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BASIC still remains the number one computer language. Although it may not be as grammatical and efficient as other languages (such as COMAL or PASCAL), its popularity shows that it meets the essential requirements of computer users all over the world. Thanks to Microsoft, who developed an excellent version of BASIC for the KIM computer some time ago, the Junior Computer can now be made bilingual, its 'mother tongue' being machine language of course. Even with the addition of a BASIC vocabulary, machine language still plays an important role in various routines and timing processes etc., so there is no question

BASIC on the Junior Computer

... puts the microprocessor in touch with the world

Although the Junior Computer is quite fluent in machine language, its linguistic skills cannot lead to full 'adult' communication until the machine has learned a 'high level' language, such as BASIC. A specially adapted version of BASIC is now available on cassette from the Microsoft/Johnson Computer Corporation, which will enable Junior Computer operators to fulfil their dreams at long last.

This article introduces the Microsoft cassette and describes how to implement the new facility on the Junior Computer. Anyone who feels that their BASIC has become rather 'rusty' will welcome the opportunity to brush up their knowledge. As for beginners, it is never too late to learn!

> of it being completely replaced. The KB-9 BASIC by Microsoft is a nine digit 8k BASIC on cassette. Since this was originally developed for the KIM, it will have to be modified before it will run on the Junior Computer. Contrary to what might be expected, this is a straightforward operation that takes a mere fifteen minutes or so. This is nothing compared to the thousands of man-hours involved in developing the Microsoft BASIC. Only 31 of the eight thousand memory locations need to have their contents altered. Now to discover what ingredients are required to 'cook up' a BASIC on the Junior Computer.

The ingredients

First of all, what about the hardware? Obviously, the computer will have to be a fully extended version, that is, equipped with an interface board and extended memory. How this is accomplished is fully described in Junior Computer Book 3. In addition, 16 k of RAM has to be located in the address range \$2000...\$5FFF. This can be made up from two RAM/EPROM cards each containing 8 k of RAM, or the 16 k dynamic RAM card which is described elsewhere in the present issue.

Although the extensions were fully described in Book 3, it may be an idea to briefly recap on a few main points here, as this is really a very basic part of the BASIC facility! The extra bus board memory should also contain the three jump vectors situated in the address range \$FFFA...\$FFFF. Appendix 3 in Book 3 mentions two ways in which to include these vectors without the need for an expensive RAM/EPROM card. This issue of Elektor also describes a mini EPROM card which provides yet another option.

As far as the software requirements are concerned, both the printer monitor (PM) and the tape monitor (TM) routines must be available. The former contains the input/output subroutines RECCHA (\$12AE), PRCHA (\$1334) and RESTTY (\$14BC) which serve to start the Junior Computer BASIC. The latter contains the main cassette routines DUMP (\$Ø9DF) and RDTAPE (\$ØBØ2). Then, of course, the KB-9 BASIC cassette (not KB-6 nor KB-8!!) will have to be acquired, together with all the necessary documentation. Other requirements include a cassette recorder, an ASCII keyboard, a printer and/or a video display terminal and an understanding of programming in the BASIC language. Anyone who wishes to brush up on their BASIC knowledge should read the crash course published in the March . . . June 1979 issues of Elektor or SC/MP Book 2.

The recipe

 Switch on the Junior Computer and start up the PM routine. Place the KB-9 cassette in the tape recorder: RST 1 Ø Ø Ø GO RES
C1 (CB)

G1 (CR)

• Start the recorder in the play mode at the beginning of the tape. The program number (ID) of KB-9 is Ø1. Reading in the instructions etc. takes several minutes, after which the computer reports 'READY'. Remove the cassette from the recorder as it is advisable to store the Junior BASIC on a separate cassette and preserve the KB-9 version in its original form.

• Using the PM routine, alter the contents of 31 memory locations, as indicated in the first section of the accompanying table. Start by checking the 'old' data at the locations concerned. Any discrepancies will mean that you have been landed with the wrong version of BASIC!

 Place a new cassette in the recorder. Start at the beginning, reset the counter and depress the record and play buttons. After about ten seconds enter:

B1, 2000, 4261 (CR)

t only takes a matter of minutes for the lunior BASIC to be recorded. The program number will now be B1.

- As soon as the Junior BASIC is stored on cassette, the message READY' will appear on the printer or he video screen. Let the tape continue or a further ten seconds before depressing the stop key.
- 18 locations on page 1A (PIA RAM) need to be loaded with six LOAD nd SAVE instructions. The address rea concerned is \$1AØØ...\$1A11; the letails of the contents of these locations an be found in the second half of the able. This data is given the program number B2 and is again stored on assette.
- Depress the record and play keys once more and enter:

SB2, 1AØØ, 1A12 (CR).

After the 'READY' message, the cassette recorder can be stopped. Now it is time to check whether the lunior BASIC is correctly stored in nemory. This can be done with the aid of the 'question and answer' game ollowing the BASIC start address \$4065). It is always a good idea to enter a test program. The cassette commands can be verified by writing a BASIC program, storing it on cassette SAVE), erasing the program area (NEW) and then reading the program in again rom cassette (LOAD). Once the Junior BASIC has met with approval, the same procedure can be used to test the Junior BASIC cassette. For this, the Junior Computer is switched off for a while and then on again, after which the two programs (B1 and B2) are loaded from cassette.

Ready to serve

By now the operator is all set to dish up the Junior Computer BASIC. Do not forget to read the manual supplied with the cassette. This consists of the 'Microsoft Introduction', 'Dictionary' and



The KB-9 to Junior BASIC conversion table (based on the KB-9 cassette, # 4065 © 1977 by Microsoft Co.; version V1.1).

1. The interpreter

а.	ID = B1 instead of Q	01.	
b.	1. Address \$2457	should contain AE	instead of 5A;
	2. Address \$2458	should contain 12	instead of 1E;
	3. Address \$26DD	should contain 80	instead of 40;
	4. Address \$26DE	should contain 1A	instead of 17;
	5. Address \$2746	should contain 79	instead of F9;
	6. Address \$2747	should contain 1A	instead of 17;
	7. Address \$274D	should contain 70	instead of F5,
	8. Address \$274E	should contain 1A	instead of 17;
	9. Address \$2750	should contain 71	instead of F6,
	10. Address \$2751	should contain 1A	instead of 17;
	11. Address \$2757	should contain 72	instead of F7;
	12. Address \$2758	should contain 1A	instead of 17;
	13. Address \$275A	should contain 73	instead of F8;
	14. Address \$275B	should contain 1A	instead of 17;
	15. Address \$275E	should contain 1A	instead of 18,
	16. Address \$2791	should contain 70	instead of F5;
	17. Address \$2792	should contain 1A	instead of 17;
	18. Address \$2794	should contain 71	instead of F6;
	19. Address \$2795	should contain 1A	instead of 17;
	20. Address \$2799	should contain 79	instead of F9;
	21. Address \$279A	should contain 1A	instead of 17;
	22. Address \$27A4	should contain Ø9	instead of 73;
	23. Address \$27A5	should contain 1A	instead of 18;
	24. Address \$27B9	should contain FA	instead of ED
	25. Address \$27BA	should contain ØØ	instead of 17;
	26. Address \$27BC	should contain FB	instead of EE
	27. Address \$27BD	should contain ØØ	instead of 17,
	28. Address \$2A52	should contain 34	instead of AØ
	29. Address \$2A53	should contain 13	instead of 1E;
	30. Address \$2AE6	should contain AE	instead of 5A
	21 Address \$2AE7	chould contain 12	instead of 1F

- 2. Additional instructions on page 1A a. ID = B2.
- b. 1. Address \$1A00 contains 20; 2. Address \$1AØ1 contains DF; 3. Address \$1AØ2 contains Ø9, 4. Address \$1AØ3 contains 2Ø; 5. Address \$1AØ4 contains BC; 6. Address \$1AØ5 contains 14, 7. Address \$1AØ6 contains 4C; 8. Address \$1AØ7 contains 48; 9. Address \$1AØ8 contains 23; 10. Address \$1AØ9 contains 20; 11. Address \$1AØA contains Ø2; 12. Address \$1AØB contains ØB; 13. Address \$1AØC contains 20; 14. Address \$1AØD contains BC, 15. Address \$1AØE contains 14; 16. Address \$1AØF contains 4C; 17. Address \$1A10 contains A6; 18. Address \$1A11 contains 27.

'Usage Notes'. Although the contents are rather concise, to the point of being cryptic, all the necessary information is provided. As far as the software is concerned, only one or two actual addresses are mentioned.

The following remarks, however, should make things a bit clearer:

- 1) After entering:
 - RST 1 Ø Ø Ø GO RES (RUBOUT) GB1 (CR)

READY (depress stop key)

GB2 (CR) (depress stop key again) READY

the Junior BASIC can now be started. A cold start entry takes place at address \$4065.

4065 (SP)R

The program must be started by way of PM and not by way of the original monitor routine, as otherwise the input/output parameters will be incorrectly defined. In any case, PM is indispensable for reading in data. The Junior BASIC utilises the following memory range on page zero:

\$0000....\$00DC and \$00FF. Thus one of the locations (MODE) belonging to the original monitor is used. This merely serves to start PM.

3) The start address for a warm start entry is \$0000. In the KIM the warm start entry allows the computer to return to BASIC after writing or reading a BASIC program to or from cassette. In the case of the Junior Computer things are slightly different (see point 9). Here, the warm start entry may be used to return to BASIC from PM. The jump from BASIC to PM occurs either as a result of a non-maskable interrupt (NMI) or because the BREAK key on the ASCII keyboard was depressed. The BRK jump vector points to the label LABJUN (\$105F) of the PM routine. After printing the text 'JUNIOR', the computer jumps to the central label RESALL of PM (see Book 4 chapter 14). In the event of an NMI, RESALL is reached at the end of the STEP initialisation routine (\$14CF).

4) The ST key may be used during PM to examine the contents of various memory locations, such as the ones on page zero (see point 2) for instance. A warm start entry heralds the return to the BASIC program.

5) Supposing the operator is executing a

BASIC program (RUN) making use of the Elekterminal (up to 16 lines on the display) and the BASIC program turns out to contain more than 16 lines. This is what should be done:

RUN (CR)

BRK (while 16th line is being printed) examine result

(SP) R The computer prints

OK Start the program again: RUN (CR) enter the 16th and following 14 lines, etc.

6) When starting the Junior BASIC by way of a cold start entry, the operator will be requested to state the 'TERMINAL WIDTH'. If the Elekterminal is being used, this is set at 64 (CR).

7) The ASCII keyboard does not provide a '1' nor a '1' key necessary for power functions, where A¹4 corresponds to A⁴. What is required is an ASCII key which generates the code \$5E. This can be improvised by sacrificing another key. One contact is connected to row x7 and the other to column y9 in the keyboard matrix (pins 32 and 22 of IC1). Only two keys are suitable: the 'PAGE[†]' key at the far right in the top row and the 'ESC' key at the far left in the second row. The latter affords the most elegant solution, as the ESC function is preserved (a matter of combining it with the Shift key). Interrupt the two connections x5 and Y10 (without actually cutting the wires!) and link the ESC key to pins 22 and 32 of IC1. Further details are provided in the article concerning the ASCII keyboard (Elektor November 1978), in

Book 3 of the Junior Computer series and in SC/MP Book 2.

8) In order to start the Junior BASIC by way of a fresh cold start entry during a computer session, the program (file B1) will have to be loaded from cassette all over again. This is necessary as a relatively large section of data block B1 is reserved as the first section of the BASIC work area if any trigonometric functions are required. After the cold start entry, the computer will request the operator to specify its task. Whether trig functions are to performed or not, the computer must be informed by way of a cold start entry, (once B1 has been loaded again).

N.B. In file B1 (\$2000...\$4260), locations \$4041...\$4260 are added to the user work space if the operator wishes to utilise the trigonometric functions (depress the Y key); locations \$3F1F...\$4260 are added to the user work space if the trig functions are not required (N key); locations \$3FD3...\$4260 are added if the ATN function (A key) is cancelled.

The first memory location is loaded with $\emptyset\emptyset$ (BOF: Beginning Of File). Now that 16k of RAM has been added, the user work space will cover the following ranges:

\$4042...\$5FFF (8126 bytes) when Y is depressed;

\$3F2Ø...\$5FFF (8416 bytes) when N is depressed;

and \$3FD4...\$5FFF (8236 bytes) when A is depressed.

9) Thanks to the Junior Computer subroutine system, reading and writing BASIC programs to and from cassette (SAVE and LOAD) is much easier than with the KIM BASIC. The only snag is that this occupies the second file, B2. After SAVE has been entered, the BASIC program is stored on tape (where ID = FE). After a while, the 'OK' message will appear followed by an empty line. After LOAD (CR) is entered, a BASIC program is read from tape (where ID = FF, so make sure the required BASIC program is stored before this!). A little later 'LOADED' is printed. This is not followed by the message OK and the computer does not start a new line. In other words, the video screen will display 'LOADEDLIST' if the entered program is to be checked.

Any questions?

Here are the answers to one or two questions which are likely to be asked: 1) Elektor cannot comply with requests

the Microsoft/Johnson BASIC cassette as this would be an infringement of copyright.

 The source listing of the KB-9 costs a few thousand dollars. Not surprisingly, Elektor is not in a position to sell it to readers.

 3) The KB-9 BASIC cassette should be available from Calist Computers Ltd.
119 John Bright Street Birmingham
B1 1BE Tel. 021/63 26 458.



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