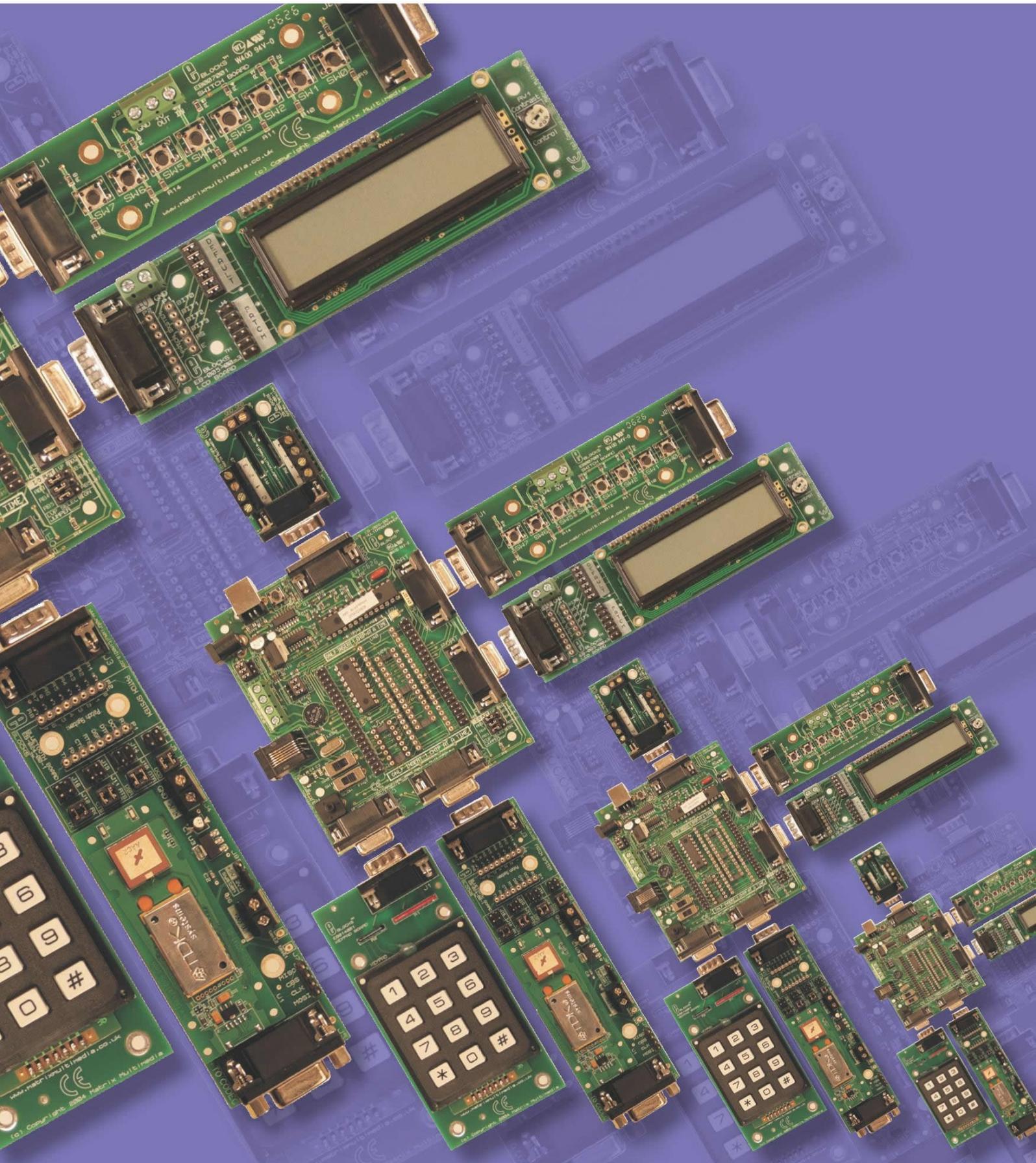


MATRIX

getting started guide

E-blocks Easy Bluetooth Bundle



Flowcode

EB980-80-1

E-blocks Easy Bluetooth Pack

Installing Flowcode

Instruction for installing Flowcode can be found inside the installation booklet located inside the Flowcode DVD case.

Before starting with the course it is recommended to update your version of Flowcode to the latest released version. This allows for the latest bug fixes and components to run on your machine. The latest version of Flowcode can be found by visiting the Matrix TSL website and clicking on the Flowcode page.

<http://www.matrixtsl.com/Flowcode3a-X.php>

Getting Started with Flowcode

There is a free online course available for helping with getting started with learning Flowcode. This course covers basic principles through to designing your own programs and programming the devices. It is recommended that you take time to go through this course before proceeding with the bundle exercises to give you a better grasp of what the Flowcode program is doing.

The online course is available from the learning centre on our website or by visiting the following address:

http://www.matrixtsl.com/lc_microcontroller.php

Flowcode Examples

A number of pre-made example files are available for download from the main Flowcode page on the Matrix TSL website. These files are also located on the Flowcode CD. Before the example files can be used you must first copy them into a folder on your hard drive.

The example programs referenced in this bundle can be found at the following web address:
http://www.matrixtsl.com/lc_bundle_manuals.php

Or by clicking the bundle manuals link from the Learning Centre area of our website.

Flowcode Help

There is a help file available that covers all the main features of Flowcode. This help file can be accessed by clicking the question mark icon in the main Flowcode toolbar or alternatively clicking the help menu and selecting contents.

There are also help files available for each and every component in Flowcode which explain the functionality of the component and the component macros. The component help files can be found by selecting the component on the panel and the clicking the Help button in the properties toolbar.

General Support

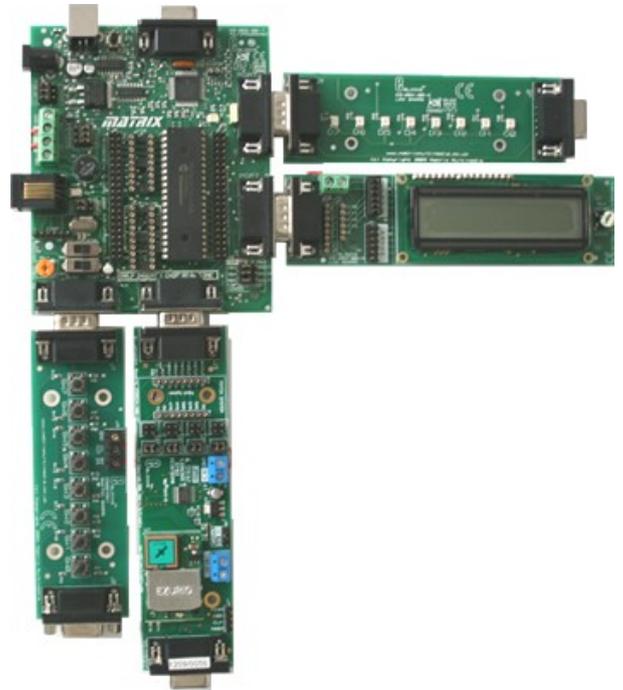
Support for frequently encountered problems can be found online on our FAQ's site. Our online forums can also be used as a general discussion area or for help or advice.

Wiring & Testing

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To setup your E-blocks for use with the example programs you must perform the following actions:

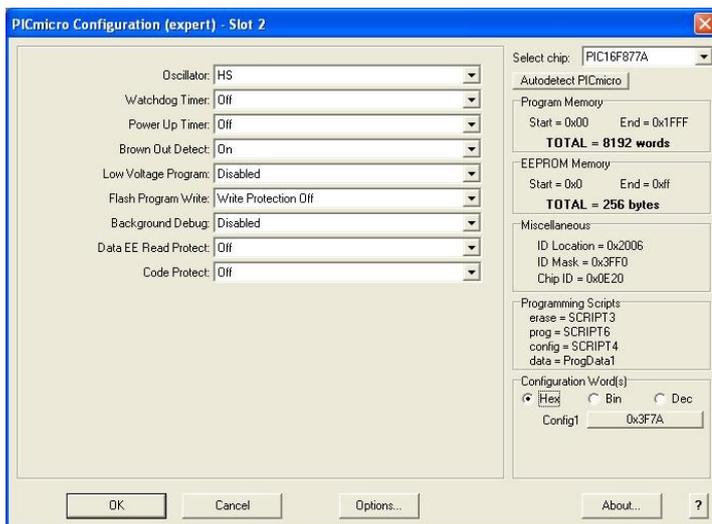
- Remove the 16F88 device from the EB006;
- Insert the 16F877A into the EB006;
- The Bluetooth E-block is connected to Port C.
- The LCD E-block is connected to Port B
- The LED E-block is connected to Port A;
- The Switch E-block is connected to Port D;
- The Bluetooth, LCD and Switch E-blocks screw terminals all need to be connected to the +V on the EB006 via single core wire.



Before you can begin you must install the driver for the EB006 using the ELSAM CD or by visiting the Matrix TSL website: <http://www.matrixtsl.com>



The system can be tested by compiling and sending one of the example programs to the hardware. This is done by opening one of the example files in Flowcode and then clicking the “compile to chip” button.



The example Flowcode files contain the correct configuration so you will not have to modify the configuration to allow them to run on the hardware.

Any program you create from scratch will have to be configured as shown on the left. The configuration is specified by clicking the Chip -> Configure menu icon in Flowcode and then if you need more options click the switch to expert config screen button.

Flowcode

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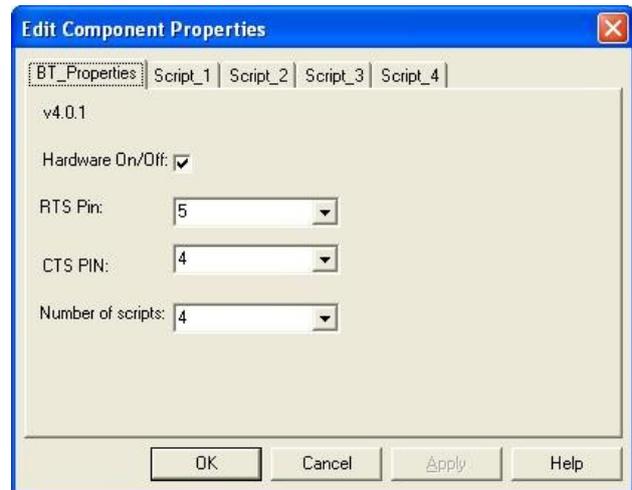
The Flowcode Bluetooth component can be added to your program by finding the component in the wireless section of the Flowcode component toolbar.



Once the component has been clicked you will find that the component has been added to your panel.

Component Properties

The Bluetooth component properties window is shown on the right. Here there are several configurable options that define how the component behaves. The script tabs allow for multiple AT commands to be hard coded into the program and called via a single Flowchart component macro icon.



Macro Functions

Create Command / Send Command These functions allow data to be built up in a string before being sent out over the Bluetooth connection.

String Receive / String Read These functions allow data to be received through the Bluetooth and then read back a byte at a time.

Once the Bluetooth device has been setup to be discoverable and a pairing key has been assigned, this information is stored into the firmware of the Bluetooth module using the AT&w command. For example 1 we show you how to set up these details so that your Bluetooth board is available for use as a serial device. Once this has been done the Bluetooth module will recover these settings every time it is powered on or until it is reprogrammed.

In examples 2 and 3 we will then be using the RS232 component to communicate over the Bluetooth serial connection. The RS232 component and the Bluetooth component both use the hardware UART so only one of the components can be connected to a single program.

Further help on the Bluetooth component can be found by selecting the component on the Flowcode Panel and then clicking the help button in the properties toolbar.

Example 1

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Example 1 is a simple program that sets up the Bluetooth module by using a script to setup the module as a generic serial communications bus. Once the device has been setup the LCD will display the message OK. When a pair request is received from another Bluetooth device the MAC address of this device is shown on the LCD.

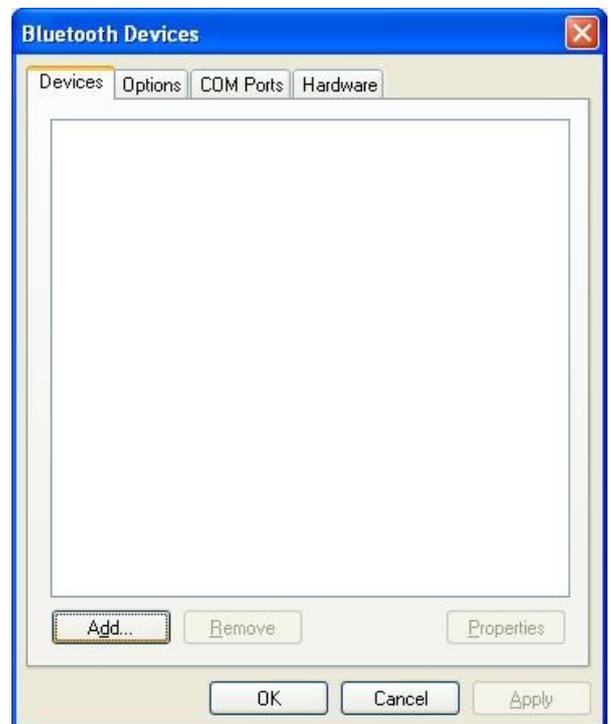
To begin, compile and program the 16F877A with the example 1 program and then follow the instructions to configure your computer. If everything is ok then the Bluetooth should initialize and the LCD should be left saying OK.



Insert the Bluetooth USB dongle in to your computer and then...

(XP / Vista Users) - go to your Control Panel - > Bluetooth. Once here go to the options tab and configure as shown on the left.

(Win 7 Users) - Click the start menu and in the search field at the bottom type in Bluetooth and select add device.



(XP / Vista Users) - Then go to the devices tab and click the add button.



Tick the box stating that the device is ready and then click next.

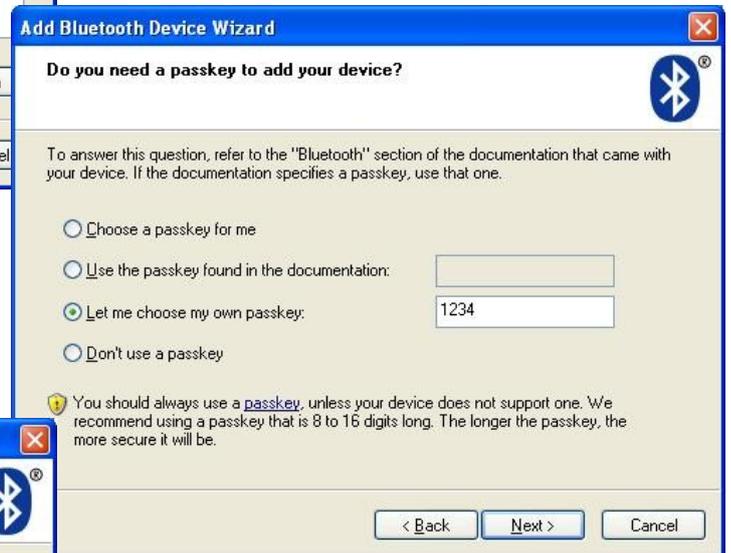
Example 1

EB980-80-1 E-blocks Easy Bluetooth Pack



After a few seconds the Bluetooth device should appear in the device list as a Ezurio device. Select the device and then click Next.

Choose let me choose my own passkey and set this to be 1234 as specified in script 1 of example 1.



Click Next and then the computer should automatically connect and pair with the device. At this point the LCD attached to the system should be saying OK.

Once the device has been paired you should have two COM ports set up. The Outgoing COM port is the port number to use when using serial PC communication software such as Hyperterm or Realterm etc.

When you open the COM port using your terminal software the LED onboard the Bluetooth module should light.



Example 2

EB980-80-1 E-blocks Easy Bluetooth Pack

Now we have configured the Bluetooth module firmware and saved the changes to non volatile memory we now have the mechanism for a stable wireless serial connection for use in our application. To communicate with the connection you simply have to use the Bluetooth or the RS232 component macros. Please remember that you can only use either the Bluetooth or the RS232 component. You cannot use both components together as they both take control of the hardware UART onboard the microcontroller.



To communicate with the Bluetooth device you can use any serial communications program. For this demo we will be using Hyperterminal. If your PC does not come free with Hyperterminal installed then RealTerm is a free alternative you can use.

To launch Hyperterminal click on start -> Run and then type in hypertrm and click Ok.

Once you have done that you will be asked for a name for the connection. This can be anything so simply type in a word and click Ok.

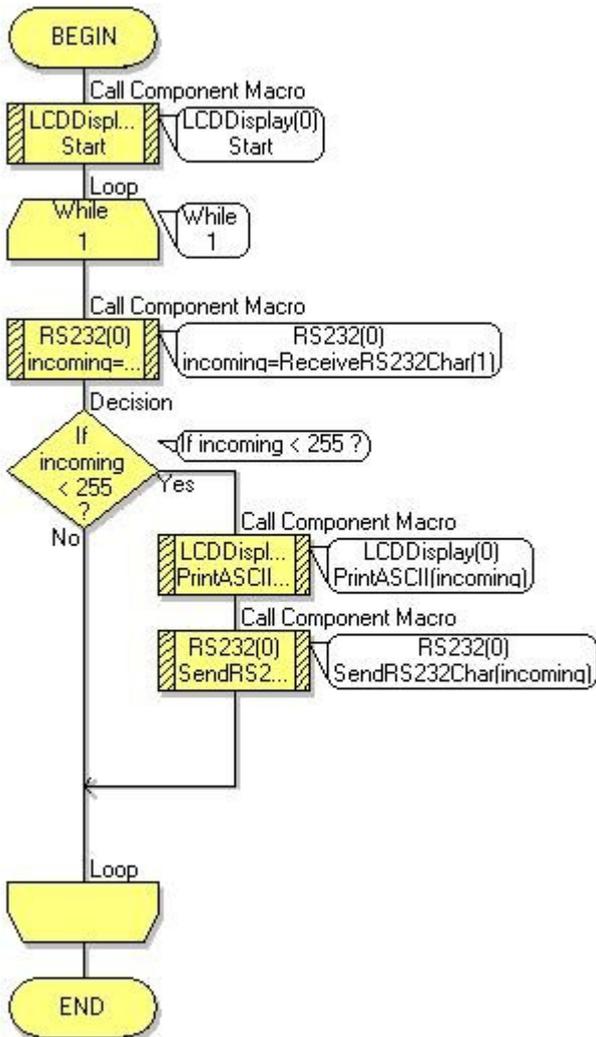


You will then be presented with the COM port you will be using to host the serial connection. Use the Outgoing port as shown on the last page. For my setup this is COM25.

When you click Ok the connection to the Bluetooth device should be established and the LED on the Bluetooth module connected to the EB024 E-block should light.

Example 2

EB980-80-1 E-blocks Easy Bluetooth Pack

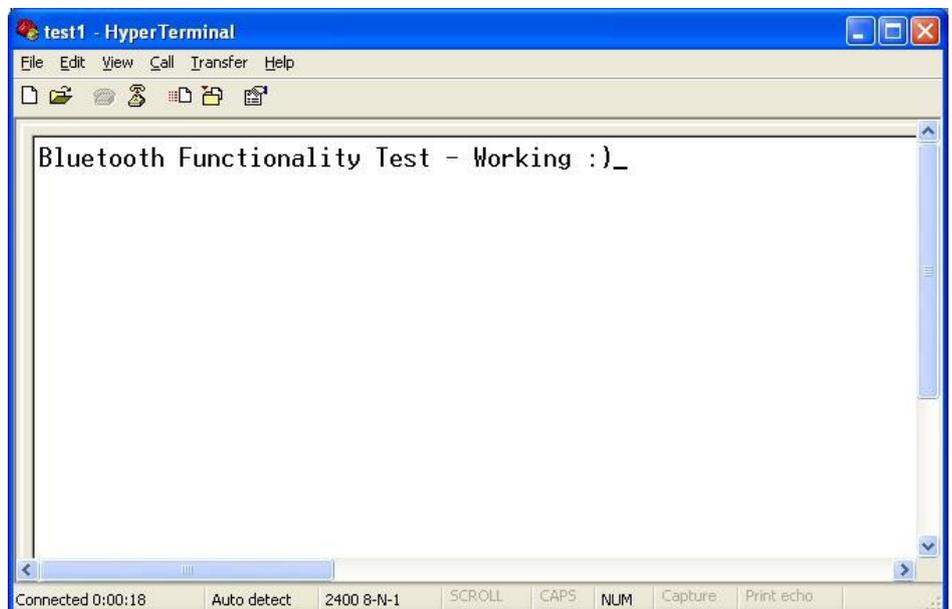


The example 2 program simply demonstrates an echo function. Any data that is received is passed to the LCD to be printed out as an ASCII character before being retransmitted back to the computer.

The ReceiveRS232Char will check for incoming data once before returning. The timeout parameter controls how many iterations to wait before returning with no data. If no data has been received then the return value will be equal to 255. However if valid data has been received then the return value will be less than 255.

If you are using a timeout greater than 1 then the function will return immediately if valid data is detected rather than waiting for the timeout to end. A timeout of 255 is an instruction to tell the RS232 component to wait forever for valid data. This allows you to use the component macro call as a blocking function in your program if you wish to use it this way.

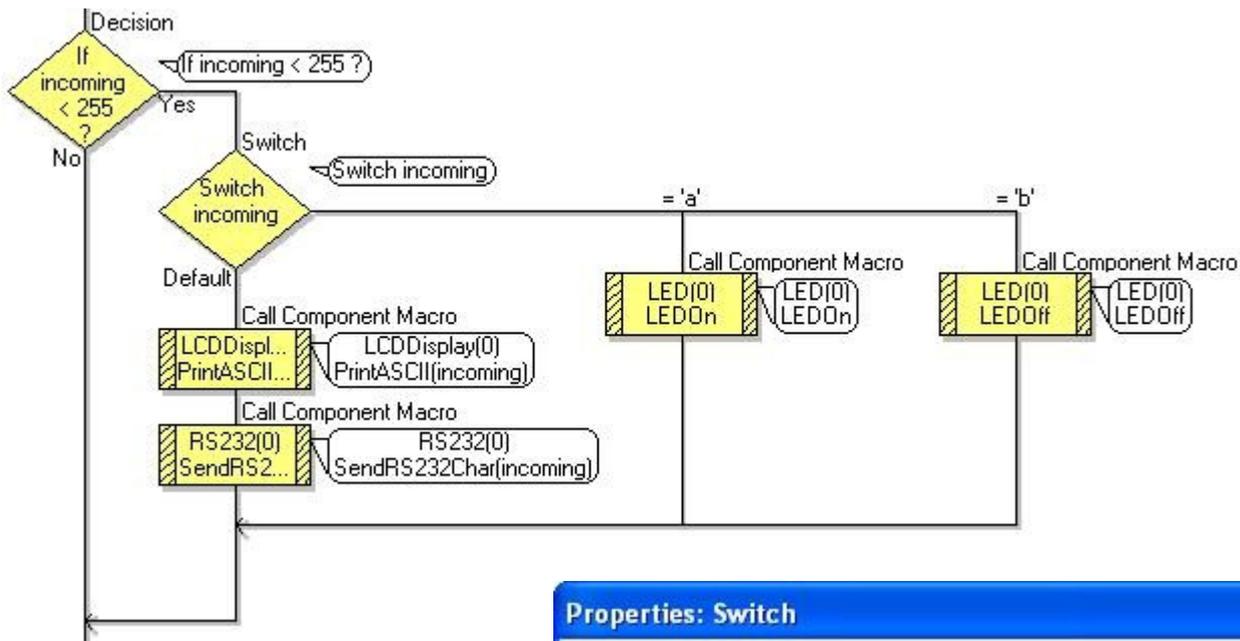
As we are now echoing back the data we should get any typed data appearing on screen as it is echoed back to the PC. We should also be able to see the data appearing on the LCD.



Example 3

EB980-80-1 E-blocks Easy Bluetooth Pack

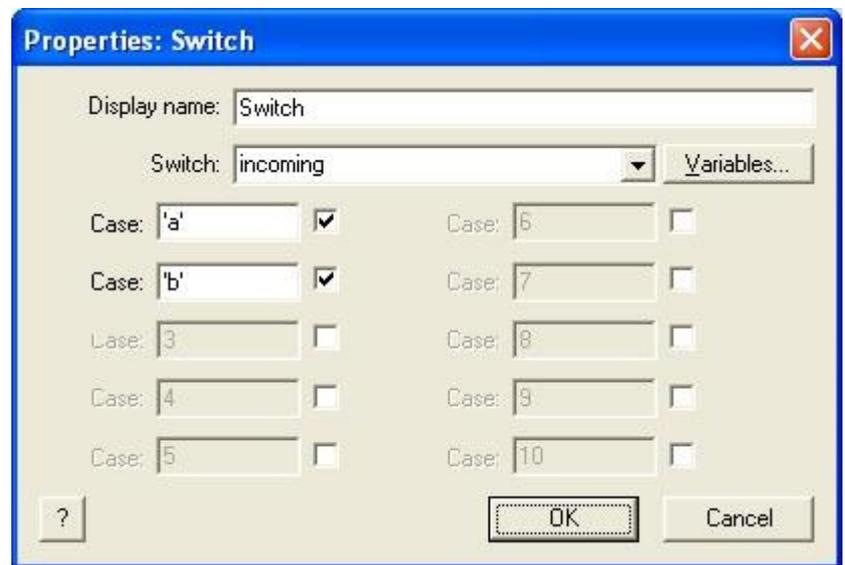
Now we have a working system its time to make it do something useful. A simple serial application is to turn an output pin on and off. If we can do this then we can then move onto bigger and better things like reading a digital or analogue input.



Here we can see the decision to detect a valid incoming byte.

If the decision returns a yes then we are using a switch case to detect for the button press 'a' or 'b'. The '' symbols allow the ASCII value to be used. For example a 0 key-press would actually return the number 48 or '0'.

Look at an "ASCII table" via Google if you are unsure.



Pressing the lowercase letter key for a or b will have the effect of switching the LED on and off respectively. Any unrecognised incoming characters will fire the default branch of the case statement which will act to echo the incoming data and print it out to the LCD. You will notice that pressing the key for lowercase a or b will not be shown on the LCD and will also not be echoed back to the computer.

Example 3

EB980-80-1

E-blocks Easy Bluetooth Pack

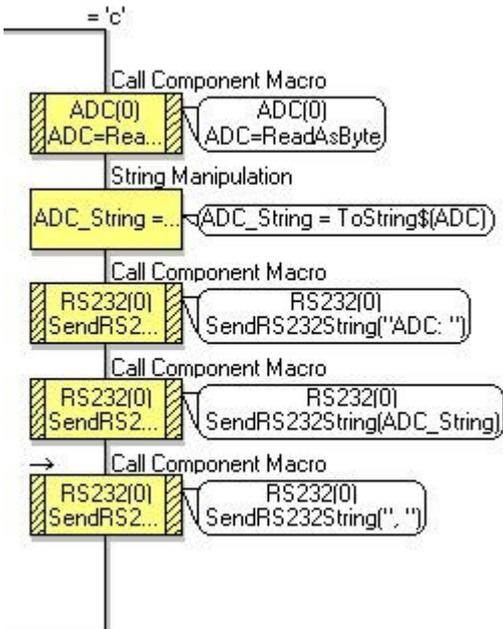
Switch option 'c' adds the functionality to sample an analogue input and return the data back to the computer.

An ADC component was added to the program and modified so that it was connected to analog pin AN5 which is pin0 of PortE on a 16F877A device. This allows our LED which is connected to Pin0 of PortA to remain working correctly.

The ADC is sampled and then the number is converted to a string. The difference between the byte value and the string is that the byte value is a number between 0 and 255 which is held in a single 8-bit variable. The string data is an array of 8-bit variables which each hold an ASCII character.

The ToString function in the string manipulation icon is responsible for converting the numeric value into a decimal string which can be displayed in text form.

The string to int function available from the string manipulation icon can be used to reverse the process and allow for ASCII numbers coming in through the RS232 to be converted back into a single variable. Note that a Flowcode Int variable type will be required to store a number that is greater than 255 or negative.



The ASCII for a carriage return can be sent by transmitting the number 10 and a line feed by transmitting the number 13.

For further help with configuring the Bluetooth module please refer to the Flowcode example files and also the Ezurio Bluetooth module manual. This contains references for all the specific AT commands and how they are used as well as how the modules find, communicate and pair with each other.

Troubleshooting

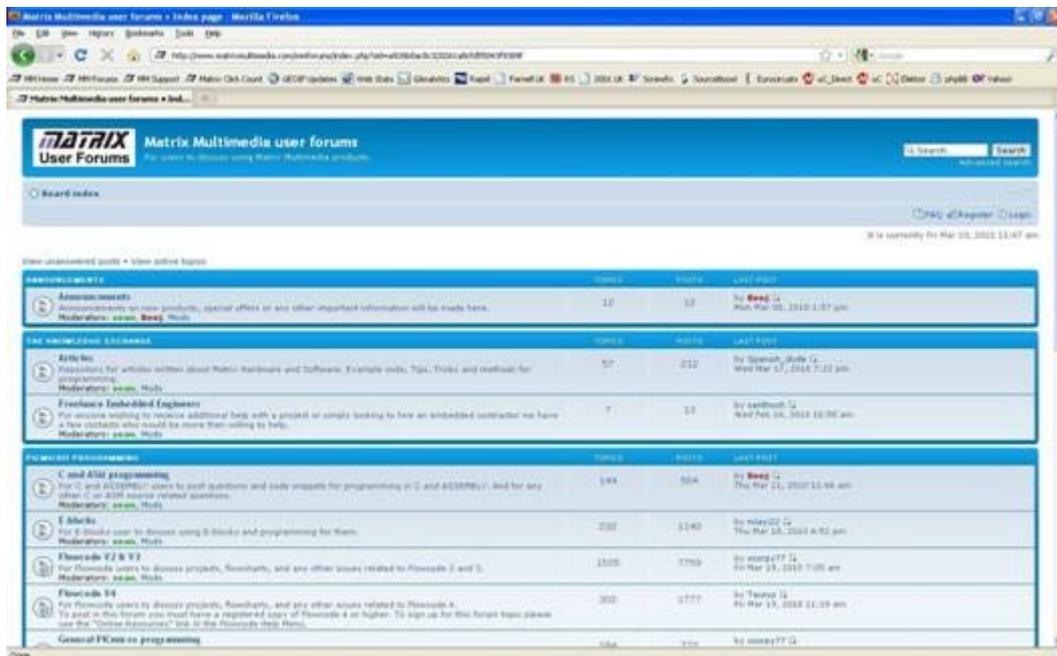
EB980-80-1 E-blocks Easy Bluetooth Pack

If you are having problems getting up and running with any of the examples or any of the Flowcode components then the first port of call is to ensure you have your boards plugged together and wired correctly. As a rule of thumb any board with a screw terminal and a +V marking should be connected via a single wire to the +V screw terminal on the corresponding Multiprogrammer.

If you do run into any problems then there is help and advice available from our online user forums located here:

<http://www.matrixsl.com/mmforums/>

The Articles section contains quite a few examples, as well as hints and tips to aid in your applications



There is also a set of online videos demonstrating Flowcode available from the videos section of our website: http://www.matrixsl.com/lc_videos.php

Other Products

EB980-80-1

E-blocks Easy Bluetooth Pack

Matrix TSL is a leading global technology company. Over the years we have developed a portfolio of award-winning products which have applications in Education, Industry and in the home.

Learning is at the heart of much of what our company does, and the philosophy of all Matrix learning products is based on 'learning by doing'. Each year Matrix spends around 25% of turnover on research and development to ensure that our learning and development resources are world class.

MIAC PLC

MIAC (Matrix Industrial Automotive Controller) is an industrial grade control unit which can be used to control a wide range of different electronic systems including sensing, monitoring and automotive. It has a number of applications in industry and learning.



Formula Flowcode

Formula Flowcode is a robot vehicle which is used to teach robotics, and to provide a platform for competing in robotics events.



ECIO



ECIO devices are powerful USB programmable microcontrollers with either 28 or 40 pin standard DIL (0.6") footprints. They are perfect for student use at home, project work and building fully integrated embedded systems.

FlowKit

The FlowKit allows for in circuit debugging directly from within Flowcode. This is the same ICD debugging feature that is included with our version 7 EB006 Multiprogrammer boards.



Flowcode + E-block Technology bundles



Matrix TSL technology bundles are based on a combination of two of our most popular products, E-blocks and Flowcode.



Other bundles in the range

- Easy Mobile Communications Pack
- Easy Zigbee Pack
- Easy RFID
- Easy Internet
- Easy CAN Bus
- Easy GPS
- Easy USB
- Build your own PC Interface
- Build your own PLC
- Build your own Data-logger