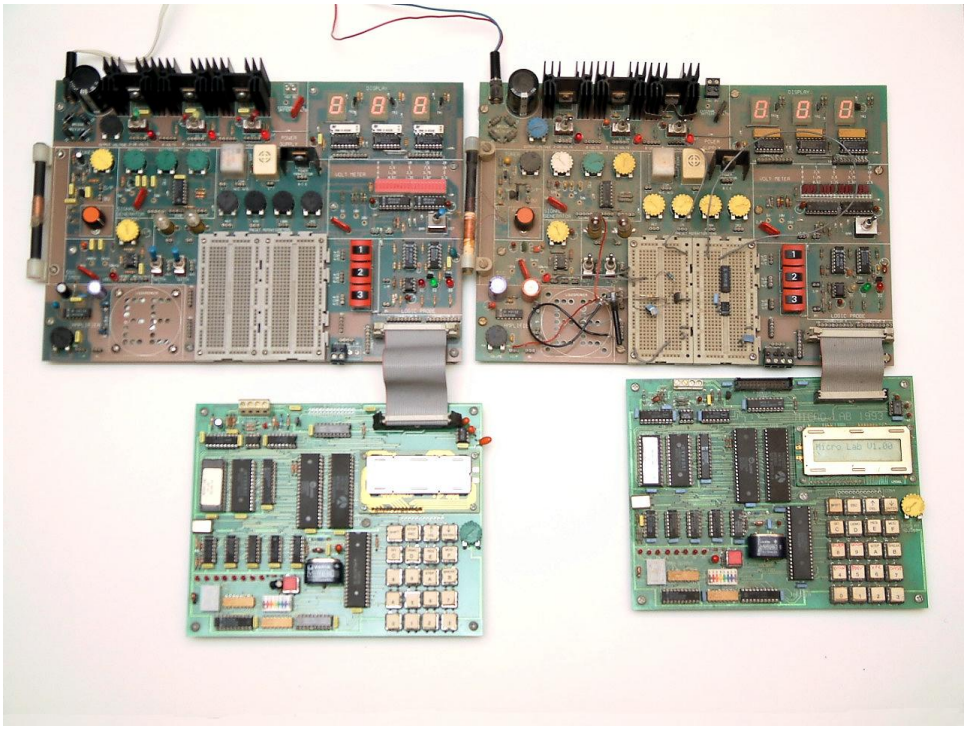
The Teach-In '93 Micro Lab – Project Notes

Hardware Design by Keith Dye B.Eng(Tech), AMIEE
Micro Lab Monitor & Software by Geoff MacDonald B.Sc(Hons), AMIEE



^^ 2014: together after all these years! Both my and Keith's Mini and Micro Lab prototypes as used in Teach-In 93. Keith's was rescued from his garage just in time, in the teeth of the 2013 floods. They were coaxed into action, but a tantalum cap on my Mini Lab exploded shortly after.

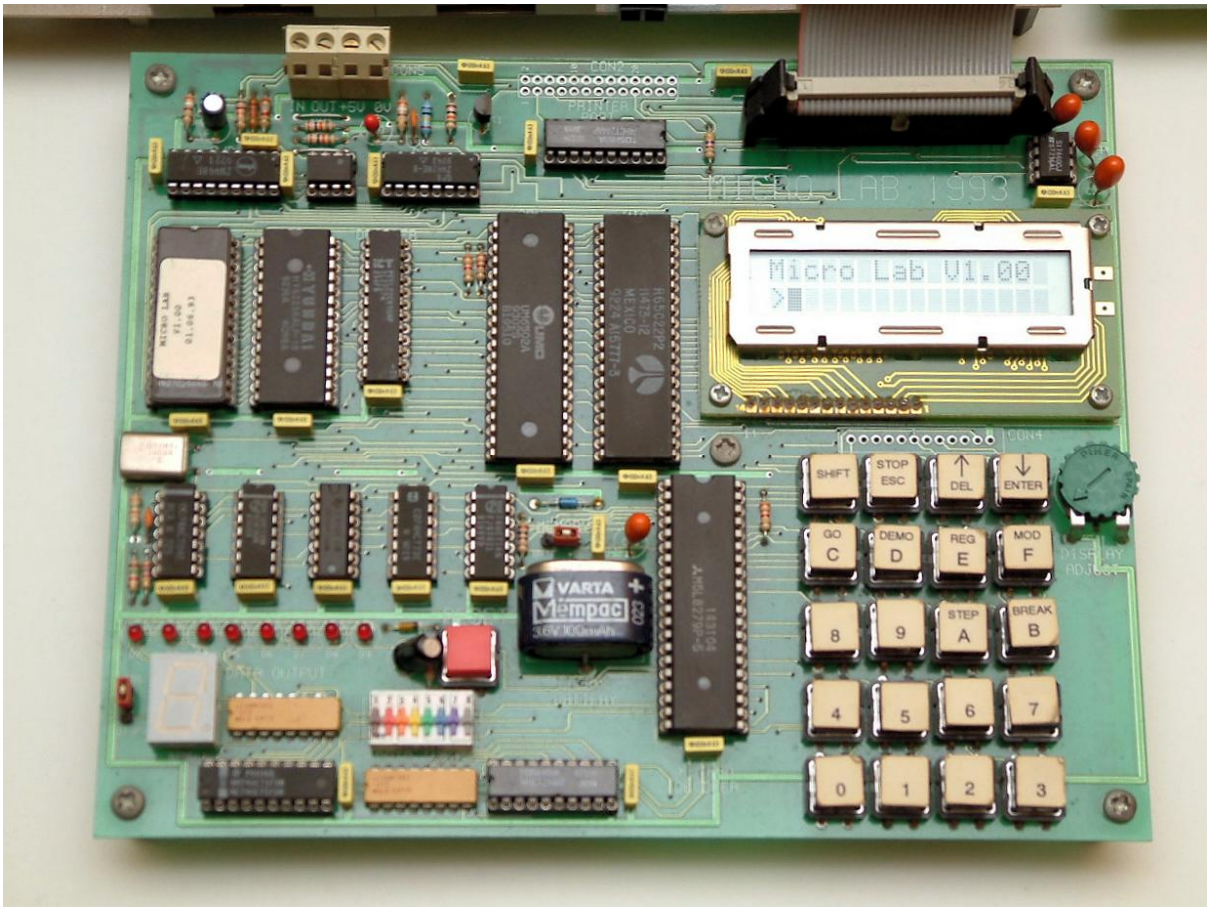
The latter parts of Teach-In '93 focussed on microprocessors for "A" Level students and a brilliant **Micro Lab** computer was designed by Keith Dye and Geoff MacDonald, whom I had met at the University of Hull when we worked together on an industrial project for HGVs.

The Micro Lab was a complete 6502-based microprocessor training and development unit designed by Keith and controlled by a custom monitor written by Geoff. It could be powered by the Mini Lab ribbon cable or separately from a 5V supply.

Teach-In 93 Micro Lab Specification:

- 8-bit 6502 processor
- 1MHz clock
- Custom 27C256 32Kb Micro Lab EPROM
- 256K low-power SRAM
- Custom 22CV10AP Programmable Array Logic (PAL) chip
- 32Kb EPROM
- 2 x 16 LCD display
- 7-segment LED and 8 data LEDs (contd.)

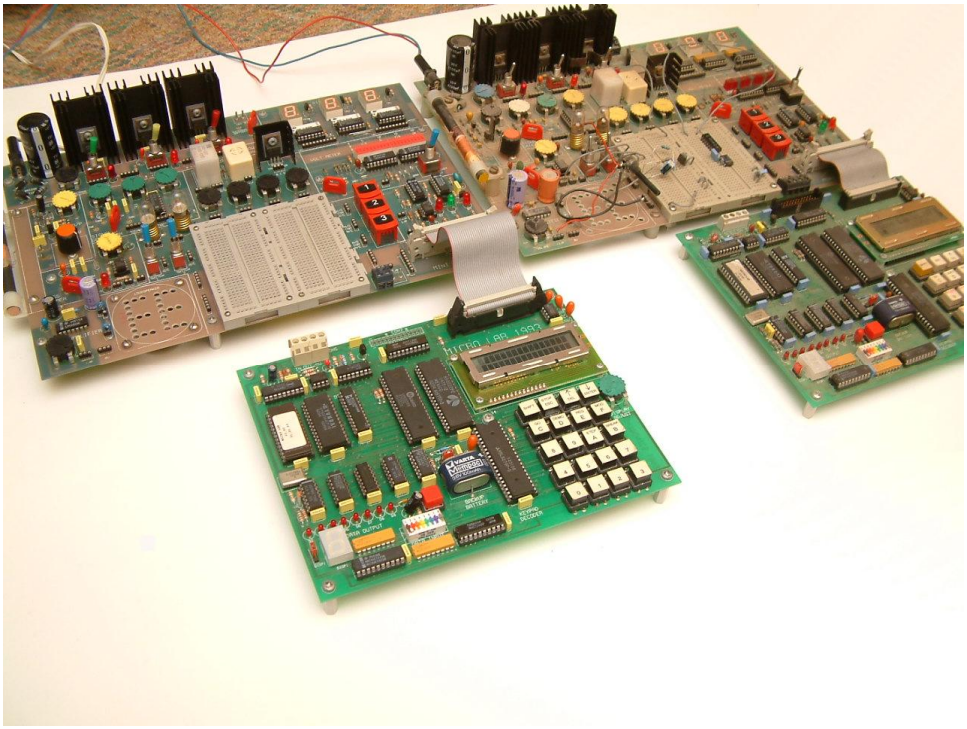
- 20-key pad, interrupt driven & Reset, and 8 DIP switch data inputs
- A/D and D/A ports (0 – 2.5V, accurate to 10mV) using Plessey ZN448 and ZN428
- I/O: 6522 VIA with 16 individually programmable I/O, 4 control lines, serial output and hardware pulse counting.
- Ni-cad backup battery
- 5V operation via Mini Lab ribbon cable or separate 5V supply



^^ My Teach-In 93 Micro Lab up and running, powered by my Mini Lab. The LCD could be backlit with an EL panel (via two pads on the right hand edge); the green control adjusted LCD contrast. Keith included a comprehensive Micro Lab manual and provided readers with laser-printed keycap legends.

The 1992 design was made to industry standards using solder resist and silk screen printing. I think Keith used the PADS CAD program at the time, on a 386 desktop PC. Cleverly designed and perfectly executed, the Micro Lab was on a par with anything that had appeared in the much more advanced *Practical Electronics* in former years. It was extremely well engineered on a double-sided board and if anything it was probably too good for Teach-In 93!

In my view, the Micro Lab probably spoiled our readership somewhat and the computer deserved a series of its own; I felt that the end result could have been better utilised rather than having just 2-3 parts of Teach-In 93 where it risked being wasted. However, it's what we offered when we pitched for the series, and the Teach-In series was extended to better accommodate the Micro Lab anyway. I recall asking Ed. (Mike) for more space because the Micro Lab was so good that just 1-2 parts of Teach-In would not do it justice.



Eventually I soldered together my own Micro Lab demo board and assembly was very straightforward. The keypad was going to be a bit difficult to implement as there was no way for us to produce custom keycaps. We offered a sheet of printed legends that could be stuck onto the keys, and I laminated mine with Scotch magic tape. Mine are still stuck on and legible 20+ years later. My Micro Lab worked first time and I was greeted by a boot message on the LCD, and I used it as the model for photographic purposes in a professional studio, with a red starburst design projected onto a rear screen (there was no digital photography yet). One image appeared on the July 1993 cover and a different version, with a blue neon grid background was used for the Teach-In No. 7 book.

The July 1993 cover of EPE – my Micro Lab was photographed in a professional photo studio, with a projector and transparencies being used to create the red starburst backdrop (hence the edge of the glass screen is visible under the July 1993 top bar.) A blue neon grid was also used, on the Teach-In No. 7 book. I reviewed the Mattel Barcode Battler shown on the cover too.

Keith and Geoff handled the entire rest of the series themselves and I had little involvement except to act as a guinea pig. Looking at it today (2014), my Mini and Micro Labs still work fine so I'm tempted to go through the series again and run some of those demos myself for old time's sake. I will probably learn a few things!

During this time Keith also demonstrated his PC and also a computer m-o-u-s-e. It was the first time I'd used a mouse and he showed me how to double-click in Windows 3.1. In late 1992, I bought my own PC, an Ambra Hurdla 486SX, and I used Windows 3.1 Paint to draw the ribbon cable IDC assembly for the Micro Lab (Fig.4) . It was my first computer graphic but the blocky bitmap was redrawn by the magazine artist anyway!

Intel Inside

Talking of computers, Teach-In 93 also saw the first appearance of the word "Pentium" covering Intel's new CPU that replaced the 486. So I duly made a late-breaking amendment to the text as the new name had just been published by Intel and this timely snippet of news would slot nicely into the Teach-In text. Unfortunately, due to a production typo it appeared as "Pentuim" [sic]. ☹

In 2013 Keith and I caught up with each other and he had found his old Micro Lab in his garage, gathering dust. It had narrowly escaped flood damage and he donated it to me along with his old Mini Lab (described separately). This is the first time that both our Mini and Micro Labs have been seen together and they both still worked.

I hope readers enjoyed looking back at one of the most exciting, hectic and rewarding parts of my journey with EPE.

Alan Winstanley November 2014