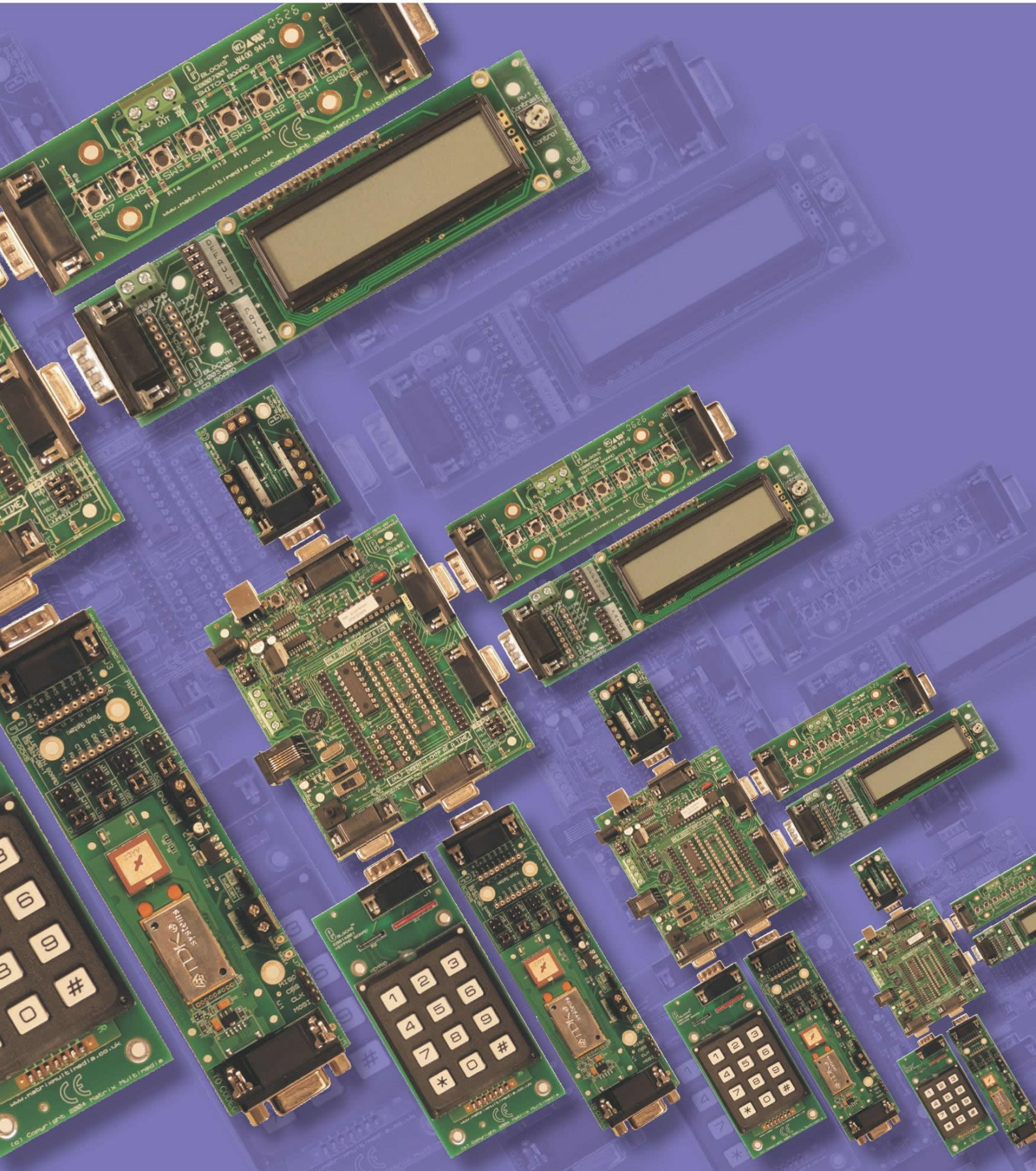
MATRIX

getting started guide

E-Blocks Easy RFID Bundle



Flowcode

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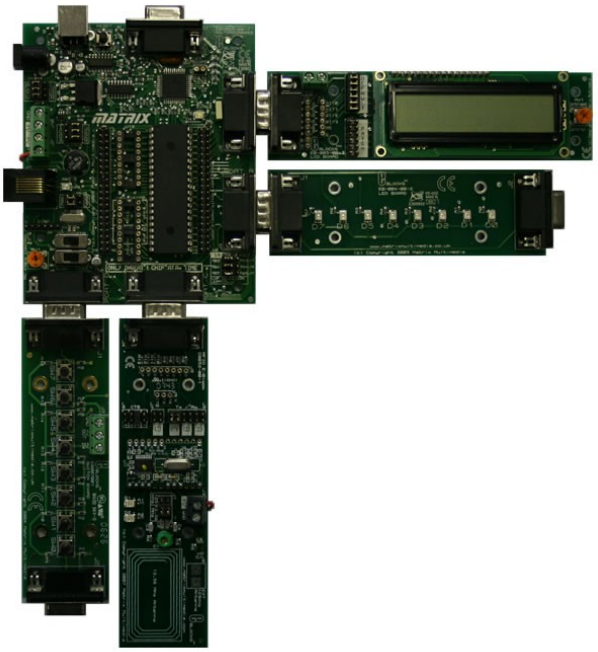
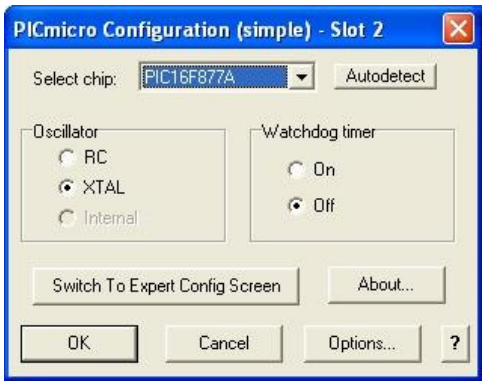
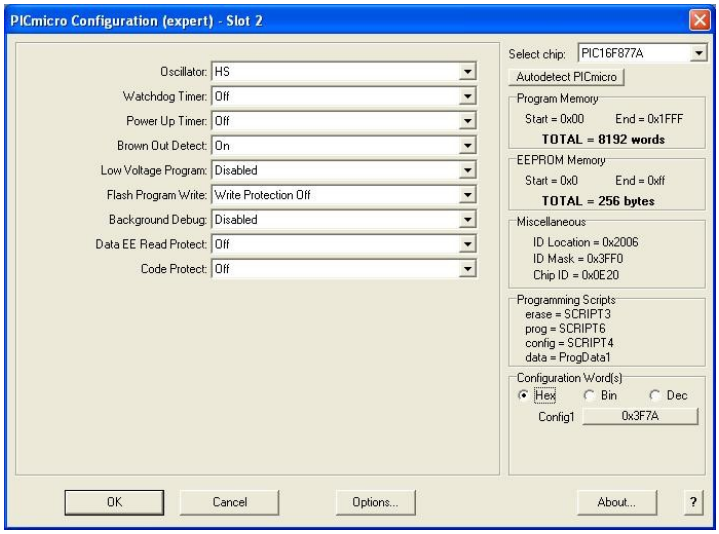
To setup your E-Blocks for use with the example programs you must perform the following actions:

- Remove the 16F88 Device from the EB006;
- Insert the 16F877A into the EB006;
- Connect up the E-Blocks as shown on the right.
- The RFID, LCD and Switch E-Blocks 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 a 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 Flowcode and then if you need more options click the switch to expert config screen button.

Example file 1 is a good test file as it is very basic and simply checks for communications between the CAN nodes. This allows for a quick and easy check to ensure that all of the nodes are working as they should.

RFID Component

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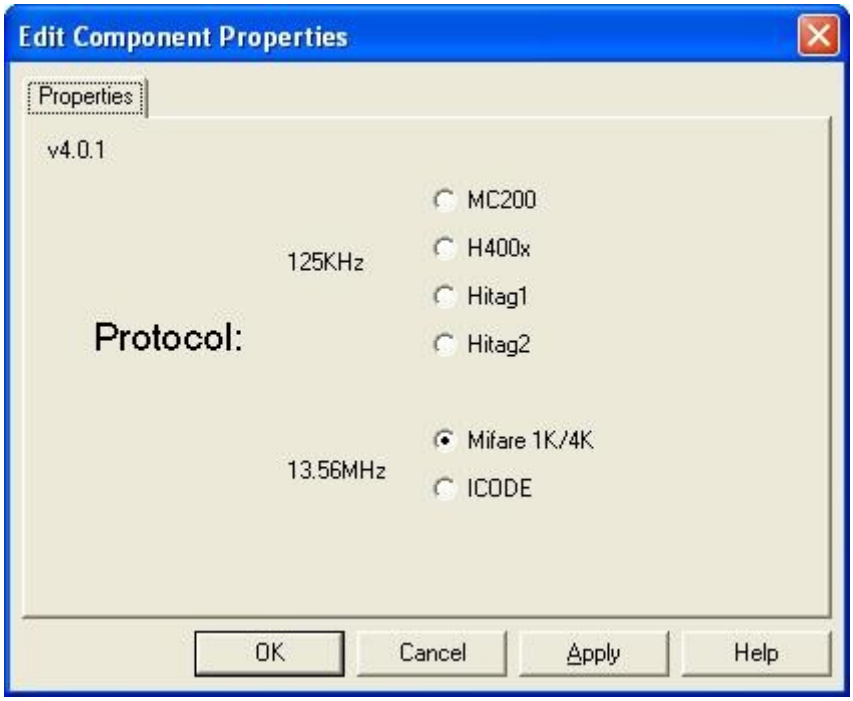
The Flowcode RFID component can be added to your program by finding the component in the Wireless section of the Flowcode component toolbar.

RFID Component Icon

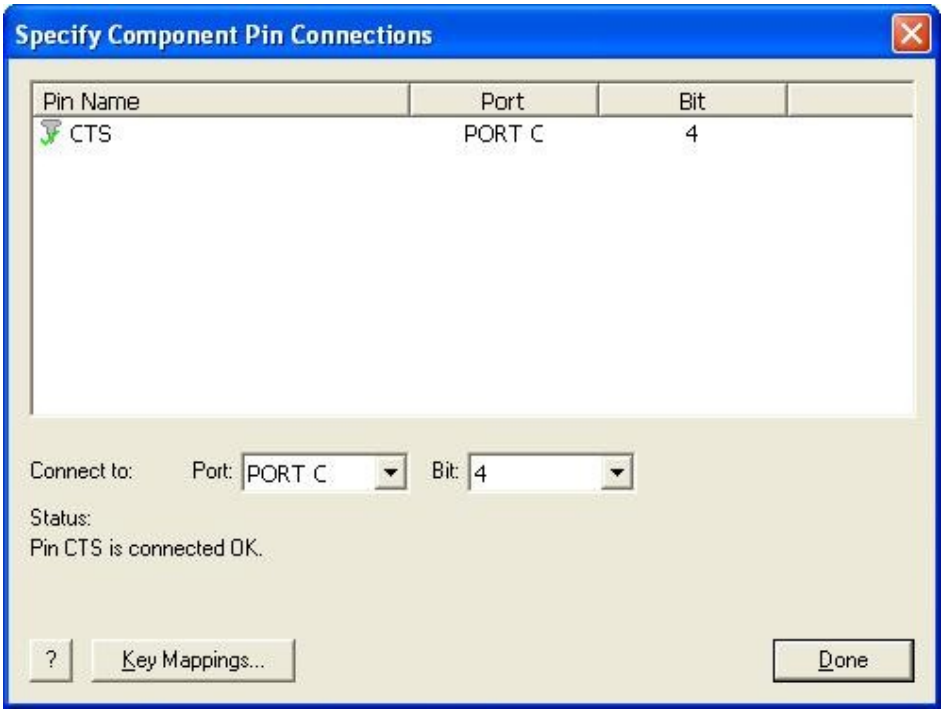
Once the component has been added to your program you will find that the RFID component icon has been added to your panel.



The RFID component properties page is laid out as shown on the left. The property page allows you to define which RFID protocol will be used for your system.

The standard RFID E-Block comes with support for the 13.56MHz Mifare and I-Code devices. To allow the 125KHz RFID protocols to function you must replace the module on the RFID E-Block with a RFID Quad tag module from RF Solutions. You must also switch the jumper to the 125Khz position and fit an external RFID coil antenna.

The clear to send (CTS) flow control pin is controlled by the numeric jumpers on the RFID E-Block. By default this is set to position 2 which relates to bit 4 of the port.



RFID Component

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The component macro functions that go with the Flowcode RFID component may not all be suitable for your RFID device. Please refer to this list to see if a particular function is available for the device you are using.

	13.56MHz		125KHz			
Function Name	**Mifare**	**Icode**	**MC200**	**H400x**	**Hitag1**	**Hitag2**
Init_RFID	Y	Y	Y	Y	Y	Y
Write_RFID_Module	Y	Y	Y	Y	Y	Y
Get_RFID_Status	Y	Y	Y	Y	Y	Y
Get_RFID_UID	Y	Y	Y	Y	Y	Y
Get_RFID_Type_ID	Y	N	N	N	N	N
Store_RFID_Key	Y	N	N	N	N	N
Write_RFID_Buffer	Y	Y	Y	Y	Y	Y
Read_RFID_Buffer	Y	Y	Y	Y	Y	Y
Read_RFID_UID	Y	Y	Y	Y	Y	Y
Write_RFID_Block	Y	Y	Y	Y	N	N
Read_RFID_Block	Y	Y	Y	Y	Y	Y
Format_RFID_Value	Y	N	N	N	N	N
Increment_RFID_Value	Y	N	N	N	N	N
Decrement_RFID_Value	Y	N	N	N	N	N
Transfer_RFID_Value	Y	N	N	N	N	N

Here is a brief description of the Flowcode RFID component macro functions that are available. For a complete description of the functions please refer to the component help file.

Init_RFID - Configures the RFID device by presetting the Osc type and Mode.

Write_RFID_Module - Stores a byte of data to the internal EEPROM of the RFID module.

Get_RFID_Status - Collect the status of the RFID device.

Get_RFID_UID - Collects the UID from a RFID device.

Get_RFID_Type_ID - Determines which kind of MIFARE device is present.

Store_RFID_Key - Stores a 6 byte key for use with devices that require authorisation.

Write_RFID_Buffer - Writes a byte of data to the outgoing buffer.

Read_RFID_Buffer - Reads a byte of data from the incoming buffer.

Read_RFID_UID - Reads a byte of data from the UID buffer.

Write_RFID_Block - Writes a block of information to the RFID device.

Read_RFID_Block - Reads a block of information from the RFID device.

Format_RFID_Value - Prerequisite to perform a Increment, Decrement or Transfer command.

Increment_RFID_Value - Performs a 32-bit increment on the number held in memory.

Decrement_RFID_Value - Performs a 32-bit decrement on the number held in memory.

Transfer_RFID_Value - Performs a 32-bit block data transfer on the number held in memory.

Example 1

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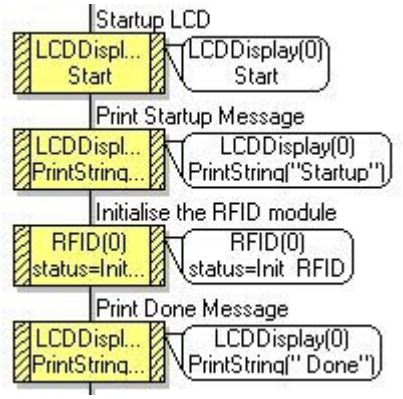
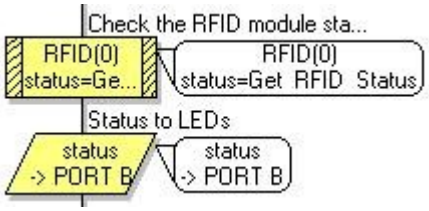
Exercise 1 is very basic and simply initialises the RFID module and then reads the status of the card. To switch between the Mifare and ICODE types of RFID card you can simply change the setting in the RFID component properties page and then recompile to the device.



We use the LCD display to demonstrate a working initialisation routine. This allows us to check that the program is indeed running and to confirm that the module has been initialised correctly.

Once we have initialised the RFID module we then go into a infinite loop that simply reads the status byte and then outputs the value to the LEDs connected to Port B. The value shown on the LEDs varies for each type of RFID device so below is the breakdown showing the significance of the individual bits in the status byte.



Mifare RFID Device

The status flags returned in the Acknowledge byte are as follows:

```
b7  b6  b5  b4  b3 b2 b1 b0
1   1   1   1   1  1  1  1
    |   |   |   |  |  |  EEPROM error (Internal EEPROM write error)
    |   |   |   |  |  Card OK (Card serial number matched to identity code list)
    |   |   |   |  Rx OK  (Card  communication and acknowledgement OK)
    |   |   |   RS232  error (Host serial communication error)
    |   |   MF type (0 = MF 1k byte card, 1 = MF 4k byte card)
    |   UL type (0 = MF standard 1k/4k card, SINGLE UID), 1 = MF Ultralight card, DOUBLE UID)
    MFRC error (Internal or antenna fault)
```

ICODE RFID Device

The status flags returned in the Acknowledge byte are as follows:

```
b7  b6  b5  b4  b3 b2 b1 b0
1   1   0   0   1  1  1  1
    |           |  |  |  EEPROM error (Internal EEPROM write error)
    |           |  |  Card OK (Label serial number matched to identity code list)
    |           |  Rx OK  (Label communication and acknowledgement OK)
    |           RS232  error (Host serial communication error)
    MFRC error (Internal or antenna fault)
```

Example 2

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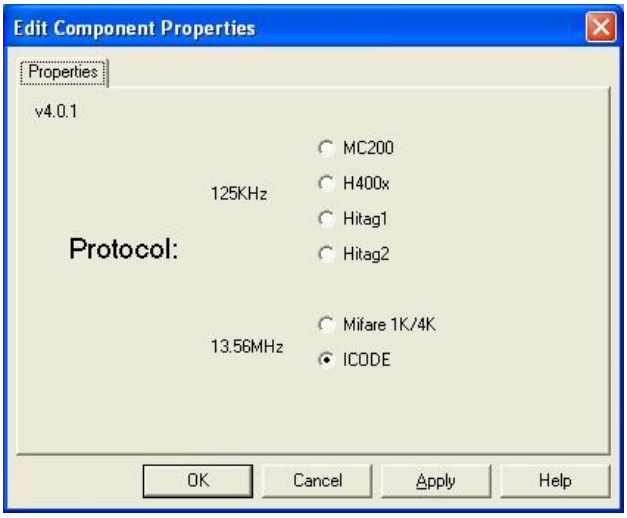
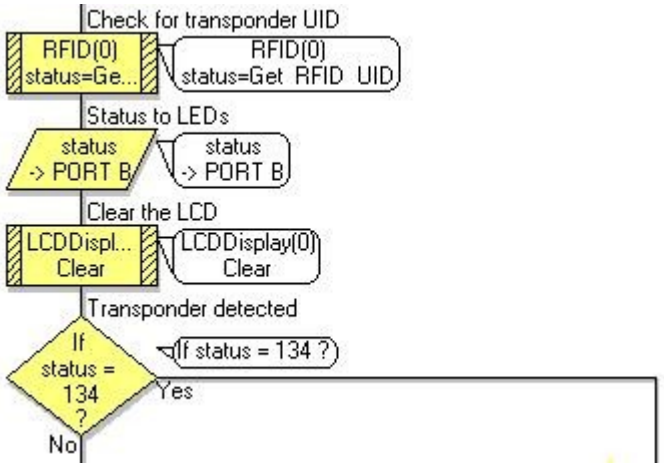
E-Blocks Easy RFID Bundle

Exercise 2 is more advanced and deals with reading and writing data from the internal memory of an ICODE type card. The program scans for a ICODE RFID device and if such a device is detected then the LCD will print out the contents of 5 of the internal memory bytes. The switches are then read and if any of the switches are pressed then the binary value from the switch port is copied into memory byte 0.

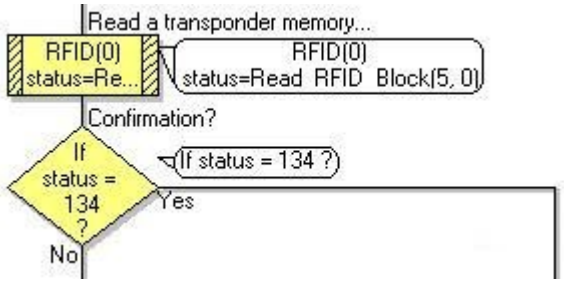
The device is configured as an ICODE and the connections for the LCD and Switch components are defined.



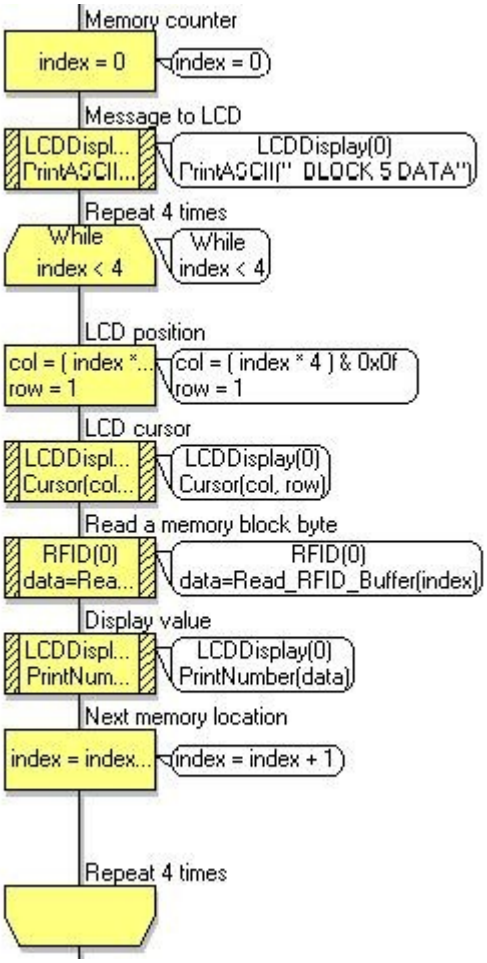


We first read back the status of the user identifier data using the Get_RFID_UID component macro. Once we have the status we send the value out to the LEDs. If the status value is 134 then this indicates that an ICODE device is present in range of the RFID reader.

We then read the memory contained in block 5 on the RFID ICODE device by calling the Read_RFID_Block function. If the device is still present and we successfully read the memory then the returned status byte will still be equal to 134.

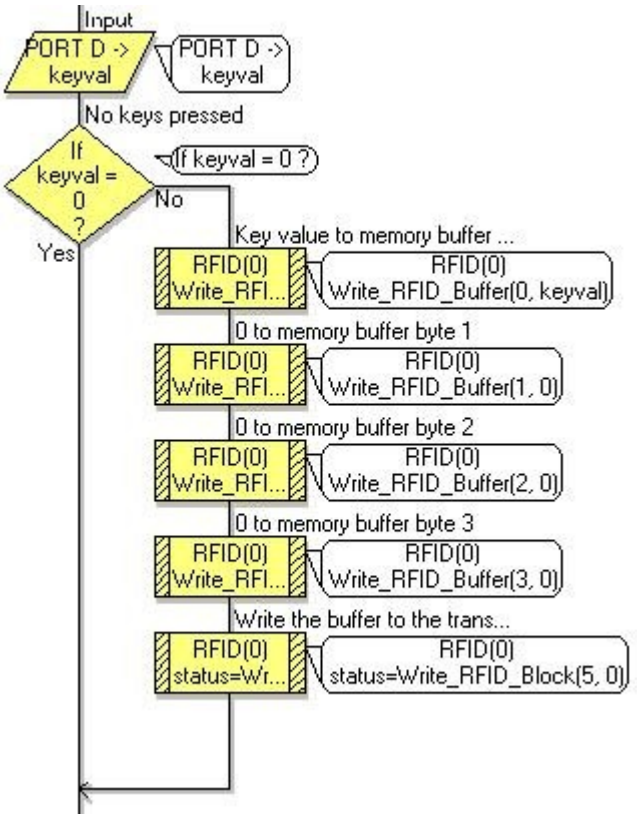


Example 2



Once we have read one of the memory blocks we can use the Read_RFID_Buffer command to read back a single byte into Flowcode. Each memory block has 4 bytes and so can be used to store four 8-bit values, two 16-bit values or a single 32-bit value. The while loop simply allows the index memory pointer to be incremented from 0 through to 3 so as to collect all four bytes from the memory and output the values to the LCD.

Finally we test the switches connected to Port D. If any of the switches are pressed then the binary value from the switch port is copied into byte 0 of the data buffer. Once we have updated all four of the buffer bytes we use the Write_RFID_Block macro to write the content of the memory block back into the RFID device.



Example 3

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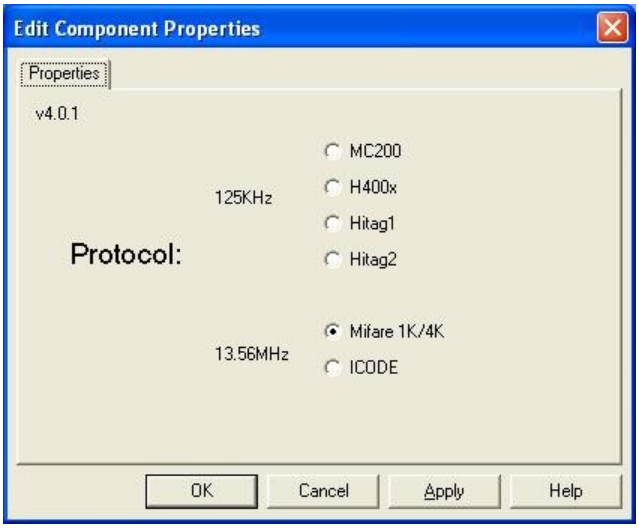
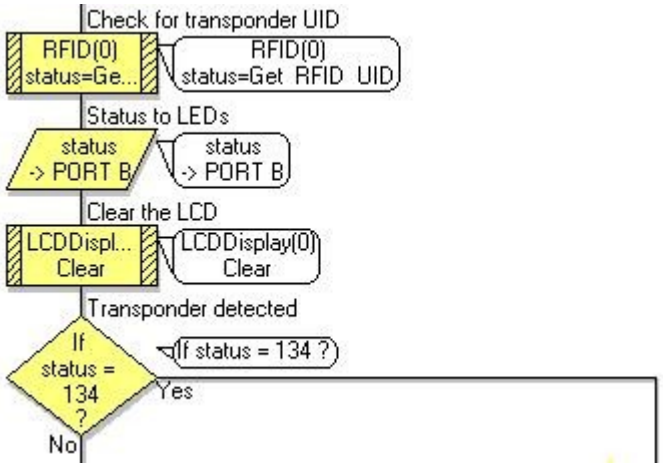
Exercise 3 repeats the functionality demonstrated in example 2 but this time using a Mifare type of RFID device. The Mifare devices feature an auto increment or auto decrement value which means it is possible to use these types of cards to obtain a fixed number of services. Eg 5 trips on the bus before you have to buy a new ticket.

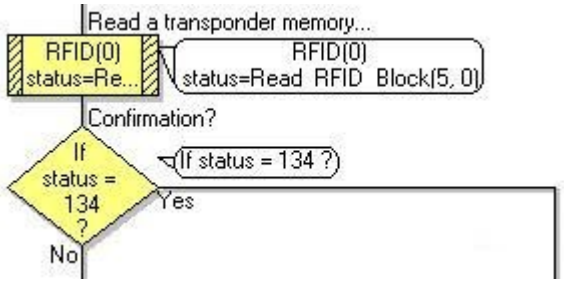
The device is configured as an ICODE and the connections for the LCD and Switch components are defined.





We first read back the status of the user identifier data using the Get_RFID_UID component macro. Once we have the status we send the value out to the LEDs. If the status value is 134 then this indicates that an Mifare device is present in range of the RFID reader.

We then read the memory contained in block 5 on the RFID Mifare device by calling the Read_RFID_Block function. If the device is still present and we successfully read the memory then the returned status byte will still be equal to 134.



Example 3

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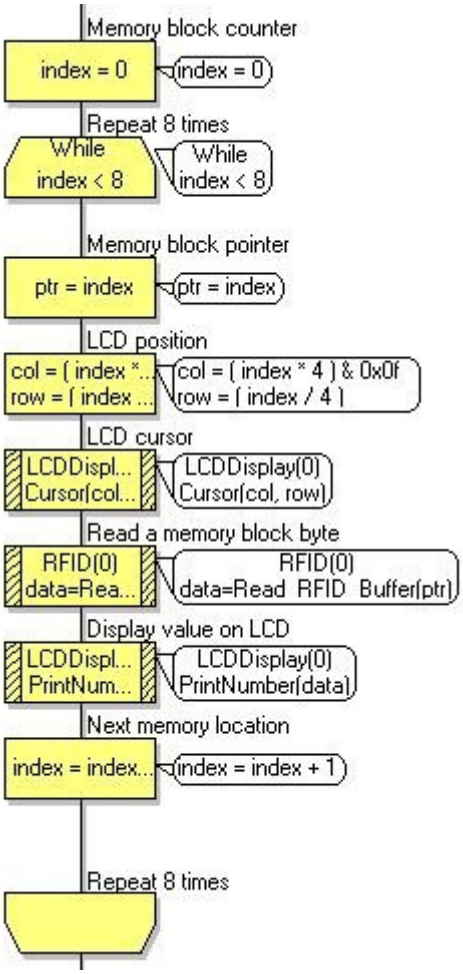
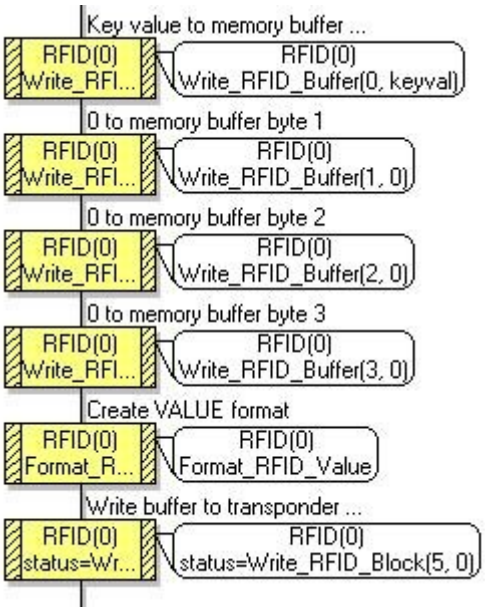
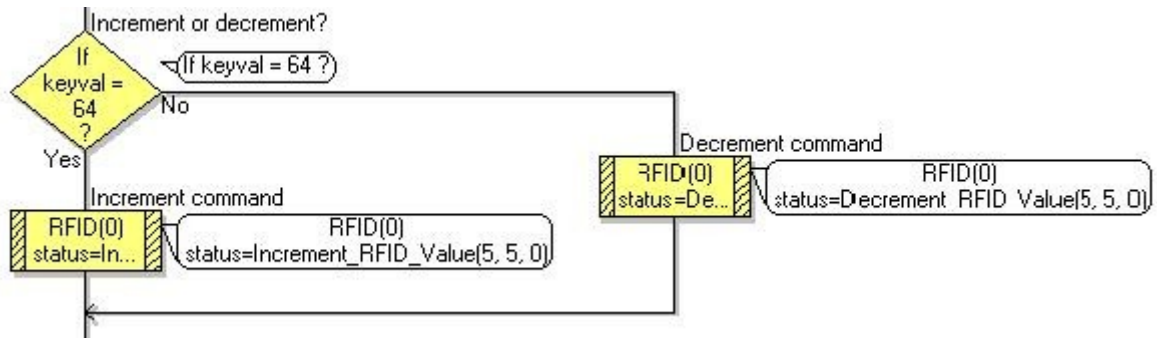


Once we have read one of the memory blocks we can use the Read_RFID_Buffer command to read back a single byte into Flowcode. This time each memory block has 8 bytes and so can be used to store eight 8-bit values, four 16-bit values, two 32-bit values or a single 64-bit value. The while loop simply allows the index memory pointer to be incremented from 0 through to 7 so as to collect all eight bytes from the memory and output the values to the LCD.



As before if a switch is pressed then we will store the binary value of the switch press into the first byte of the buffer. The Format_RFID_Value macro is used to configure a memory byte for use with the increment, decrement or transfer commands.

The data manipulation is performed by simply calling the Incement_RFID_Value or the Decrement_RFID_Value macros.



Troubleshooting

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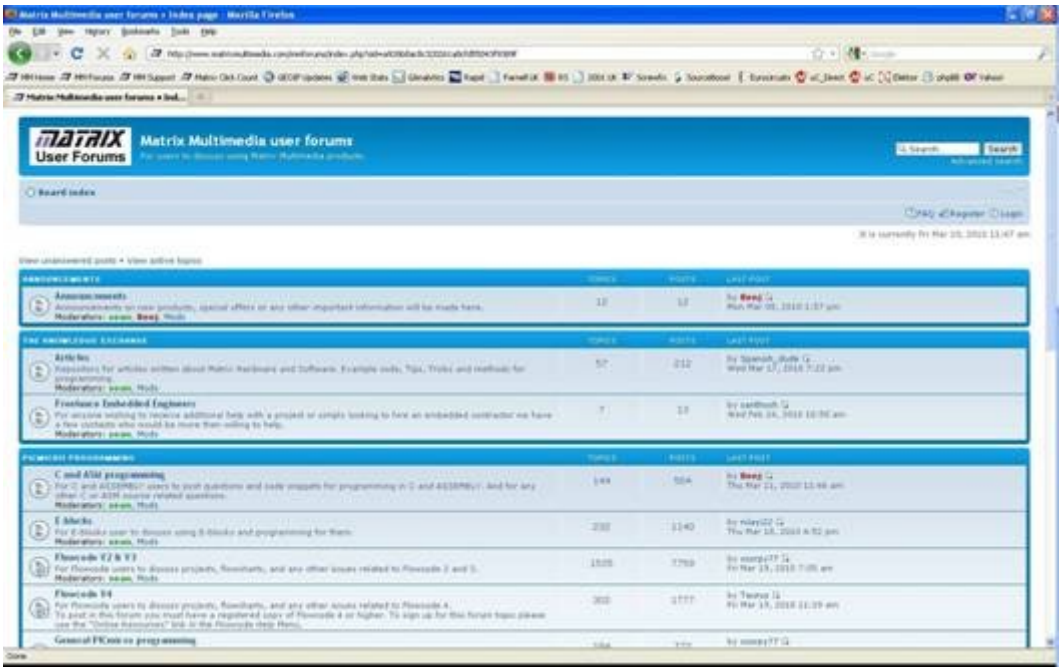
E-Blocks Easy RFID Bundle

If you are having any 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 core 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.matrixtsl.com/mmforums/

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



There is also an online video demonstrating Flowcode, available from the videos section of our website: http://www.matrixtsl.com/lc_videos.php

Other Products

EB976-80-1

E-Blocks Easy RFID Bundle

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