and assembly code. MIAC is also equipped with a fully operational CAN bus interface so that several MIACs can be networked together to form wide area electrical systems.

In the coming 12 months we will be developing a range of additional add-ons and curriculum for MIAC.

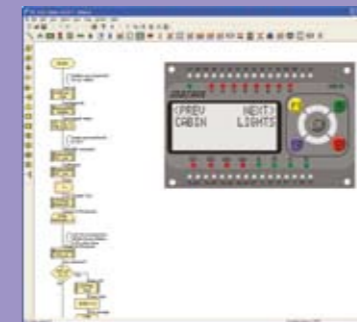
Design



Flowcode contains standard flow chart icons and electronic components that allow you to create a virtual electronic system on screen. Drag icons and components onto the screen to create a program, then click on them to set properties and actions.

- ▶ Easy to use interface
- ▶ Allows complex programs to be developed and managed quickly
- ▶ All I/O and expansion options are supported in Flowcode

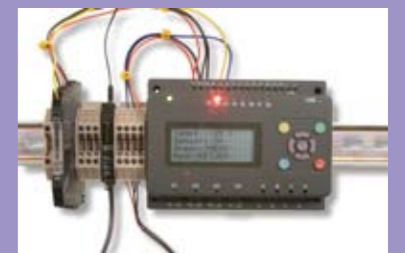
Simulate



Once your system is designed you can use Flowcode to simulate it in action. Test MIAC functionality by clicking on switches or altering sensor or input values, and see how your program reacts to the changes in the electronic system.

- ▶ Simulation aids understanding
- ▶ Debug before download
- ▶ Shorten the design cycle

Download



When you are happy with your design click one button to send the program directly to the MIAC device. Press the reset button and your program starts to run.

- ▶ One button download
- ▶ Fast action
- ▶ Flexible and expandable



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