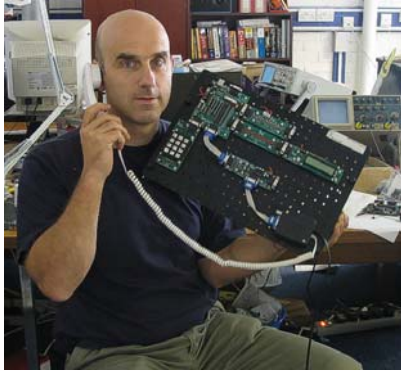


Mobile telephony solution

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About this presentation



- This presentation was developed by John Dobson – Managing Director of Matrix Multimedia Limited.
- PowerPoint versions of this presentation are available on request.
- Notes on the presentation are included with each slide down here:

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On each slide you will see notes in this position – this is my commentary.

What does it do?



- A fully working mobile phone
- Can be used as resource for teaching the basics of microcontroller programming with low level students using Flowcode
- Can be used for a wider variety of comms learning with higher level students – using Flowcode, C or ASM

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This solution is a fully working mobile phone that can teach about several aspects of mobile telephony, and can also be used as a basis for learning general embedded programming using the mobile phone as a highly motivating context.

What is in the pack?



- Built and tested phone made from E-blocks
- Teacher's manual
- Flowcode single user – with course and sample files
- Datasheets on the GM28/29 GSM module
- Accessories and leads, PSU etc.

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In the pack you will find a fully assembled and tested mobile phone like the one shown in the picture. You also get additional boards, like prototype boards, which can be used for a variety of additional exercises. A copy of Flowcode is included with several mobile phone text messaging examples, a teacher's manual with suggestions on how to use this in the classroom, and a pH sensor which is used as a basis of telemetry work. A variety of leads and power supplied (all countries) are included along with rugged storage trays.

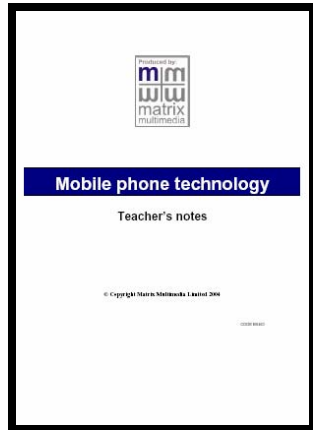
How we support each type of user:

- Low academic user – Flowcode
 - Flowcode and Flowcourse
 - Pre-built routines in Flowcode
 - EB634 teacher's notes with tasks
- High academic level – C or ASM users
 - Individual datasheets on all boards
 - GM28/29 support manuals
 - Flowcode software architecture is useful

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The mobile phone can be used with students of differing academic ability – or at different stages in a course. At a low academic level the mobile phone is great for teaching the fundamentals of programming using Flowcode, and provides a highly motivating way of introducing the subject to students. At higher academic levels the mobile phone is great for teaching about the principles of communications – in particular packet structure and communication strategy using the AT command set. As you will see in the next few slides, we provide guidance on how each type of student can use the mobile phone solution, and we provide sample programs to help get students started.

Support materials

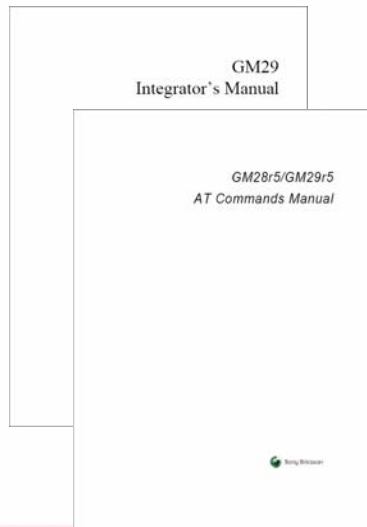


- The teacher's notes set out a number of tasks
 - For example: Send a text message when the pH in a lake rises above a certain value.
 - Students call on several resources to solve the problem.....
- Teacher's notes are flexible guides/ideas – this is not an enforced curriculum

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The teacher's notes shipped with the product make some suggestions as to how the unit can be used. This does not include a full step-by-step curriculum, but it will allow one to easily be developed with your own student's requirements in mind.

Technical datasheets



- Datasheets on the GM28/29 are supplied. These detail the full operation of the module and can be used for development and experimentation.
- These are around 250 pages each!

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Technical datasheets are also shipped with the solution. At higher academic levels good levels of detailed technical documentation will be the most important part of the solution. Technical datasheets on each of the circuit boards used in the mobile phone are also supplied – with circuit diagrams.

Initial learning objectives for the mobile phone

- Logic thinking
- Development of E-systems, and E-systems architecture
- Programming E-systems using Flowcharts
- Architecture of mobile telephony systems
- Remote telemetry using sensors

These are applicable to most learners

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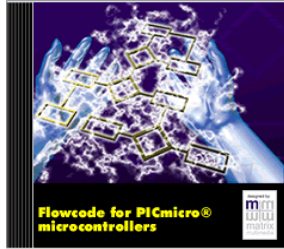
There are many learning objectives that it is possible to fulfil using the mobile phone including those listed here and on the next slide.

Additional learning objectives for the mobile phone

- Many programming learning outcomes in C or assembler
- Electronics outcomes also
- Understanding RS232 communications
- Understanding AT command structure
- Understanding AT command protocols and programming strategy

This is only applicable to computer science or electronics undergraduates

About Flowcode

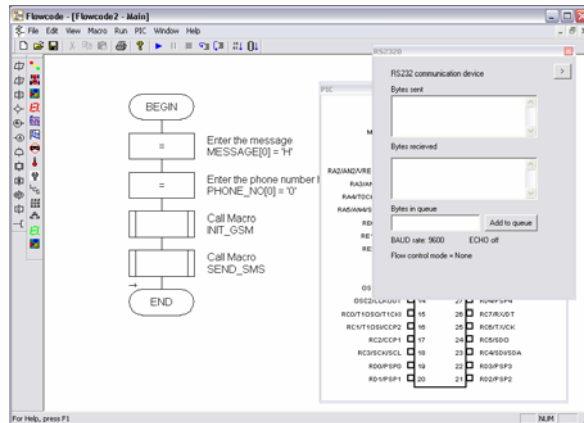


- Flowcode allows students to program complex electronic systems without getting bogged down in syntax
- Flowcode converts a flow chart into PICmicro code
- Pre-written examples for the mobile phone are available
- Routines that control the important aspects of the mobile phone are available that can be used as a shell for motivational learning

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Flowcode is used at the heart of many of our applications and the examples shipped with the solution also use Flowcode. It is perfectly possible to use C to Assembler if higher level students should require.

Flowcode shell and macros

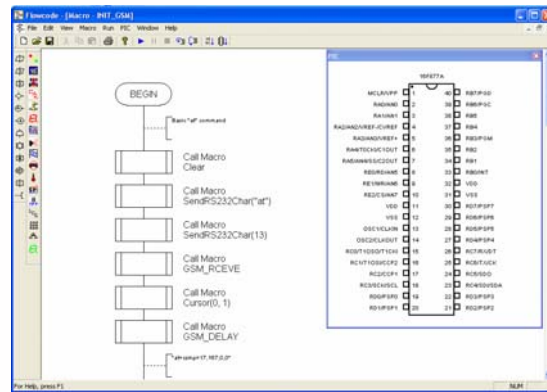


- For motivational learning students are given key routines and have to 'fill in the gaps'

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For working with beginners to programming you can use our core macros for initialisation and sending messages, and simply get the student to construct simpler programs – for example using the A/D converter – around these macros. This is a great way to get students interested in the subject.

More advanced learners



- A wide variety of tasks from 'fill in the gaps' to complete system construction

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There are many possibilities for advanced learners – from learning AT commands, acquiring signal strength data on the nearest 6 base stations etc. Advanced learners will also benefit from understanding the layering of software shown here: the mobile phone is controlled by AT commands which are built on RS232.

Flowcode support

The screenshot displays the Flowcourse software interface. On the left is a green sidebar with a file tree containing folders like 'Introduction', 'Flowcharts', 'Flowcode', and 'Projects'. The main window is divided into two panes. The left pane shows a list of tutorial files (TUT_01.FCF to TUT_28.FCF) and their descriptions. The right pane shows a preview of a tutorial with a brain image and a flowchart, along with a 'System checks' section.

TUT_01.FCF	Tutorial 1: Lighting an LED
TUT_02.FCF	Tutorial 2: Outputting a value to a port.
TUT_03.FCF	Tutorial 3: Single bits and ports.
...	
TUT_25.FCF	Tutorial 25: Using embedded C and Assembly code.
TUT_26.FCF	Tutorial 26: Using Analog inputs.
TUT_27.FCF	Tutorial 27: Advanced calculations.
TUT_28.FCF	Tutorial 28: Using macros.

- Students can learn the basics of Flowcode with an on-screen course and by looking at 30+ tutorial files.

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To support students in learning Flowcode a full course is available ('Flowcourse') on the CD and online. Also Flowcode is shipped with 30 tutorial files which can be used to build students' expertise.

AT commands

- AT commands are widely used in Telecomms for control of telecomms systems
- Initially AT commands were defined by Hayes and others

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Just a little here about AT commands.

An example of an AT command

AT

ATD0123456789;

**[phone call
takes place]**

ATH

- This is a simple routine to dial 0123456789.
 - 'AT' opens a circuit
 - 'ATD' is dial
 - 'ATH' is hang up

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This shows a basic AT command transaction. This is AT at its simplest....

Sending a message

AT

AT+CMGF=1

AT+CSDH=1

AT+CSMP=17,167,0,0

AT+CMGS="0123456789"

>Hello world.

<CTRL-Z>

- More complex routines are needed to send a text message.

- Students need to understand message structure and strategy

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However AT commands are also used as a basis for text messaging and even sending fax data. Those students that want to take advantage of this will need to dig into the AT command manual!