

User's guide



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Please email sales@matrixmultimedia.co.uk for datasheets

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1 An introduction to E-blocks™?

1.1 What are E-blocks™?

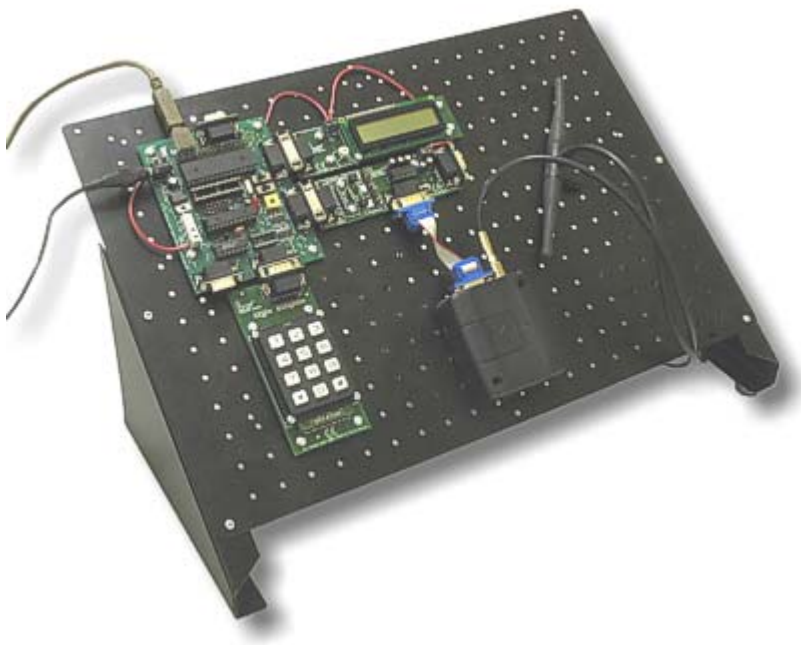
Thank you for purchasing an E-block system or component. This document introduces you to the E-blocks concept and gives you information on how to use them.

E-blocks are small circuit boards each of which contains a block of electronics that you would typically find in an electronic system. Each E-block performs a separate function as either an input sub-system, an output sub-system, an input/output sub-system or a processing sub-system.

E-blocks can be put together to form a variety of systems that can be used for teaching and learning electronics and for the rapid prototyping of complex electronic systems.

This document contains an introduction to E-blocks. A datasheet on each E-block board is also available in electronic format on CD ROM. Where software is supplied then a comprehensive help file (or course) is supplied which will tell you how to use it.

1.1.1 An example of an E-blocks system



Matrix Multimedia's mobile phone E-block™ system (EB115) contains a Multiprogrammer Board which is used to program a 40 pin PIC16F877 device. This is connected to an LCD display, a keypad, and an RS232 E-block. The RS232 E-block communicates with a GPRS mobile phone unit (from Sony) with integral SIM card.

The cost of this system is about £500. This is a good example of how E-blocks can be used to build a dedicated training or development system. Within educational institutions this system is of great appeal: students are very interested in mobile phone technology and this is a good context in which to study microprocessor programming.

1.2 How do E-blocks connect together?

Each E-block has one or more 9 way D-type connectors that provide up to 8 input/output lines and a ground line. These D-type connectors allow connection between E-blocks to be made in buses of multiples of 8 lines – just like a real electronic system. Power is routed separately to those E-blocks that need it.

Details of how this works are given in the section entitled ‘Electrical Attributes of E-blocks’ below.

1.3 How do processing E-blocks work?

Processing E-blocks control the whole E-blocks system. PICmicro® microcontrollers are used as the preferred processor: these provide up to 5 E-block ports with up to 8 lines per port. CD ROM courses and utilities allow software to be written in Flowcharts, C or Assembly code. Details of these courses and utilities is given below.

1.4 How many E-blocks are available?

The E-blocks family of products consists of:

- 14 hardware E-blocks
- 4 CD ROM courses/programming utilities
- 30 Additional sensors

1.5 Why use E-blocks?

E-blocks offer a number of advantages in teaching, learning and developing electronic systems:

- Within an educational context E-blocks’ ability to easily form complex electronic systems means:
 - Students are motivated by working with ‘real’ systems
 - Students can go further, faster
 - Students can understand how electronic systems are built
 - Teachers can customise systems for their own particular requirements
 - Students can explore systems with more than one processor
- The rapid prototyping facility E-blocks offer means:
 - It is easy to build an electronic system of your choice
 - It is very quick to build a prototype system of your choice
 - Reusability of E-blocks for different projects can result in a considerable financial saving.
- The range of software and courseware supplied with E-blocks means:
 - Software development tools (flowcharting, C and Assembly) are available to suit each kind of user
 - There is full support in terms of learning materials for first time users
- The tight integration between Flowcode and E-blocks means:
 - Development times for systems are extremely rapid
 - Learning curves for first time users are extremely short

- Users can migrate to Assembly or C programming with ease as their applications become more sophisticated

More details on E-blocks are given below.

2 Electrical attributes of E-blocks

2.1 How E-blocks buses are connected?

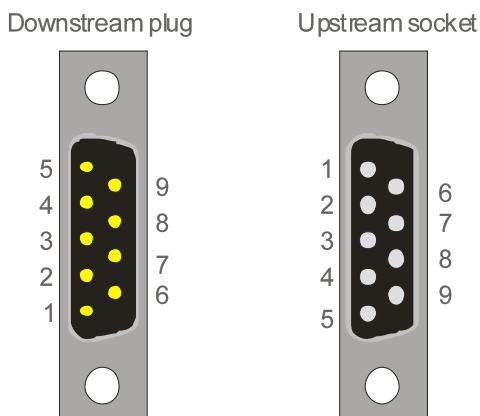
E-blocks is a bus based system. Each E-block connection consists of 8 bits and ground – 9 connections in total. There are two types of E-block – ‘upstream’ and ‘downstream’ E-blocks. This terminology is used in computing systems to denote which item has control over a bus rather than to denote the direction of flow of information.

Any device which contains intelligence and can dictate the direction of flow of information on the bus can be thought of as an ‘upstream’ device. Examples include microcontroller boards, and Programmable Logic Device boards. Any device which responds to these changes and whose behaviour is determined by another device can be thought of as a ‘downstream’ device. Examples include LED boards, RS232 boards etc.

In the E-blocks system it is important to understand which E-blocks are upstream and which are downstream because each uses different connectors – upstream devices connect using 9 way D-type sockets, and downstream devices connect to E-blocks using 9 way D-type plugs.

This combination works remarkably well as most system topologies require upstream devices to connect directly to downstream ones.

The following diagram shows the connections that can be made to the plugs and sockets. On each connector bit 0 is on pin 1, bit 7 is on pin 8 and pin 9 is designated 0V.



Where two upstream devices need to be connected together a gender changer or IDC cable with two IDC sockets on can be used.

2.2 Adding power

Power connections are always routed separately between E-blocks using simple screw terminals. This facilitates the interoperation of E-blocks with different voltage levels (notably 3.3V and 5V) and power sources.

Some upstream E-blocks (notably the multiprogrammer) have 5V outputs provided by a voltage regulator. These E-blocks are powered by applying a higher voltage via a power jack (usually positive outer) or using screw terminal blocks.

As 0V is connected to all blocks through the 9 way D-type connectors it is only necessary to connect power to all E-blocks. Most upstream E-blocks have a regulator that produces 5V, and many

downstream E-blocks have a 5V loop through connectors which allows users to keep power wires tidy. Power wires can be looped under E-blocks and under the backplanes.

2.3 Protecting E-blocks circuitry

Where possible leaded components have been used for all devices on E-blocks boards that can be subjected to electrical damage. This means that in the case where devices on the E-blocks boards do become damaged that the task of replacing them is very simple.

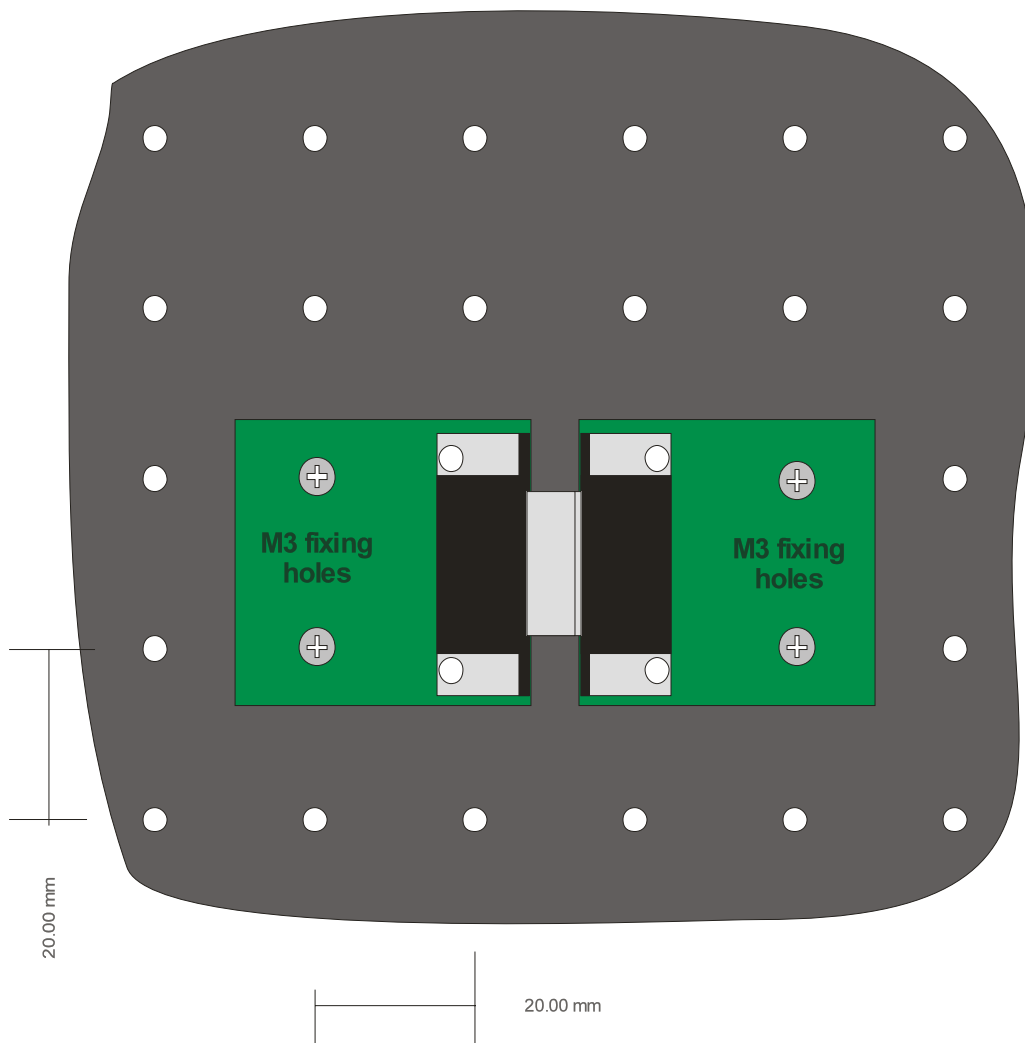
All downstream E-blocks have been developed with protective resistors so that it is not possible to damage an upstream E-block by improperly declaring an input as an output, and having two output pins with different output levels, clash.

3 Physical attributes of E-blocks

3.1 Mounting on a backplane

E-blocks can be mounted onto a metal backplane to form a completely rugged system.

To facilitate this each E-block is fitted with 4 off 3 mm holes spaced at 20mm intervals. M3 bolts with spacers can be used to mount the E-blocks onto a backplane which has 4mm holes on a regular 20mm grid. This task can be left to students so that their understanding of how the blocks in a system interconnect or this can be done by a supervisor to make a customised E-block system.



Mounting E-blocks onto backplane

Backplanes are available with side mounts that present the E-blocks at a suitable angle on the bench to allow them to be worked on.

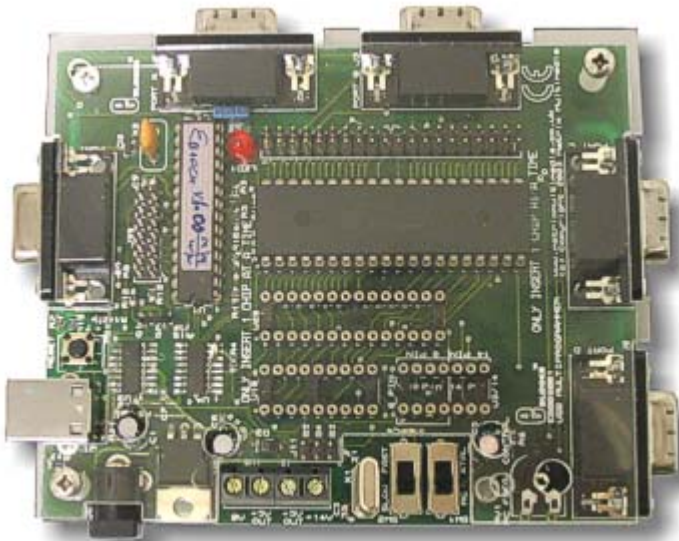
The spatial relationship between the mounting holes on the backplane, the holes on the E-blocks and the spacing of each D-type plug and socket on the E-blocks are such that each E-block will fit into another and yet still be mountable on the backplane.

3.2 Adding security and strength

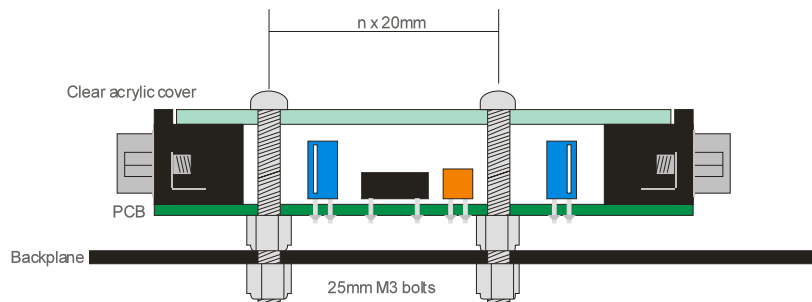
In some circumstances it is advisable to only allow access to certain parts of the E-blocks boards. This includes situations where settings or chip selections made on E-blocks do not want changing, where

there is a chance of vandalism or where there is a chance of theft of components on the E-blocks themselves.

To facilitate this clear acrylic covers are available for all E-blocks as you can see here with the USB PICmicro microcontroller multiprogrammer:



These are mounted onto E-blocks with M3 bolts and spacers using the same grid of holes that are used for mounting the E-blocks to the backplane. The following cross section diagram shows you how this is done:



Cross section of mounting details showing acrylic cover

The tight fitting clear acrylic covers provide considerable strength to each E-block as well as making them – to some extent – tamper proof.

3.2.1 Setting up an E-blocks system

You have several choices as to how to use E-blocks.

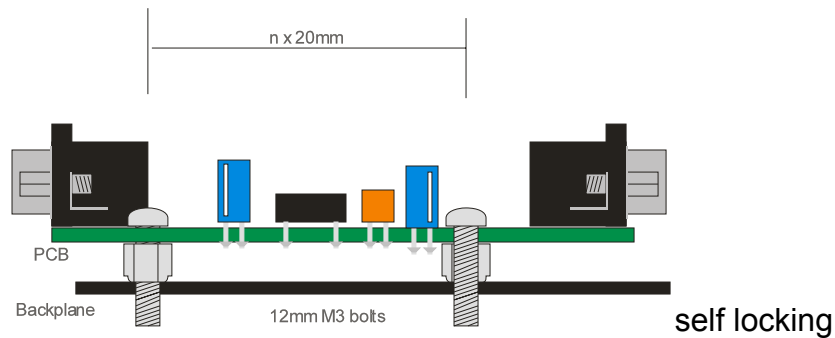
3.2.1.1 On the bench

You do not need a backplane to use E-blocks – you can simply connect them together on the bench. In each E-blocks package you will find a four small rubber feet to facilitate this – these will provide a degree of protection for your E-blocks boards and will help prevent shorts from tinned copper wire and other metal objects on the bench.

3.2.1.2 On a backplane – flexible

If you are reconfiguring your E-blocks system regularly or you want others to go through the process of doing this then we suggest that you use steel or Nylon M3 bolts on all your E-blocks and that you use a backplane to allow them to be mounted at an angle which is more conducive for experimentation and projects. The E-blocks can be mounted on the backplane and will stay in position without using securing bolts behind the backplane – although if you are going to move them around then one or two loose bolts on the back will ensure your E-blocks stay in place.

The diagram below shows 12mm bolts with self locking nuts – these will keep the bolts secured onto the circuit board.



For best results with this mounting technique you should attach the nuts and self locking bolts and then slacken off the nuts by a quarter turn – this allows the bolts a little movement in the PCB mounting holes and makes them easier to take off the backplane.

Using nylon bolts will prevent the bolts from catching on the backplane holes.

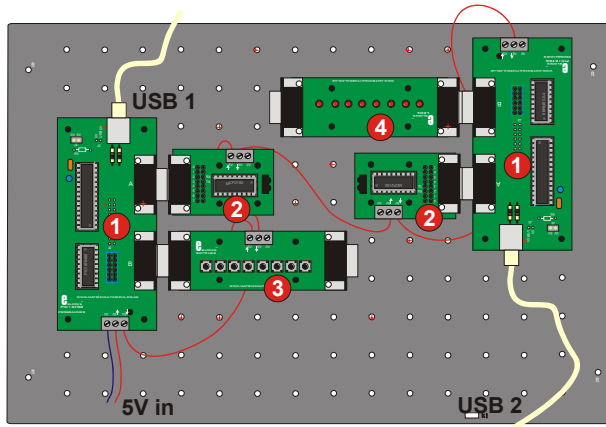
3.2.1.3 On a backplane - permanent

If you are permanently mounting the E-blocks on a backplane then we suggest you use two self locking nuts as shown on the previous page.

4 Examples of systems that can be built with E-blocks

This section gives details of some systems that can be built with E-blocks within an educational context.

4.1 Infrared training system



This E-block diagram shows two USB based PIC16F88 microcontroller programmers - one of which is connected to an 8 switch E-block, the other of which is connected to an 8 LED E-block.

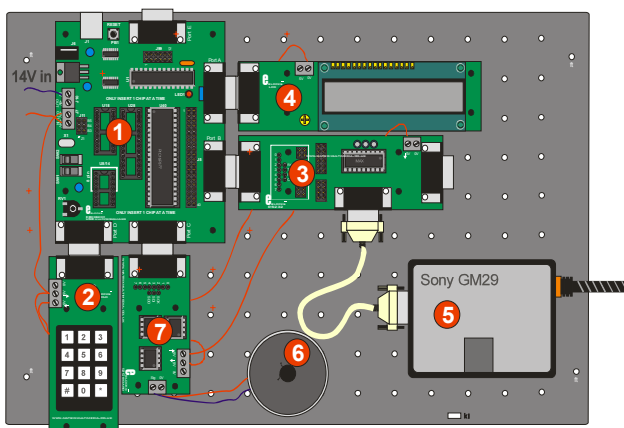
This E-block system allows students to develop code for two microcontrollers: one of which acts as an infrared transmitter and the other of which acts as an infrared receiver.

Students using Flowcode will want to use high level infrared macros provided whilst students learning Assembly or C may want to write all the software from scratch.

This complete system – including the Backplane - costs less than £200. The rugged Backplane allows the E-block system to be stored permanently if required.

1: Lite programmer, 2: Infrared transmitter receiver, 3: Switch board, 4: LED board

4.2 Mobile communications system



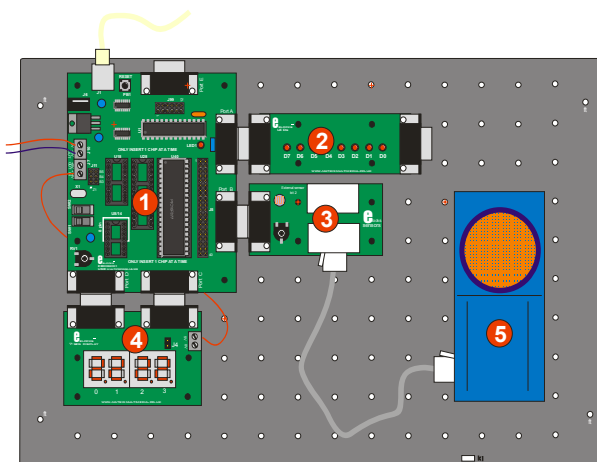
This E-blocks diagram shows how a student project panel can be constructed from E-blocks. The system contains a Multiprogrammer Board which is used to program a 40 pin PIC16F877 device. This is connected to an LCD display, a keypad, an I²C E-block, and an RS232 E-block. The I²C board used contains an A/D and amplifier which is used to power a speaker. The RS232 E-block communicates with a GPRS mobile phone unit (from Sony) with integral SIM card.

The student is tasked with developing a mobile text messaging system that can send and receive simple text messages and generate a variety of tones for warning and feedback. This core system can be easily expanded using E-blocks and the range of sensors to generate further systems including SMS burglar alarm warning systems, SMS heart attack warning systems, remote pollution monitoring systems etc.

Systems like this can be assembled quickly using E-blocks to provide a wide variety of motivating tasks for students to program using Flowcode, C or Assembly.

1: Multiprogrammer board, 2: Keypad, 3: RS232 board, 4: LCD board, 5: GPRS comms. Unit, 6: Speaker, 7: no longer included.

4.3 Ultrasonic measuring system



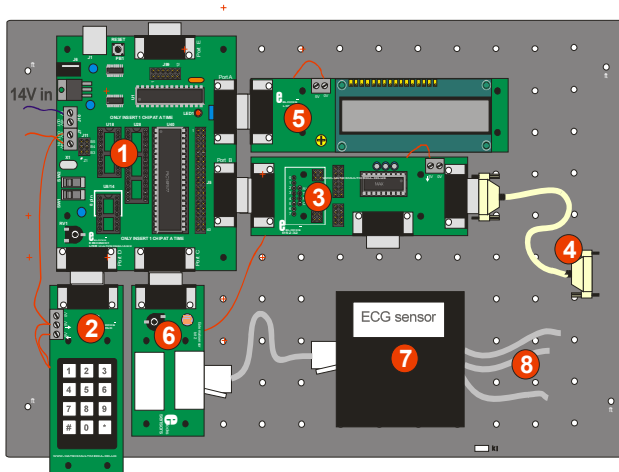
This diagram shows an ultrasonic measuring system. Students can be tasked to create an ultrasonic system that measures distance (such as those used by estate agents) or to develop a system that gives a warning when the distance falls below a pre-set amount (such as those used by cars for reversing distance warning systems).

The system consists of:

1: Multiprogrammer board, 2: LED board, 3: Sensor board, 4: 7-segment display board, 5: Ultrasonic sensor.

The cost of this system is about £230.

4.4 PC based ECG and heart rate monitor



This system uses an Electro-cardiogram monitor to display heart rate on the local LCD display and to allow ECG data to be displayed on a PC.

This system consists of a PICmicro microcontroller programmer that is controlled by a key pad. Data from the ECG monitor is passed to the microcontroller through a sensor board. Heart rate is displayed on the LCD display and ECG data is passed to the PC via the RS232 board.

The cost of this system is around £330.

1: Multiprogrammer board, 2: Keypad, 3: RS232 board, 4: RS232 serial lead, 5: LCD board, 6: Sensors board, 7: ECG unit, 8: ECG leads and electrodes.

5 Description of individual E-blocks

5.1 USB PICmicro® microcontroller multiprogrammer



- E-blocks compatible
- Low cost
- Used as a programmer and as a development board
- Programs a wide range of PICmicro MCU devices
- Programming software provided
- RC or Xtal operation
- 5 I/O ports
- Interchangeable crystal
- Fitted with PIC16F88 as standard

This new PICmicro microcontroller programmer connects to your PC via USB to provide you with one of the World's lowest cost and most flexible PICmicro® microcontroller programmers. This board can be used with Assembly, C or Flowcode programming utilities provided by Matrix Multimedia. The board will program most 8, 14, 18, 28 and 40 pin PICmicro microcontroller devices using the flexible programming software provided – PPP - and provides 'clean' access to all I/O lines on the relevant PICmicro MCU devices.

A complete customised solution for development or training purposes can be built using this board and other E-blocks.

5.2 USB PICmicro® microcontroller lite programmer

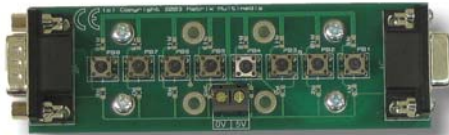


- E-blocks compatible
- Ultra-low cost for student projects and comms. work
- Used as a programmer and as a development board
- Programs selected 18 pin devices
- Includes free Lite versions of programming utilities
- 2 I/O ports
- Fitted with PIC16F88 as standard

This new low cost programmer connects to your PC via USB and can be used with Assembly, C or Flowcode programming utilities. Lite versions of these products are shipped with the product. This programmer has been designed for use where an ultra-low cost PICmicro MCU device is required. The Lite programmer gives access to two PICmicro ports and can be powered from the USB port or (where more current is required) from an external power supply.

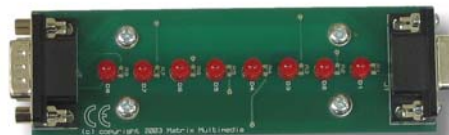
This programmer is compatible with a number of 18 pin devices including the 16F627, 16F628, and 16F88.

5.3 Switch board



Contains 8 push-to-make switches with upstream and downstream D-type connectors. Further E-blocks can be connected to this E-block.

5.4 LED board



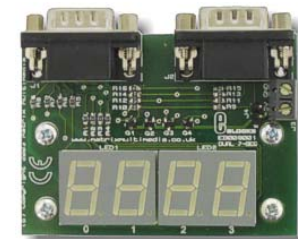
Contains 8 LEDs with upstream and downstream D-type connectors. Further E-blocks can be connected to this E-block,

5.5 LCD board



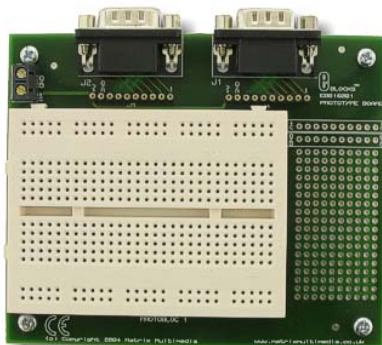
16 character, 2 line alphanumeric LCD display on a 4 wire bus. Flowcode macros for driving this E-block are available.

5.6 Dual 7-segment display



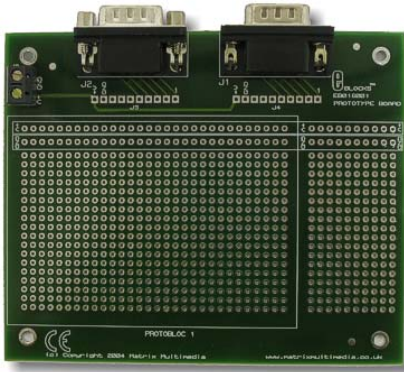
Quad 7-segment common-anode display with an option to operate off one port using links. Flowcode macros for driving this E-block are available.

5.7 Prototype board



This E-block 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.

5.8 Patch board



This very low cost E-block can be used for developing permanent circuits that connect into the E-blocks system. The multitude of holes on the patch board allow components to be soldered onto the board and wired into the D-type connectors.

5.9 RS232 board



This E-block provides an RS232 interface which can be used to facilitate communication between PICmicro microcontroller and third party devices like PC serial ports, mobile communications systems etc. Flowcode macros for driving this E-block are available.

5.10 Keypad board



A simple 4x3 keypad that allows data entry into bus based systems. Flowcode macros for driving this E-block are available.

5.11 Infrared transceiver board



This highly sophisticated E-block contains a small infrared transmitter receiver device as well as an IRDA decoder stack. This E-block allows communication links to be set up between E-blocks on a low level or high level basis. This E-block also supports the IRDA protocol which is used on lap tops, Windows CE devices and Palm compatible computers. Flowcode macros for driving this E-block are available.

5.12 SPI board board



This E-block contains a 2k byte SPI serial memory and an SPI bus D/A converter. It can be used by students to practice serial communications and to provide additional memory or D/A features into an E-block system.

5.13 Sensors board



This E-block 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 30 professional sensors.

5.14 Other E-blocks

If you have ideas for other E-blocks that you would like to see added to this list then please contact us.

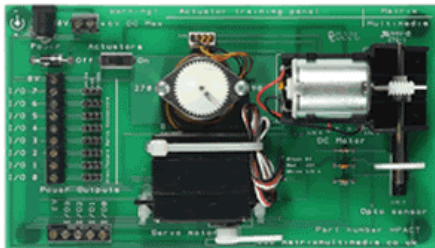
6 E-block Accessories

6.1 IDC lead



This IDC lead can be used to connect E-blocks together using 9 way ribbon cable. This is useful where mechanical constraints mean E-block can not be directly connected.

6.2 Actuators training panel

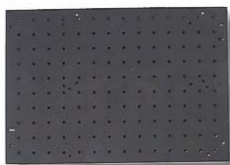


The Actuators training panel contains several types of motor which students are encouraged to write a range of programs for: a 7.5 degree/step stepper motor, a 120 degree servo motor, and a bi-directional DC motor with gearbox and rotational feedback. Flowcode macros are available for servo control. A new version of the Actuators training panel includes an E-blocks 9 way D type.

6.3 Backplanes



A3 Backplane



A4 Backplane



Backplane with side mounts

These metal Backplanes can be used to bolt and E-blocks together to form a rigid construction. This will extend the life of E-blocks, facilitate storage and movement and increase security. Each Backplane consists of a 1mm thick metal plate with holes cut at regular 20mm intervals for mounting E-block components.

A slot in the bottom of the Backplane can be used to secure the Backplane to a bench or wall plate using a standard Kingston lock.

Side mounts are available which present backplanes at an angle of 30 degrees.

6.4 Mobile phone unit



This GPRS mobile phone unit can be added to any E-blocks system with an RS232 E-block board. The module is supplied with antenna, power supply, cables and a CD with documentation. SIM card not included.

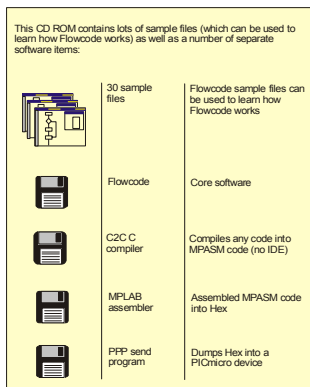
7 Software and courseware for E-blocks

7.1 Flowcode for PICmicro® microcontrollers version 2.0

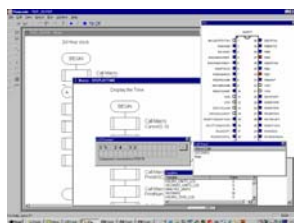
Allows those with no programming skills to design complex electronic systems



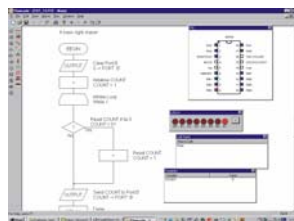
- Requires no programming experience
- Allows complex PICmicro microcontrollers to be designed quickly
- Uses international standard flow chart symbols (ISO5807)
- Full on-screen simulation allows debugging and speeds up the development process
- Produces ASM code for a range of 18, 28 and 40 pin devices
- Free course online
- Integrates tightly with the E-blocks system



The software on the CD



24 hour clock with LCD display



Simple light chaser construction

Flowcode is a very high level language programming system for PICmicro microcontrollers based on flowcharts. Flowcode allows newcomers to programming to design and simulate complex robotics and control systems in a matter of minutes.

Flowcode is a powerful language that uses macros to facilitate the control of complex devices like 7-segment displays, motor controllers, and LCD displays. The use of macros allows students to control highly complex electronic devices without getting bogged down in understanding the programming involved. Flowlog is a powerful rapid development tool and is also useful as a means of introducing the need for C and assembly programming.

The following devices are supported:

12C67x, 12F629, 12F675, 16F630, 16F676, 16F7x, 16F8x, 16F81x, 16F87x, 16F62x, 16C5x, 16C6x, 16C7x.

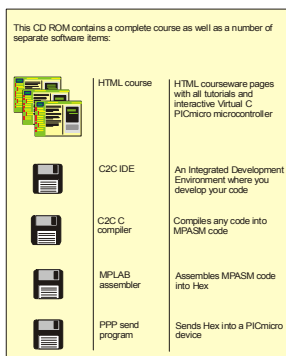
New features in version 2 include: arrays, improved LCD handling, RS232 comms, IDRA comms, Keypad control, multiple servo control, on-board EEPROM routines and a wider range of supported PICmicro microcontrollers.

7.2 C for PICmicro® microcontrollers version 3.0

A complete solution for learning and teaching C programming for PICmicro microcontrollers.



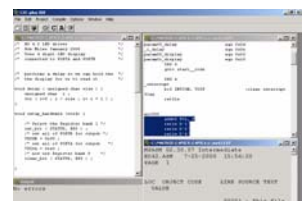
- Includes a new version of our budget C compiler and IDE
- New analogue sections
- Complete course in C as well as C programming for PICmicro microcontrollers
- Highly interactive course
- Virtual C PICmicro improves understanding
- Includes MPLAB software
- Compatible with most PICmicro programmers



The software on the CD



The virtual PICmicro microcontroller



The IDE and C compiler

This new version of our popular C for PICmicro microcontrollers CD ROM is designed for students and professionals who need to learn how to program embedded microcontrollers in C. The CD contains a full course as well as all the software tools needed to create hex code for a wide range of PICmicro devices - including a full C compiler and an Integrated Development Environment (IDE).

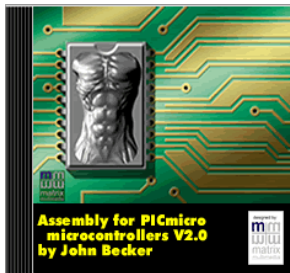
The C compiler on this CD ROM is compatible with most 12xxx series and 16xxx series PICmicro microcontroller devices.

The compiler on this product is for educational use only. Those wanting to produce commercial products using the compiler will need to purchase a commercial licence.

This new version includes new sections on programming analogue PICmicro microcontrollers and an updated C compiler and IDE.

7.3 Assembly for PICmicro® microcontrollers version 2.0

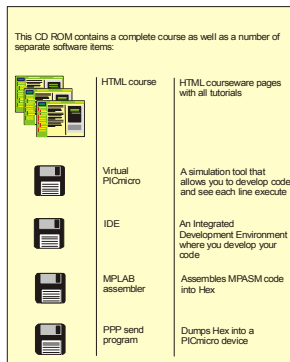
A complete solution for learning and teaching assembly code programming for PICmicro microcontrollers



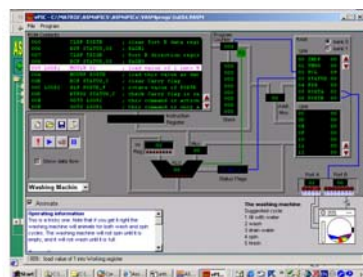
- Comprehensive instruction through 39 tutorial sections
- Includes a Virtual PICmicro microcontroller: a fully functioning simulator
- Tests, exercises and projects covering a wide range of PICmicro applications
- Includes MPLAB assembler
- Includes fully operational virtual PICmicro

Assembly for PICmicro microcontrollers V2.0 contains a complete course in programming the PICmicro microcontroller from Arizona Microchip. It starts with fundamental concepts and extends up to complex programs including watchdog timers, interrupts and sleep modes.

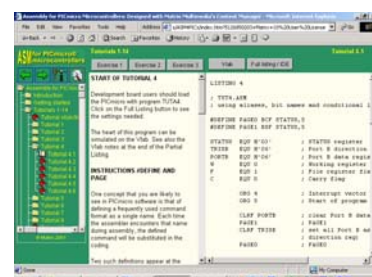
The CD makes use of the latest simulation techniques which provide a superb tool for learning: the Virtual PICmicro microcontroller. This is a simulation tool that allows users to write and execute assembly code for the PIC16F84 microcontroller on-screen. Using this students can actually see what happens inside the PICmicro microcontroller as each instruction is executed. This enhances understanding, retains student interest, and is a great debug tool.



Contents of the CD ROM



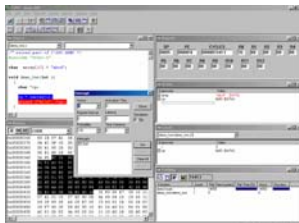
The Virtual PICmicro microcontroller



Typical tutorial screen

7.4 IAR Embedded Workbench for PIC16xxx and PIC17xxx MCUs

Helps you create the most efficient C code for the most advanced projects



The IAR Embedded Workbench showing the C-SPY simulator.

- Complete IDE, compiler, linker, librarian, and assembler
- Advanced C-spy simulator debugger provides variable monitoring, code and data breakpoints, and structure browser
- Full documentation on CD ROM
- Floating point and maths operation including trig functions

The C compiler shipped with our C for PICmicro microcontrollers CD ROM will be sufficient to get you started and for many C projects. When you want to go further with embedded programming then IAR produce a suite of C code development tools for PICmicro programming that provide you with all the advanced features you need. The IAR Embedded Workbench includes a highly sophisticated C compiler, complete with maths, trig functions and many other features, as well as a complete development environment which is designed to save you time and effort. The IAR Embedded Workbench is designed to operate with 16xxx and 17xxx PICmicro microcontrollers only.

IAR have made this compiler available to us at a special discount rate for educational institutions only. Contact IAR for industrial and home versions.



8 Sensors compatible with the E-blocks system

A complete range of sensors for real world interaction

Using the Sensor interface board E-blocks can be used with a superb range of over 30 sensors and attachments. These sensors are designed primarily for educational use and are rugged and well built.



Barometer



Current probe



Dual range force sensor



Differential voltage probe



ECG sensor



Heart rate monitor

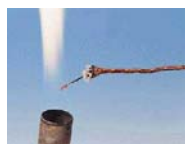


Gas pressure sensor

Product	Code
Bar Tape	HSTAPE
Barometer	HSBAR
Colourimeter	HSCOL
Conductivity probe	HSCON
Current probe	HSDCP
Differential voltage probe	HSDVP
Dissolved oxygen probe	HSDO
Dual-range force sensor	HSDFS
ECG electrodes	HPELEC
ECG sensor	HPEKG
Extra long temperature probe	HSTPL
Fast response photogate	HSVPG
Flow rate sensor	HSFLO
Gas pressure sensor	HSGPS
Heart Rate Monitor	HSEHR
Instrumentation amplifier	HSINA
Low-g accelerometer	HSACC
magnetic field sensor	HSMG
Microphone	HSMCA
Motion Detector	HSMD
O ₂ gas sensor	HSO ₂
pH sensor and amplifier	HSPH
Picket Fence	HSPF
Radiation Monitor	HSRM
Relative humidity sensor	HSRH
Respiration monitor belt (requires gas pressure sensor)	HSRMB
Rotary Motion sensor	HSRMS
Smart Pulley Attachment	HSSPA
Thermocouple	HSTCA
Three range light sensor	HSLS
Turbidity sensor	HSTRB
Wide range stainless steel temperature probe	HSTMP



colourimeter



thermocouple



gas pressure sens



Instrumentation amplifier



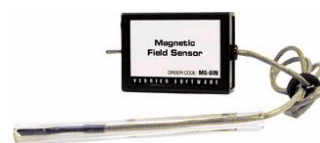
Low g accelerometer



Motion detector



O₂ sensor



Magnetic field sensor



pH sensor



Temperature probe

9 Where are E-blocks used?

E-blocks are used in several areas. This section details how we believe E-blocks technologies will be used in each area:

9.1 Industrial use

In industry E-blocks have a number of uses:

9.1.1 Rapid system prototyping in industry

The modular nature of E-blocks and the wide variety of E-blocks compatible parts means that electronic systems can be assembled in a wide range of configurations with great speed. Once initial prototyping is complete then engineers can take E-blocks circuits and software and develop a custom circuit board from the component parts.

Flowcode has implications here too: Flowcode converts flowcharts to PICmicro microcontroller code and is an extremely rapid development language. The use of flowcharts as a programming tool makes microcontroller technology accessible to those with little or no training.

9.1.2 Training in industry

Within industry training on microcontroller development is a major consideration. E-blocks hardware systems can be configured for a wide range of industries and the software solutions facilitate training in development of microcontroller systems in flowcharting, C or assembly. The relatively low cost of E-blocks software and courseware packages makes training very low cost and all training packages are stand alone items which can be used without the academic support traditionally given by institutions.

9.2 Educational use

9.2.1 School: Technology studies

In Technology studies students need to study systems and how they are controlled. In many courses they are required to understand how to use microprocessors and tend to use PICmicros as a context for understanding various concepts such as feedback in control systems. Using Flowcode with E-blocks students can build systems of surprising functionality which mimic real life systems.

9.2.2 School 16 - 18 years: Electronics

Most students opting for a two year course in electronics at schools will need to understand microprocessor operation and architecture including functions of ROM, RAM etc. There will be some quite in depth work here and a significant part of the course is likely to be a project. E-blocks are used with Assembly code programs to fulfill most of this part of the electronics syllabus.

9.2.3 FE Colleges / vocational schools

E-blocks are used with Flowcode flowchart programming systems for many uses in Colleges including the teaching of low level control theory in various subjects, and the teaching of microprocessor

architecture and programming in assembly in electronics courses. E-blocks have uses in many departments in Colleges.

9.2.4 Universities

in Universities E-blocks and programming software are used in many departments. Here are a few examples:

- In chemical engineering E-blocks and sensors are used for experiments in process control and for developing process systems.
- In electronic engineering E-blocks are used for teaching C programming in a microcontroller context and for teaching about microprocessor systems. E-blocks also save a considerable amount of electronics departmental budget allocated to projects as they are reusable.
- In Computer Science departments E-blocks with Assembly for PICmicro microcontrollers courseware are used to teach students assembly code programming and to teach the inner workings of a microcontroller including fetch-execute cycles.

9.3 Hobbyist/home/student use

There are several areas where E-blocks will be used in the home and by hobbyist:

- For those wanting to design electronic systems
- For robotics use
- For home automation
- For studying at home in conjunction with a formal electronics course

10 E-blocks starter packs and starter systems

We anticipate that most customers will buy more than one E-block at once. With this in mind we have prepared three common sets of E-blocks parts which are likely to appeal to the 'average' customer. These are:

10.1 E-blocks Starter Pack

For customers who want to get started with the E-blocks system then we offer a Starter Pack that contains all the core blocks and a Backplane. The E-blocks Starter Pack contains a USB Multiprogrammer, USB Lite Programmer, 2 Switch Boards, 2 LED boards, LCD block, 7-segment display block, and an A3 Backplane with nuts and bolts. Available February 2004.

10.2 E-blocks Deluxe Pack

For customers who want a well rounded package that contains all the core E-blocks as well as a number of additional E-blocks that will allow them to build more ambitious projects then the Deluxe pack will be an appropriate choice. E-blocks and a number of accessory E-blocks consisting of: USB Multiprogrammer, USB Lite Programmer, 3 Switch Boards, 3 LED boards, LCD block, 7-segment display block, Prototype board, IR tx/rx board, RS232 board, Keyboard, I²C board and an A3 Backplane with nuts and bolts. Available from March 2004.

10.3 Mobile phone package

This system contains a Multiprogrammer Board, an RS232 E-block, a Keyboard, an LCD display, an A3 Backplane and a GSM/GPRS serial modem. (Speaker, SIM card and wire not included)

With this system you can create a text messaging system or even a full voice and data mobile phone. This system will provide a high degree of motivation for your students. not included. European operation only. Customers in other parts of the World should call us for alternative GPRS modules.

If you have suggestions on other packages you would like to see then please call us.