

QL Super buy

by Sid Martin and Timothy Green

The world's top QL team, Sid Martin and Timothy Green try out Supertrace from Stack Software

MANY programmers have put their best efforts into speeding up Sinclair SuperBASIC – but David Henderson, of Stack Software has worked out a neat way of slowing it down!

Supertrace is a utility that helps you trace through your SuperBASIC program as it runs. Each program line is listed in a window as it is executed, so you can see the exact sequence of instructions performed, as your program runs.

Line-tracing is not a new idea – many computers have 'trace' commands that print each new line-number as it is encountered.

A one-page routine to do this is listed in Andy Pennell's book *Assembly Language programming on the Sinclair QL* (Sunshine). There's a similar routine in Digital Precision's *Turbo Toolkit*, reviewed here in October.

Commands like TRON and TROFF control tracing on Microsoft BASIC systems like Dragons, MSXs, Tandy's, CP/M machines and IBMs.

These simple tracers only show the number of each new line, and they usually intermingle the numbers with program

output, which can soon become confusing.

Device independence

Supertrace lists the whole program line, and uses the 'device independence' of the QL to direct its output to any console window. You can even trace programs as they run on another computer, via the QL network.

There are three ways to control *Supertrace*. You can type commands to switch tracing on or off, or imbed the commands in your programs so that only a few routines are traced. Alternatively you can turn *Supertrace* on or off at any time by pressing control keys as the program runs. These keys are useful when you need to know where a program has got stuck.

You can pause the trace at any time by pressing CTRL-F5, as with a normal listing. There can be a preset delay between execution of one line and the next, or BASIC can wait for a key-press before starting on each new line.

Package

Supertrace costs £5, on micro-drive, and that's all you get: one

tape, mostly empty, holding 900-odd bytes of code, a four line BOOT program, and instructions in a three page Quill document.

Supertrace is easy to use – it only takes a minute or two to learn all its features. The documentation is a palatable mixture of instructions and advice, with short code fragments to make a back-up copy of the utility and set up both ends of a network link – in each case you only need enter two statements.

When loaded, *Supertrace* adds two commands to the normal SuperBASIC repertoire: TRACE and UNTRACE. These turn tracing on and off, and can be embedded in a program or typed as direct commands.

TRACE has two optional parameters, with the same significance as parameters of the standard SuperBASIC function INKEY\$.

First comes the channel number used for program output and control key input. By default *Supertrace* uses the command window, channel #0.

The second parameter is the delay between lines, in units of 'frame time'. One frame is the

time taken to transmit the entire screen display to the TV or monitor. It usually corresponds to the cycle-time of your AC mains supply, and will be one fiftieth or one sixtieth of a second, depending on the speed of your display. QLs in the USA use 1/60 second, but most others send 50 frames a second, so:

TRACE #3,75

will trace in window 3 with a one-and-a-half second delay between program lines, assuming you're using a UK model of the QL. You can cut this delay short by pressing any key, which causes the next line to appear.

The time '-1' has a special QL meaning, as with INKEY\$. It makes *Supertrace* wait indefinitely for a key, so tracing proceeds as you tap the keyboard, a line at a time.

Apart from a decrease in running speed, BASIC runs just as normal when *Supertrace* is turned on. UNTRACE turns *Supertrace* off, and is advisable before entering heavyweight commands like LOAD, SAVE and LIST.

How it works

Supertrace works by switching the QL's 68008 processor into a hardware 'trace mode', which traces machine-code instructions rather than BASIC. Trace mode is a major advantage of the 68008 family compared with earlier chips.

Normally a processor works its way through a stream of machine-code instructions in memory, stepping to each in turn. When trace mode is switched on, a diversion is set up. A routine at the address in location 36 in memory is called after each machine-code instruction in the current task is executed.

This slows things down a lot, as several instructions must be executed for each 'useful' one, but it means that machine-code can be checked or diverted at any point, even if it is in an unchangeable ROM chip.

Location 36 is itself in ROM, on the QL, but the operating system QDOS lets you link in your own 'trace' routine, via the system call `MT.TRAPV`. System calls – including time-critical network and drive access routines – are not affected by trace mode, but BASIC interpretation is.

Supertrace checks for keys and spits out lines as your program runs, but it does not use another task to do this. Instead it adds a routine to the 'scheduler list' – a list of routines processed by SuperBASIC whenever it thinks about swapping to another task.

The *Supertrace* routine in the list is fast and simple, although the code it controls is not. When the routine finds a control key it turns the processor's trace mode on or off.

When trace mode is on, *Supertrace* checks each instruction, looking for the characteristic code when a new line is started. Each new line is listed in the window as it is encountered.

There are six control keys – all combinations of a letter and the CTRL key.

Control T and U correspond directly to TRACE and UNTRACE, but can be typed while a program is running. Control A 'arrests' SuperBASIC, turning on *Supertrace* and waiting for a key at the start of the next line.

TRACE and Control T work instantly, but UNTRACE and Control U do not take effect till the new line is printed – so you may have to wait for an in-line FOR or REPEAT loop to finish, at a few per cent of normal speed, unless you get impatient and break in with CTRL-SPACE.

Control I and D increase and decrease the time delay between trace steps. The five pre-set delays range from instant to four seconds.

In action

The opening statement of a FOR and REPEAT loop is only traced once, when the loop starts – not at each iteration. The SuperBASIC interpreter doesn't need to look at the FOR or REPEAT part of the loop once it's underway, so *Supertrace* doesn't list it.

Furthermore, *Supertrace* does not display the first few lines when a procedure or function is called. It skips the DEFINE line, LOCALs and REMARKs – up to and including the first executable line of each definition.

In practice, you see the name and the actual parameters on the line that calls the routine, then the second line of the definition, discounting the DEFINE, LOCALs and REMARKs. A dummy statement like 'PRINT;' after LOCAL declarations will ensure that each executable line is traced.

The problem is that procedure and function headers are not scanned by the main loop in the SuperBASIC interpreter. *Supertrace* only intercepts the main loop, so it doesn't notice those lines.

Net Trace

TRACE works happily over the network to another QL or a CST Thor. Both machines must be using *SuperToolkit's* 'network file server', reviewed here in October.

Simple commands to set up both ends of the network link appear in the documentation. There's no need to load either *Supertrace* or the program you're testing on the tracing machine – it reads all it needs to know over the network.

Useful

It would be better still if *Supertrace* would display variable values continuously as a program runs; David Henderson is working on a new version that does this. The listing alone is still very useful when you want to know the exact sequence of code being interpreted.

Once you know the result of each test you get a good idea how your program is working. You can break in with CTRL-SPACE, check or change values, and restart as normal with RETRY or CONTINUE.

It's a pity the start of each definition is not traced, but even so *Supertrace* is a useful utility. At £5 it should soon defray its cost in saved time for most SuperBASIC programmers.

Contact

Stack Software, Great Wolford, Shipton on Stour, Warwickshire CV36 5NQ. (0608) 74369.

