

CFLS CHIPFACTORY

One of the great things about PIC developments in education is the range of alternative opportunities and new products. However this can be sometime rather daunting and make for rather too much choice. We think allied to the Chipfactory that the new Chipfactory Logic System (CFLS) will help existing users and newcomers to the world of PIC programming have an easier decision about which programming system to adopt.

LOGIC SYSTEM

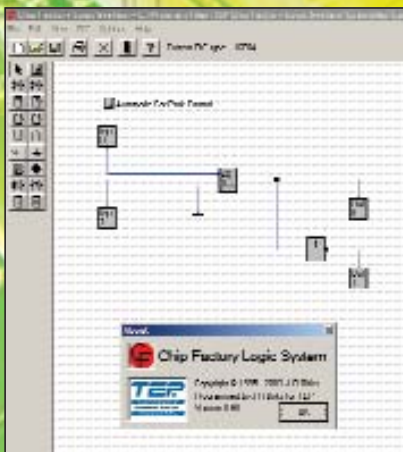
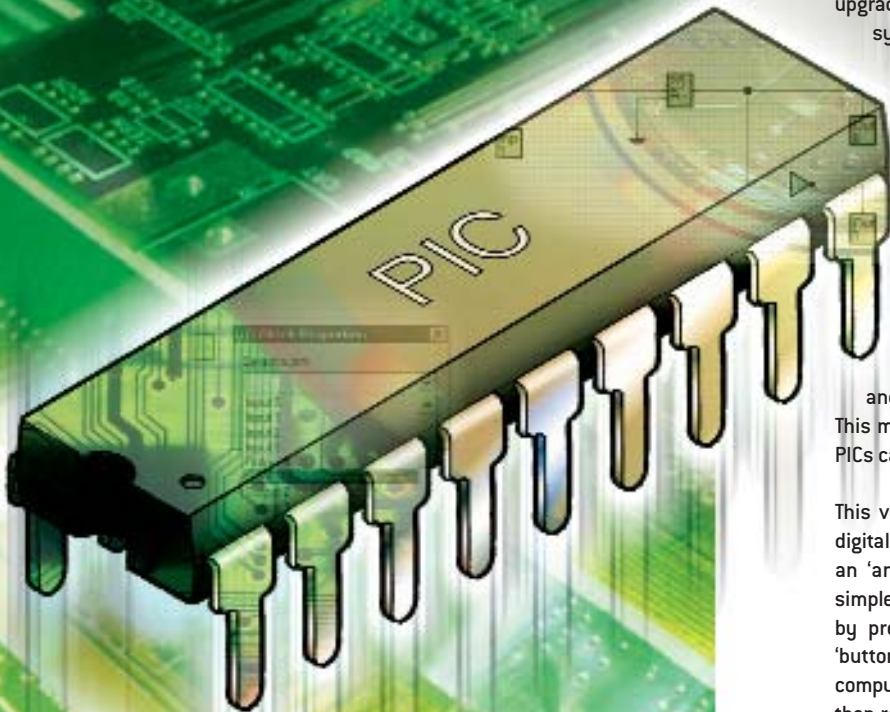
The Chipfactory has been TEP's standard PIC microcontroller programmer for over 5 years in schools and colleges. It has an enviable reputation for having introduced 1000's of pupils and students to PIC technology. Its attraction remains intact in its ability to be used as a 'stand alone' programmer without a computer or software. However the all-new CFLS will not only upgrade the Chipfactory but adds an entirely new dimension to system and circuit design.

Nick Baldwin takes you through the software.

CFLS was developed over the last two years by TEP's Frank Muraca and Joseph Birks and represents a whole new way of thinking and planning programming and using PICs. Having had a few weeks to 'play' with the software the potential and certainly the speed and ease of programming PICs has become evident. CFLS currently supports programming 16F84 (4 inputs and 8 outputs), the 16F627 (4 inputs and 8 outputs) and the 16F629 (2 inputs and 4 outputs). This means older stock PICs as well as more recent lower cost PICs can be used.

This version of the software allows the designer/user to use digital inputs only but the next version release should include an 'analogue in' revision. Linking the software could not be simpler. The Chipfactory needs to be 'set up' in serial link mode by pressing 'shift' and 'new' buttons together followed by 'button 2'. Of course you will also need a serial lead for the computer connection. The LCD display on the Chipfactory should then read: 'serial link to host'. PICs used are blank with no pre-programmed 'bootstrap' or 'header' program which makes life easier. Any version of the Chipfactory can be used with this system, which makes the Chipfactory future proof.

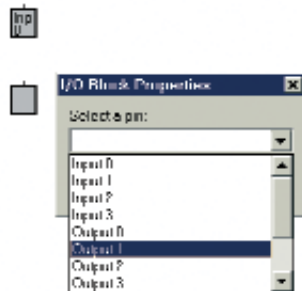
Ladder logic and flowchart methods with many contemporary software packages for circuit design have led us to a point where logic circuits had become surplus knowledge. In fact I asked myself quite a few questions about this layer of knowledge and keep coming back to the need to prototype circuits quickly and to try them out. At an electronic products level and systems level of teaching such logic knowledge is crucial. At every other level of design it remains advantageous. Understandably TTL and CMOS logic circuit construction has all but disappeared in recent years due to time, complexity, reliability and design time and assembly time, let alone getting all the components in school and on the bench at the same time! CFLS puts logic circuit design and manufacture firmly and rightfully back on the agenda without the hassle and what really separates this product from all the others is instant outcomes, not merely designing or modelling on screen but prototyping and bench testing the programmed PIC in seconds as well.



CFLS is a graphical circuit design tool and uses the entire screen for development work. It is characterised by a conventional 'pull down' menu toolbar and at the side of the working screen component toolbar icons. Digital circuits are created by dragging and dropping logic gates onto the work area and then 'wiring' up using the pointer. Logic symbols can be selected and used and once drawn the circuit/s can be printed directly to a default printer. Yes, I did say circuits! Up to the capacity of inputs and outputs available for the selected PIC, the programme allows the designer to develop any number of free standing circuit designs. This means one PIC can easily be free running a number of bespoke circuits and controls. This makes real sense in reducing the complexity of hard wired circuits and external components.

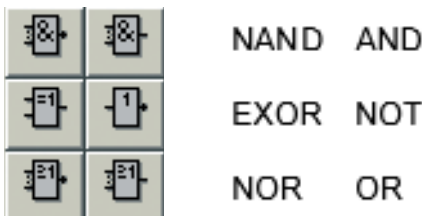
Ins and Outs

Inputs and outputs are selected blank blocks dragged from the toolbar are then assigned as inputs or outputs from the 'pop-up' window and selecting the input or output pin. The block is then ready for use. Modifying the design may mean re-assigning the blocks and this can be done at any point during the design as well.



Logic Components

The full range of sequential logic components is available as well as a library of really useful components. The logic gates all have two inputs except the NOT gate. All the inputs should sensibly be connected to inputs either from a switched input or from another gate. For complex circuits an output from a gate can 'fan out' to several other components.



Additional component library

Shown are the additional library components for comparison



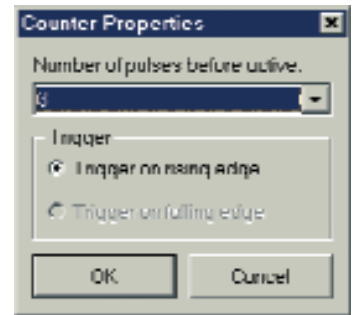
Each of these components can be used as many times as you wish in a design and are dragged onto the working screen individually. In turn we can identify the main characteristics of each.

R-S Flipflops

The R-S Flipflop is a Reset – Set bistable unit that 'toggles' the inverting and non inverting outputs. It has two inputs set and reset and two outputs Q and Q-bar

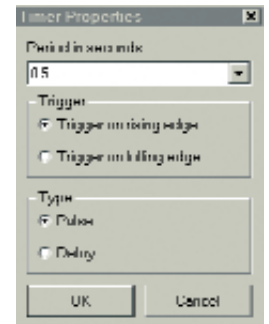
Counters

You can see the counter has three inputs. These are Count up the top pin, Count down the middle pin and reset the bottom pin. This component allows the designer to control up/down counting and resets. The individual counter property is controlled by a 'pop up' menu as shown and the number of pulses can be preset up to value 255.



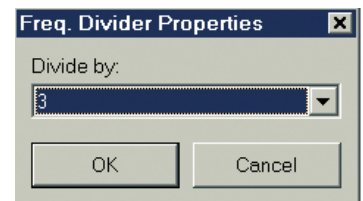
Timers

The timer again has a 'pop up' menu allowing the designer to specify time delays from 0.1 second to 4.2 second. There is of course one input and one output and can be specified as a delayed output or a pulse of a specific duration. Once selected the icon on screen displays RD for delay or RP for pulse.



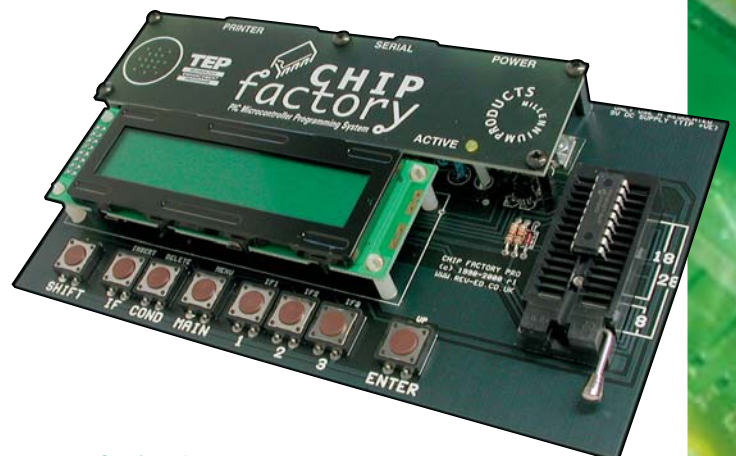
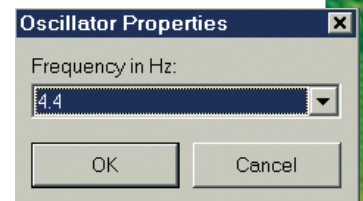
Frequency Dividers

The frequency divider is a really useful component as it allows the designer to again pre-select a divide by value from 1 up to 255. So set at 3 as shown in the 'pop up' menu the input would have to be pulsed 3 times for the output to go high 1. This feature allows higher clocked rates of data or switched pulses to be brought down to manageable levels.

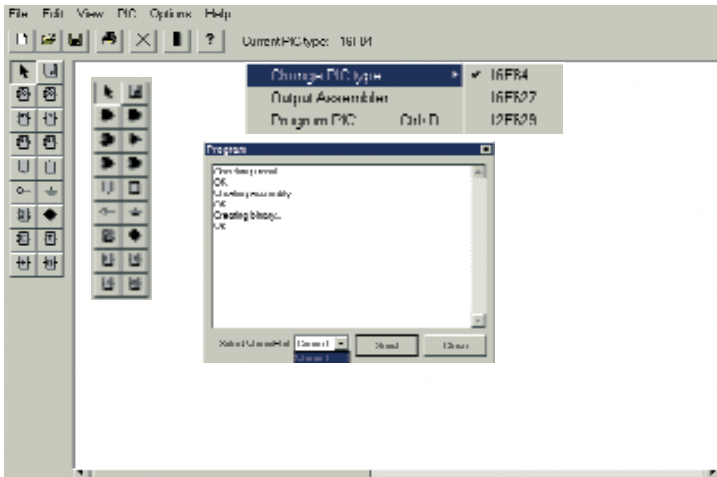


Oscillators

To get a whole range of activities operating without any inputs active requires an oscillator and this component allows the designer to do just that. The oscillator provides a frequency source from just 0.1Hz to 30.5Hz. This allows motors, lamps, LED's to be pulsed or counters to be 'clocked'. The frequencies available are defaults and are the same regardless of the PIC selected.



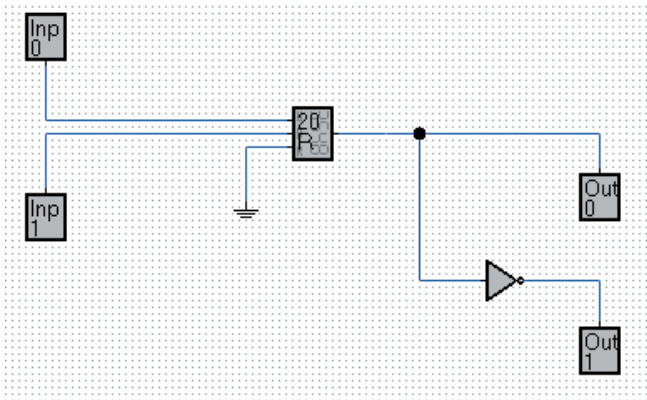
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This screenshot shows the entire program screen for CFLS. Note the alternative identity icons available for European and American symbols. The pull down menu is a familiar process with the PIC menu the most used. Users need to pre-select the PIC type to be programmed and after design on screen File Save and then Program PIC. You can see from the program dialogue box the software converts the drawing into Assembler and then into binary, but do ensure you select the correct Comm Port or an error message will result. Future releases of the software will include other components which will dramatically enhance electronic design capability.

Example - Car Park Counter

This example shows a simple up /down counter in the context of a car park or contents counter.



Note the use of an 'in' and an 'out' input to the counter that has been preset to output after 20 'in' pulses. The reset pin has been connected to earth and the two outputs are the inverse of each other by using a NOT gate. Input 0 counts up and input 1 counts down

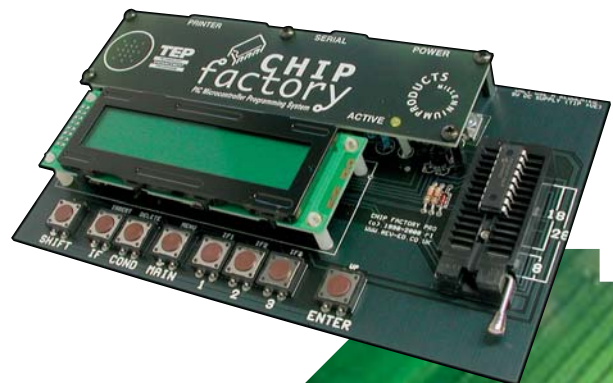
In Summary

The properties of individual logic gates are fixed but the additional components have a number of variables. The oscillator frequency is selected by holding the cursor over the circuit symbol and right clicking the mouse. Typing in a frequency in the highlighted box or selecting with the mouse provides a range from 0.1Hz up to 30.5 Hz. The frequency divider provides a divide by value between 2 and 255 and the counter triggered on the rising edge has allows you to select between 1 and 255 pulses before it becomes active. The timer symbol provides a little more variable selection with a time delay between 0.1seconds and 4.2seconds in 0.1 second increments. It can be triggered on the rising or falling edge and preselected to provide a pulse output or a delay. Input and output blocks are identical blocks and are designated by R/H click and labelled as particular input or output pins. The number of pins available as inputs or outputs is of course determined by the type of PIC selected.

This software is also supplied free with the Chipfactory when purchased complete. Schools are reminded that the software is provided for educational use only and may not be redistributed to other establishments without the prior permission of TEP. Rather like the availability of PICAXE this software can be used by pupils on their PC's at home as a design and development tool and circuits brought back into school on disc. We are looking forward to this approach of using design tools for electronic work being used in the same way students are using ProDesktop and can we can see a real growth in PIC based work as a result.

TEP will be pleased to hear from teachers with exemplar projects and programmes we can feature in future issues of News and Views. If you do not already have a TEP Chipfactory for programming using this software it is available from Teaching Resources using order code CH1001. As the software bypasses the Chipfactory firmware, users of any version of the Chipfactory do not have to upgrade to use this software.

We think you will agree this must be an essential addition as a desktop tool for design and build of digital circuits and coupled with the TEP Chipfactory represents an exciting leap forward for D&T.



CFLS software will be free to all TEP schools during summer term 2004 and will also be included free in future purchases of the TEP Chipfactory. Future release upgrades will be available on the TEP website.