



How do we engage Key Stage 3 and 4 student interest in D&T projects? How do we stimulate and motivate them to generate their own ideas and provide the opportunity to become creative individuals? How do they design and develop distinctly different projects/products from their peers with the limited resources that exist in the classroom?

RU ON MSG?

(ARE YOU ON MESSAGE?)

Engaging pupils interest is the first step towards a successful D&T project. One important element of the project, has to be its relevance to the world that they live in. The world of communication technology is rapidly changing and is a phenomenon that has completely changed the way we communicate with one another, especially the younger generation. **The Short Messaging Service (SMS) or text messaging has taken the world by storm since its introduction in 1995.**

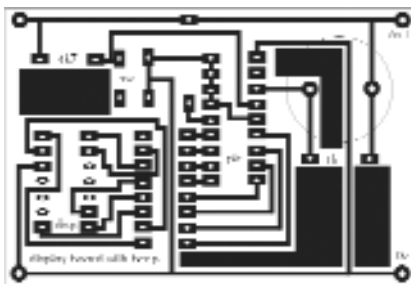
A recent survey from a mobile phone insurer has indicated mobile phone text messaging has more than doubled since March 2002. At least 96% of teenagers own a mobile phone and most conduct their lives around SMS. More than eight out of ten people between 15 and 24 are more likely to send someone a text message than call. This rapidly developing language of the SMS text is phonetic. That means it represents the sound of words rather than the dictionary definition spelling. An article from BBC News Online explains:

'You know you're getting older when you receive a text message written by someone with a chronic allergy to spelling. 'How r u m8? Wan2go2pub?' is a fairly obvious translation, but you're definitely not a hip-cat teen if 'ROTFLMYHO' does not mean 'rolling on the floor laughing my head off!' This is the new language of the Texting Teen.'

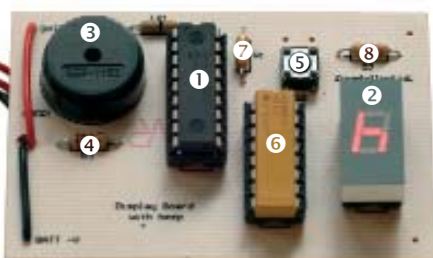
The world of SMS was the beginning of a project at Sheffield Hallam University which would provide the stimulus and opportunities for pupils to extend their fascination of this technology whilst developing their skills in systems and control. The **'Message in a Box'** is one of a suite of projects developed for the TEP Millennium Schools Project.



↑ SMS texting lingo



↑ Reverse of Circuit



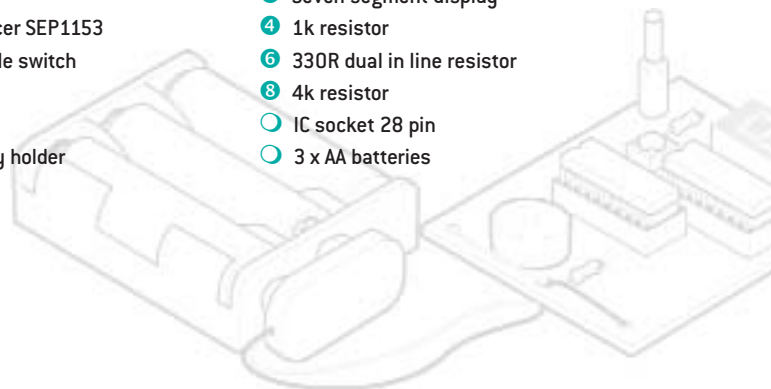
The Circuit

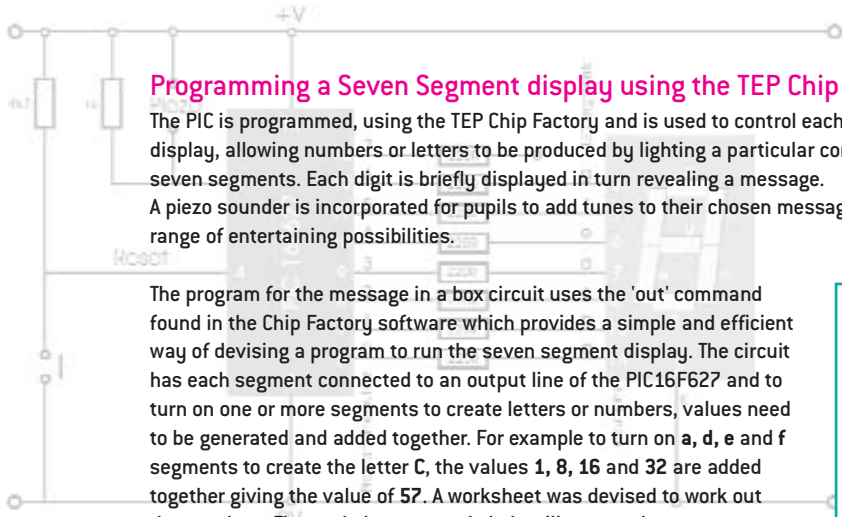
The project consists of a printed circuit board holding a Peripheral Interface Controller (PIC) used to drive a seven segment display. A seven segment display contains seven separate LEDs (segments) and is used in a variety of applications, such as digital clocks, audio and video equipment, medical, industrial and gaming readouts.

This circuit is part manufactured which requires minimal soldering of components and is available from Teaching Resources.

Circuit resources:

- ① PIC16F627 chip
- ② Seven segment display
- ③ PCB piezo transducer SEP1153
- ④ 1k resistor
- ⑤ push to make tactile switch
- ⑥ 330R dual in line resistor
- ⑦ 2.2 ohm resistor
- ⑧ 4k resistor
- IC socket 16 pin
- IC socket 28 pin
- 3 x AA snap battery holder
- 3 x AA batteries





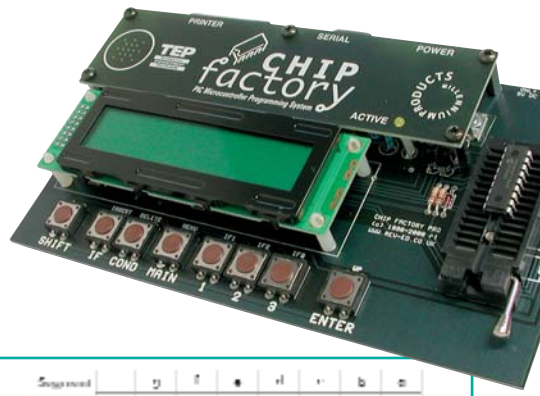
Programming a Seven Segment display using the TEP Chip Factory

The PIC is programmed, using the TEP Chip Factory and is used to control each segment of the display, allowing numbers or letters to be produced by lighting a particular combination of the seven segments. Each digit is briefly displayed in turn revealing a message. A piezo sounder is incorporated for pupils to add tunes to their chosen messages, extending the range of entertaining possibilities.

The program for the message in a box circuit uses the 'out' command found in the Chip Factory software which provides a simple and efficient way of devising a program to run the seven segment display. The circuit has each segment connected to an output line of the PIC16F627 and to turn on one or more segments to create letters or numbers, values need to be generated and added together. For example to turn on a, d, e and f segments to create the letter C, the values 1, 8, 16 and 32 are added together giving the value of 57. A worksheet was devised to work out these values. The worksheet example below illustrates how to create values to program the word 'AGE'.

Line	Command	Value
00	out	119
01	wait	006
02	out	121
03	wait	006
04	out	111
05		
06		

These values are incorporated in to each line of program to create a series of letters and or numbers. The charts illustrate each line of program for the word 'AGE'. A 'wait' command of sixth tenths of a second has been introduced between each line of program to provide a time delay between each letter or number to make them easier to read.



Segment Line/output	a	b	c	d	e	f	g	Total
190	04	32	16	0	0	4	0	56
Aa	04	32	16					52
Bb								
Cc								
Dd								
Ee	64	32	16	8				120
Ff								
Gg	64	32		8	4	0	1	109
Hh								
Ii								
Jj								

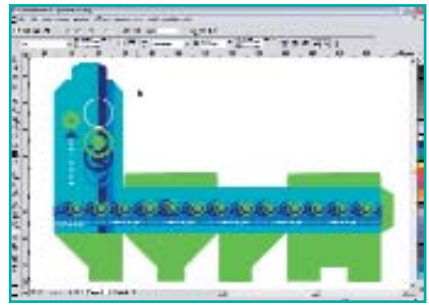
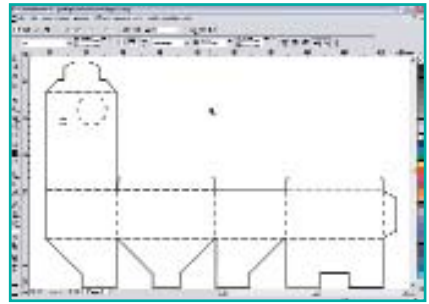


Graphic Product

The original concept of the project was to provide pupils with the opportunity to develop programming skills. To enable pupils to focus on this particular aspect, a simple card package was used to house the circuit.

The pupils could be provided with net template files on any graphics package to develop their ideas.

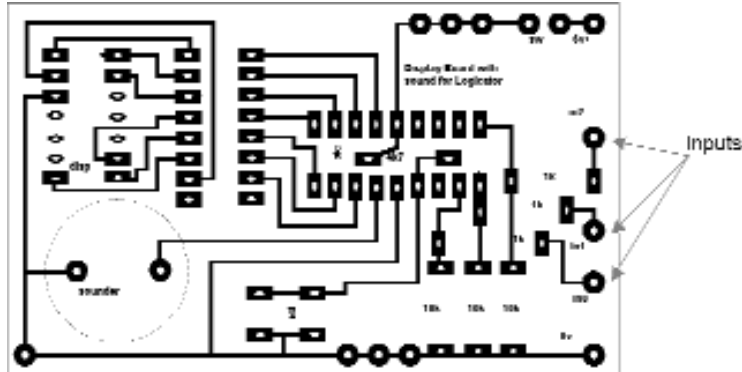
Using a laminator to laminate card is an inexpensive method of strengthening the package whilst considerably raising the finished products quality. It allows the designer to include a 'clear' window for the message to be seen through.



Circuit Developments

Tim Lewis, Principal Lecturer at Sheffield Hallam University has developed the project further with Design and Technology ITT students and derived a wide range of concepts and products while only making slight modifications to the original circuit. Initially the circuit did not provide an on/off switch, only a reset switch which has its obvious limitations. Three inputs were added to the PCB providing opportunity to incorporate different triggers for the message. By choosing different digital and analogue inputs, such as tilt switches and moisture sensors, different contexts are easily derived from the same circuit which can produce completely different products and alternative messages on one chip.

Alternative software packages such as PICAXE were also introduced to program the PIC to extend the range of programming possibilities.

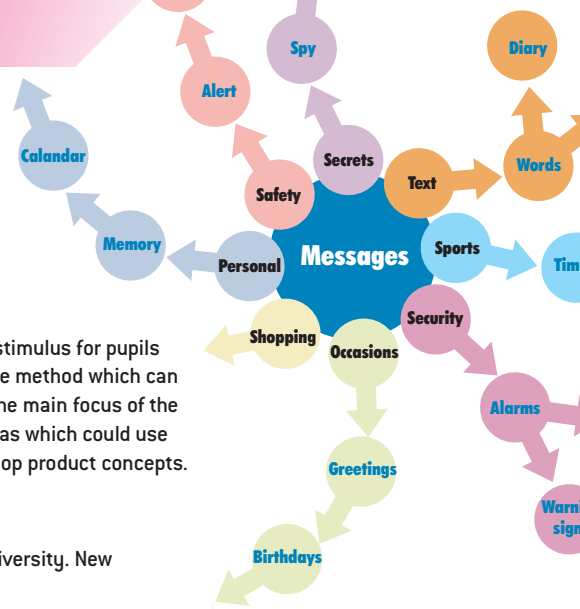


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RU ON MSG? continued

Concept generation

There are several brainstorming methods which can be utilised to provide stimulus for pupils to develop different message products. The mind map shown illustrates one method which can be used in generating different concepts. Start with a word which depicts the main focus of the project in the middle. In this case 'Messages'. Think of several different areas which could use a messaging system. Work within an area to narrow the field down to develop product concepts.



Message in a Box Showcase

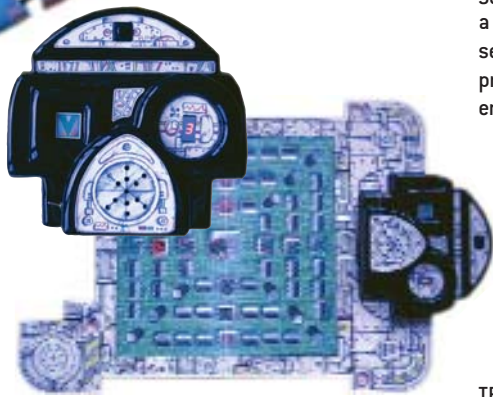
Message in a Box project development is continuing at Sheffield Hallam University. New concepts and products are being devised using the same basic circuit.



☞ A polypropylene package decorated using vinyl cut on a CNC vinyl cutter. This product context was based on a greeting product perhaps in place of a box of chocolates or a card and which could be purchased from a vending machine. Think of the possibilities... Anniversary, Birthday, Christmas, Valentines or simply to say I love you! The process moves packaging into being the product and raises the awareness of the relationship of the 'wrapper' to the electronic content and also nicely avoids the usual hassles associated with workshop made vacuum formed plastic enclosures.



⏴ A tilt switch has been incorporated in this circuit to trigger a message and sound when agitated to warn away prying eyes. The packaging is manufactured by press forming two halves of Foamex which are then glued together. Elastic cord has been threaded through the casing and fixed using a toggle to secure the lid in place. A design has been printed on to the surface of the Foamex prior to forming using the dye sublimation process. (More of this exciting process in the next issue of News and Views)



➔ Search for the Pharaohs gold using the message circuit as a dice in this game. The circuit randomly generates seven segment numbers using a push to make switch in this Yr 10 project. This student has created a wonderful board game and encased the circuit inside an Egyptian tomb.



☞ Move up through different levels of circuitry, in this futuristic game of chance. This student has programmed the circuit to randomly generate different levels of games and generates sound using a push to make switch.

TEP would like to acknowledge staff and students at Sheffield Hallam University responsible for work featured in this article:

- ◆ Tim Lewis, Principal Lecturer
- ◆ Alan Barnes, Electronics Technician
- ◆ Professional Year students developing a system and control project for Yr10
- ◆ 3yr BSc students developing a systems and control project for Key Stage 3
- ◆ Penny Bailey at Shipston High School for Message in a Bag.



The circuit diagram and PCB wizard file are available on the TEP website and the Message in a Box booklet is available from Teaching Resources



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