

MASTER

512

*Technical Guide
Programs Disc*

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**DABS
PRESS**

Master 512 Technical Guide Programs Disc

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Introduction

This programs disc contains a number of useful items for Master 512 users who are programming their machine—a version of BBC BASIC, which includes an assembler, for those most familiar with that language, a full, extremely powerful assembler/debugger which provides a no-compromise development environment, and finally some demonstration assembler programs which are 512-specific.

As a bonus, Essential Software, developers of Master 512-specific product, have provided demonstrations of some of their programs.

Master 512 BBC BASIC

History of BBCBASIC(86)

Several versions of BASIC written for DOS machines will actually work on the 512 as some of you will know, however many people find these BASICs, often using the IBM BASICA syntax, a little foreign. However, a commercial version of BBC BASIC for DOS systems also exists. The product BBCBASIC(86) marketed by M-TEC Computer Services, The Market, Reepham, Norwich, Norfolk NR10 4JJ Tel: 0603 870620 and at the time of writing costs £79 plus £5 p&p plus VAT. It can also be obtained from many dealers including Dabs Press. Incidentally, the lack of a space between the words BBC and BASIC is simply a reflection of the filename used in CP/M and DOS for the program. However, most people use the term 'BBCBASIC' when referring to the CP/M and DOS versions of the language (although not the Cambridge Z88 version) and 'BBC BASIC' when referring to other versions (Acorn, Amiga, Macintosh etc.).

BBCBASIC(86) is a version of BBC BASIC 4 (the Master 128 version) which, although intended primarily for ordinary PCs, also works in the 512. The author of BBCBASIC(86) (the same Richard Russell who wrote BBCBASIC as packaged with the Acorn Z80) also wrote a version of the BBCBASIC especially for the Master 512, and this special version we have included on the programs disc is 'freeware', which means that we can distribute it and you can use it without charge. Dabs Press are very grateful to Richard Russell for permitting us to distribute his program.

NB: The program is not, however 'public domain'. Richard Russell retains full copyright, though you may freely use and distribute the programs.

In addition to that welcome fact, this version is customised for the 512, so unlike the PC version it need make no allowances for PC screen modes, but uses standard BBC micro screen modes including mode 7. This has two major advantages. Firstly there

is no need to alter the screen modes used in your existing programs if they are transferred from the BBC, and secondly 512 BBCBASIC performs screen output very much quicker than the PC version of the language (running on the 512 or even on a PC of comparable processor speed!).

Transferring programs

So well executed is the language that you'll find that many of your programs can be transferred to the 512 and they'll run without any changes required at all. However, there are some specific points to watch out for. In particular, in-line assembly is supported by 512 BBCBASIC, but of course for 80186 code, not 6502. Any BBC micro programs which include 6502 assembler, direct memory poking, or which rely on finding data in specified memory locations (such as the MOS variables) will need amendment before they can be transferred successfully to the 512. If you need to work in a block of memory, reference it with the DIM statement. If you need a short assembler routine, write it in 80186 assembler!

Transferring program files from the BBC Micro to the 512 is a two stage process. First, assuming that the program uses only legitimate BASIC facilities, the program must be moved to DOS Plus. No other preparation work is needed, existing tokenised BASIC programs are directly transferred as they stand. You should use the MOVE command (documented in the main Master512 Technical Guide) to do this. Having created a DOS file which contains the original BBC program you must then invoke the program FCONVERT, which is included with the package, to convert the tokenised BBC file into the format used by 512 BBCBASIC.

The FCONVERT program is a BASIC program and is run by typing 'BBCBASIC FCONVERT' at the DOS prompt, or, of course CHAIN "FCONVERT" from the BBCBASIC '>' prompt. The program asks you for the '6502 filename' which is the filename of the DOS file which you have just created with the MOVE command. It then prompts for a different filename under which to save the new corrected version of the program which can be run under the 512 version of BBCBASIC.

When this program has finished, the DOS or BASIC prompt will return. You can then CHAIN or otherwise run, or alternatively list and edit your corrected program.

Using BBCBASIC

The 512 BBCBASIC programs are all stored on the Programs Disc in the directory BBCBASIC. The following text assumes that you have the Programs Disc in your disc drive, and have selected the directory BBCBASIC. This is done with the command CD \BBCBASIC which is issued from the DOS Plus prompt.

There are two ways to run programs. You can either type 'BBCBASIC' on its own to enter the BBCBASIC shell. The familiar '>' prompt will appear and, with a few exceptions, operations are much the same as in the BBC Micro. Alternatively, you can type 'BBCBASIC progname' as a single DOS+ command. In this case when the

language is entered the named program is CHAINED immediately. Within BBCBASiC you can load and run programs much as in the BBC Micro, or can enter *QUIT' to exit BBCBASiC and return to the DOS Plus prompt.

In BBCBASiC LOAD, CHAIN and SAVE operate the same way as in the BBC micro except for filing system differences. All 512 BBCBASiC programs have a '.BBC' file extension which is reserved for BASIC programs, but can be omitted from commands like LOAD, CHAIN and SAVE. You can also run native DOS commands from within BBCBASiC, by preceding them with a *, much as you would to run machine code programs or to issue MOS or filing system commands in the BBC micro.

Discs can be catalogued by either '*CAT', when the display will show only .BBC files, or by '*DIR' which will show all files or specified extensions as required, using normal wild card matching. However, note that commands like *COPY, *INFO and so on will not work on DOS files, but will attempt to access native BBC disc formats.

Although the 'COPY' key is used as the ALT in the 512 in DOS Plus, when on the BASIC command line its function reverts to its usual purpose in BBCBASiC, so that both COPY and the cursor keys are used exactly as in the BBC micro to provide line editing facilities. Note that, just as in the BBC micro and unlike DOS, all commands (except *quit) must be entered in upper case, or the familiar 'Mistake' will appear.

Included on the disc are various ready-to-run demonstration programs. These can easily be identified by their .BBC file extension in DOS Plus, or simply by '*' within BBCBASiC. Included are graphics demonstrations, the PCW benchmarks and various sort routines, which may be loaded, listed and run.

Other Facilities

Two versions of the interpreter are provided on the disc. The smaller one should be considered the standard since it is more efficient and faster. It allows all programs transferred from the BBC Micro to work, since PAGE is at &400 and HIMEM at &10000, giving 64,512 bytes free for the program and BASIC's heap and stack.

There is however, another version, 'BIGBASiC', although less efficient than the smaller one, is useful if you need to write extremely large programs, or more probably, programs which need very large data areas. It utilises all the 512's available memory, with PAGE remaining at &400, but with HIMEM rising as high as &83640 in an expanded 512, providing 537,132 bytes of RAM for your code and its data.

Also present on the disc are two conversion programs 'CRUNCH' and 'UNLIST' which are used to produce run-only code. Such run only code includes all the necessary routines so that the program can be run as a normal 'EXE' file without needing a copy of BBCBASiC, but necessarily a run only module will be much larger than the original source program and will not execute any faster. Bearing this in mind, together with the fact that both CRUNCH and UNLIST render a program unlistable, there is little advantage for personal use in either of these. Nevertheless, this is a useful way of producing PC-compatible programs

There's also a utility to provide a facility to *DUMP a file, which not surprisingly produces output exactly like the BBC micro's own *DUMP command. This works either from the DOS command line or as *DUMP from within BBCBASIC.

The A86/D86 assembler/debugger package

A86 and D86 are two complementary programs which provide the writer of '86 series machine code programs with the necessary tools to produce *COM files for self contained programs, or .OBJ machine code files for linking into .EXE modules along with code produced by other languages. All the files which make up the system are contained the directory A86 on the Programs Disc.

The package was written by Eric Isaacson, who although not likely to be well known to users of the BBC Micro and the 512, was part of the original team that wrote the assembler for Intel, the manufacturers of the '86 series of processor chips. This alone is probably sufficient recommendation for the quality of the programs, but equally important to 512 users is that the entire package works excellently in the 512, with no known problems. (All Essential Software's .COM programs were assembled in A86 and debugged in D86.)

Both programs are available as shareware and you may freely distribute the package (so long as it is passed on in its entirety and exactly as issued), but those who become serious users should register by sending the appropriate fee (documented within the package) to the author in the United States.

Before you can use the package you will need to expand the files. They have been archived and compressed so as to save disc space, but the instructions for this are included on the disc as a text file which can be TYPED.

A86

A86 is the machine code assembler for the '86 series of processor and is notable for several reasons.

First it is extremely rapid in operation, despite of the fact that it assembles (source) from and (the output) to disc. Secondly it requires very little in the way of 'red-tape' or source program pre-amble, which certainly vastly increases its convenience over alternative assemblers. Finally, it is the only assembler which can be obtained (legally) on a 'try before you buy' basis and even for registered users it is very much less expensive than the alternatives from MicroSoft, Digital Research, Intel and so on. A complete A86 manual is included on the disc.

All the examples of machine code source included on the disc are written for immediate assembly in A86.

D86

D86 is the debugger ('machine code monitor' to 6502 assembler writers) for '86 series machine code. Such tools are invaluable for debugging '86 assembler programs

which typically are much larger and more complex than the 6502 equivalents you may be used to. Even while single stepping programs the degree of resilience and compatibility in the 512 is impressive, the only likely areas of difficulty being when single stepping through ROM BIOS routines.

Of the two packages (A86/D86) D86 is perhaps the more disappointing, which will be especially noticed by those used to the better quality 6502 machine code monitors available for the BBC micro. Most facilities are included, with on-screen help prompts, the ability to edit and display memory and so on, but (at least in the 512) there are some limitations.

It is impossible, for example to break into an endless loop in free run mode, and since there is no warm-boot in the 512 getting into such a situation means a complete system re-start. Equally it is not possible to set breakpoints based on memory contents, or more surprisingly, even on register contents and only two may be set at any time.

Grumbles apart, D86 is very easy to use and, by carefully avoiding its limitations, provides all you will need to test and debug your assembler programs. Like A86 it is fully documented on the disc and likewise the registration fee is very much less than most of the alternatives.

Example Source programs

The 512's DOS Plus 2.1 claims only compatibility for MS or PC-DOS 2.1 for interrupts 20h to 27h, but many others must be implemented for the machine to function.

The example source programs on the disc, contained in the EXAMPLES subdirectory, are ready for immediate assembly by A86 and show not only how 80186 assembler code programs are constructed, but also demonstrate how to call many of the functions which you must frequently use if you intend to write your own assembler code for the 512.

All the example source programs are copiously documented, with both a general description of the program's purpose at the beginning and a line by line commentary on what each instruction does within it. The examples fall into three groups.

The first and largest group shows how to call the general function dispatcher (INT 21h). As can be seen from the interrupt function lists in Appendices A through C in the Technical Guide, INT 21h provides all the standard facilities for both string and character input and output plus program control functions such as the various methods of terminating a program, plus memory management and system information like date and time. In other words, without an understanding of INT 21h you simply cannot write even the simplest machine code program in 80186 assembler code.

The second group expands on the techniques explored in the first group to show the power of 80186 machine code for performing such operations as moving and comparing areas of memory, repetitive loops, and the INT 21h functions for disc file handling including disc and directory management.

The final group is concerned with the specialised screen control provided by ROM BIOS calls (INT 10h). These techniques are needed to control positional screen output and effects like inverse and bold text, as well as simple but obscure operations such as clearing the screen.

Obviously, to use these programs, you will first need to unpack and prepare A86 for use, and then use it to create executable files.

Essential Software Demonstration programs

In the directory DEMOS you will find some demonstration versions of software available from Essential Software. This is a free bonus on the disc, and Dabs Press cannot advise on or support any of these programs. If you find any of them useful, you are invited to contact Essential Software to purchase a full version.

All the demonstration programs provided are restricted versions of Essential's software produced especially for the 512. In all cases there are some limitations in use and or function of the program, which varies with each particular program.

In the case of interactive programs, such as a mouse control program, limitations are applied to the time for which the program may be used, while for programs which respond immediately to the pressing of hot-keys, such as printing the screen's contents, the number of times the program may be activated is limited, ie, when you have used the demonstration the preset number of times, it will cease to function. This does not make the disc faulty - it is deliberate, to encourage you to buy the full version.

In addition, where programs are normally included in a package to allow user configuration, such as hot-key selection or the setting of mouse sensitivity these programs have not been provided. Finally, although all the programs will normally happily co-exist in the machine simultaneously, most of the demonstration versions are amended so that loading any one will remove any other. You are cautioned to read the notes in the disc text files accompanying each program very carefully as these will offer guidance on individual programs.

The purpose of these demonstrations is therefore not to provide you with free copies of working software, but rather to demonstrate that the suppliers of the software do have the expertise to provide otherwise non-existent (in the 512 at least) user facilities.



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