README file for

Bywater BASIC Interpreter, version 3.20

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for bwBASIC version 2.10, 11 October 1993

Version 2.20 modifications by Jon B. Volkoff,

25 November 1995

Patch level 1 release by Jon B. Volkoff,

15 March 1996

Patch level 2 release by Jon B. Volkoff,

11 October 1997

Version 2.30 modifications by Paul Edwards,

5 March 2008

Version 2.40 modifications by Paul Edwards,

26 Jan 2009

Version 2.50 modifications by Paul Edwards,

4 June 2009

Version 2.60 modifications by Paul Edwards,

6 November 2012

Version 2.61 modifications by Paul Edwards,

4 August 2014

Version 3.00 modifications by Howard Wulf, AF5NE

12 May 2015

Version 3.10 modifications by Howard Wulf, AF5NE

27 July 2016

Version 3.20 modifications by Howard Wulf, AF5NE

4 June 2017

DESCRIPTION:

The Bywater BASIC Interpreter (bwBASIC) implements a large

superset of the ANSI Standard for Minimal BASIC (X3.60-1978),

a significant subset of the ANSI Standard for Full BASIC

(X3.113-1987), and many classic BASIC dialects in C. bwBASIC

seeks to be as portable as possible.

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A separate license is available for commercial distribution,

for information on which you should contact the author.

OBTAINING THE SOURCE CODE:

The source code for bwBASIC is available from

http://bwbasic.sourceforge.net

COMMUNICATIONS:

email: tcamp@delphi.com (for Ted Campbell)

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A LIST OF BASIC COMMANDS AND FUNCTIONS IMPLEMENTED in bwBASIC:

The complete list of over 500 commands, functions and operators is

in the file "ALL.txt" in the DOCS directory. Documentation for each

dialect is also in the DOCS directory. Be aware that the commands,

functions and operators available depend upon the particular BASIC

dialect selected using the OPTION VERSION command.

CHANGE HISTORY

CHANGES FROM 3.10 to 3.20

\* Implements most of the following BASIC dialects:

OPTION VERSION "BYWATER" ' Bywater BASIC 3

OPTION VERSION "BYWATER-2" ' Bywater BASIC 2

OPTION VERSION "CALL/360" ' SBC CALL/360 Mainframe BASIC

OPTION VERSION "CBASIC-II" ' CBASIC-II for CP/M

OPTION VERSION "DARTMOUTH" ' Dartmouth DTSS BASIC

OPTION VERSION "ECMA-55" ' ANSI Minimal BASIC

OPTION VERSION "ECMA-116" ' ANSI Full BASIC

OPTION VERSION "GCOS" ' GE 600 Mainframe BASIC

OPTION VERSION "HAARDT" ' bas 2.4 by Michael Haardt

OPTION VERSION "HANDBOOK1" ' The BASIC Handbook, 1st Edition

OPTION VERSION "HANDBOOK2" ' The BASIC Handbook, 2nd Edition

OPTION VERSION "HEATH" ' Heath Benton Harbor BASIC

OPTION VERSION "MARK-I" ' GE 265 Mainframe BASIC

OPTION VERSION "MARK-II" ' GE 435 Mainframe BASIC

OPTION VERSION "MBASIC" ' Microsoft BASIC-80 for Xenix

OPTION VERSION "PDP-8" ' DEC PDP-8 BASIC

OPTION VERSION "PDP-11" ' DEC PDP-11 BASIC

OPTION VERSION "RBASIC" ' Micronics RBASIC for 6809 FLEX

OPTION VERSION "RSTS-11" ' DEC RSTS-11 BASIC-PLUS

OPTION VERSION "SYSTEM/360" ' IBM System/360 Mainframe BASIC

OPTION VERSION "SYSTEM/370" ' IBM System/370 Mainframe BASIC

OPTION VERSION "TRS-80" ' TRS-80 Model I/III/4 LBASIC

OPTION VERSION "VINTAGE" ' Vintage BASIC 1.0.1

OPTION VERSION "XBASIC" ' TSC XBASIC for 6800 FLEX

\* CONST variable [, ...] = value

Assigns the value to variable.

Any later assignment to the variable causus a VARIABLE NOT DECLARED error.

\* DIM now supports lower and upper bounds.

OPTION BASE 1

DIM X( 9 ) ' lower bound is 1

DIM Y( 5 TO 9 ) ' lower bound is 5

\* DIM now supports virtual variables.

OPTION BASE 1

OPEN "VIRTUAL.DAT" FOR VIRTUAL AS # 3 ' virtual data file

DIM # 3, A( 1000 ) ' array is virtual

LET A( 1000 ) = 0 ' value is written to the file

LET X = A( 1000 ) ' value is read from the file

CLOSE # 3 ' array is no longer valid

\* ERROR 27, "Bad DATA"

Occurs when the READ command detects garbage in a DATA command.

\* INPUT LINE

Same as LINE INPUT.

\* MAT now supports lower and upper bounds.

OPTION BASE 1

MAT X( 9 ) = ZER ' lower bound is 1

MAT Y( 5 TO 9 ) = ZER ' lower bound is 5

MAT X = ZER( 9 ) ' lower bound is 1

MAT Y - ZER( 5 TO 9 ) ' lower bound is 5

\* MAXLEN()

Returns the maximum string length.

\* OPTION DIGITS integer

Sets the number of significant digits for PRINT.

Setting the value to zero restores the default.

\* OPTION EDIT string$

Sets the program name used by the EDIT command.

Setting this to "" disables EDIT command.

\* OPTION FILES string$

Sets the program name used by the FILES command.

Setting this to "" disables FILES command.

\* OPTION PROMPT string$

Sets the prompt.

\* OPTION PUNCT AT char$

Sets the PRINT AT character, commonly "@".

Setting this to "" disables PRINT AT.

Setting this to a non-punctuation character is not supported.

\* OPTION PUNCT BYTE char$

Sets the BYTE type suffix, commonly "~".

Setting this to "" disables BYTE suffix.

Setting this to a non-punctuation character is not supported.

\* OPTION PUNCT COMMENT char$

Sets the trailing COMMENT character, commonly "'".

Setting this to "" disables trailing comments.

Setting this to a non-punctuation character is not supported.

\* OPTION PUNCT CURRENCY char$

Sets the CURRENCY type suffix, commonly "@".

Setting this to "" disables CURRENCY suffix.

Setting this to a non-punctuation character is not supported.

\* OPTION PUNCT DOUBLE char$

Sets the DOUBLE type suffix, commonly "#".

Setting this to "" disables DOUBLE suffix.

Setting this to a non-punctuation character is not supported.

\* OPTION PUNCT FILENUM char$

Sets the FILE NUMBER prefix, commonly "#".

Setting this to "" disables the FILE NUMBER prefix.

Setting this to a non-punctuation character is not supported.

\* OPTION PUNCT IMAGE char$

Sets the shortcut IMAGE character, commonly ":".

Setting this to "" disables the shortcut IMAGE character.

Setting this to a non-punctuation character is not supported.

\* OPTION PUNCT INPUT char$

Sets the shortcut INPUT character, commonly "!".

Setting this to "" disables the shortcut INPUT character.

Setting this to a non-punctuation character is not supported.

\* OPTION PUNCT INTEGER char$

Sets the INTEGER type suffix, commonly "%".

Setting this to "" disables INTEGER suffix.

Setting this to a non-punctuation character is not supported.

\* OPTION PUNCT LONG char$

Sets the LONG type suffix, commonly "&".

Setting this to "" disables LONG suffix.

Setting this to a non-punctuation character is not supported.

\* OPTION PUNCT LPAREN char$

Sets the LEFT PARENTHESIS character, commonly "(".

Setting this to a non-punctuation character is not supported.

\* OPTION PUNCT PRINT char$

Sets the shortcut PRINT character, commonly "?".

Setting this to "" disables the shortcut PRINT character.

Setting this to a non-punctuation character is not supported.

\* OPTION PUNCT QUOTE char$

Sets the QUOTE character, commonly """".

Setting this to a non-punctuation character is not supported.

\* OPTION PUNCT RPAREN char$

Sets the RIGHT PARENTHESIS character, commonly ")".

Setting this to a non-punctuation character is not supported.

\* OPTION PUNCT SINGLE char$

Sets the SINGLE type suffix, commonly "!".

Setting this to "" disables SINGLE suffix.

Setting this to a non-punctuation character is not supported.

\* OPTION PUNCT STATEMENT char$

Sets the shortcut STATEMENT seperator character, commonly ":".

Setting this to "" disables the STATEMENT seperator.

Setting this to a non-punctuation character is not supported.

\* OPTION PUNCT STRING char$

Sets the STRING type suffix, commonly "$".

Setting this to "" disables STRING suffix.

Setting this to a non-punctuation character is not supported.

\* OPTION RECLEN integer

Sets the default record length for RANDOM files, commonly 128.

Setting thisto zero means there is no default RANDOM record

length, so the record length must be specified in the OPEN

statement.

With OPTION RECLEN 128:

OPEN "FILE.DAT" FOR RANDOM AS #3

is considered to be the same as

OPEN "FILE.DAT" FOR RANDOM AS #3 LEN 128

With OPTION RECLEN 0:

OPEN "FILE.DAT" FOR RANDOM AS #3

causes an error.

\* OPTION RENUM string$

Sets the program name used by the RENUM command.

Setting this to "" disables RENUM command.

\* OPTION SCALE integer

Sets the number of digits to round after the decimal point for PRINT.

Setting the value to zero disables rounding.

\* OPTION USING DIGIT

\* OPTION USING COMMA

\* OPTION USING PERIOD

\* OPTION USING PLUS

\* OPTION USING MINUS

\* OPTION USING EXRAD

\* OPTION USING DOLLAR

\* OPTION USING FILLER

\* OPTION USING LITERAL

\* OPTION USING FIRST

\* OPTION USING ALL

\* OPTION USING LENGTH

Sets the characters recognized by PRINT USING.

Setting these to a non-punctuation character is not supported.

\* OPTION VERSION now requires a string instead of a literal.

Some version names have changed.

\* OPTION VERSION "PDP-8"

Added LPT, PTP, PTR, TTY, TTY IN and TTY OUT commands.

Added GET() and PUT() functions.

\* OPTION VERSION "CALL/360"

\* OPTION VERSION "SYSTEM/360"

\* OPTION VERSION "SYSTEM/370"

Added alphabet extenders. $ is a string variable.

\* OPTION ZONE integer

Sets the PRINT zone width.

Setting the value to zero restores the default.

\* REPEAT - UNTIL added

REPEAT

...

EXIT REPEAT

...

UNTIL expression ' exits when expression != 0

\* SPC( X ) and TAB( X )

No longer use control codes.

\* UNTIL - UEND removed (to add REPEAT - UNTIL)

Here is a work-around for existin code using UNTIL-UEND:

UNITL expression -->> WHILE NOT expression

... ...

EXIT UNTIL -->> EXIT WHILE

... ...

UEND -->> WEND

\* from Howard Wulf, AF5NE

CHANGES FROM 3.00 to 3.10

\* Implements most of the following BASIC dialects:

OPTION VERSION DARTMOUTH ' Dartmouth DTSS BASIC

OPTION VERSION MARK-I ' GE 265 Mainframe BASIC

OPTION VERSION MARK-II ' GE 435 Mainframe BASIC

OPTION VERSION SYSTEM-360 ' IBM System/360 BASIC

OPTION VERSION SYSTEM-370 ' IBM System/370 BASIC

OPTION VERSION CBASIC-II ' CBASIC-II for CP/M

OPTION VERSION ECMA-55 ' ANSI Minimal BASIC

OPTION VERSION HANDBOOK1 ' The BASIC Handbook, 1st Edition

OPTION VERSION HANDBOOK2 ' The BASIC Handbook, 2nd Edition

OPTION VERSION TRS-80 ' TRS-80 Model I/III/4 LBASIC

OPTION VERSION BASIC-80 ' Microsoft BASIC-80 for Xenix

OPTION VERSION ECMA-116 ' ANSI Full BASIC

\* from Howard Wulf, AF5NE

CHANGES FROM 2.61 to 3.00

\* Code redesign from Howard Wulf, AF5NE

CHANGES FROM 2.60 to 2.61

\* Bug fix from Matthias Rustler

CHANGES FROM 2.50 to 2.60

\* New maths functions and append mode support from Edmond Orignac

\* Bug fixes

CHANGES FROM 2.40 to 2.50

\* Bug fixes

\* New compilation procedure for MVS and CMS

CHANGES FROM 2.30 to 2.40

\* Bug fixes from Bill Chatfield

\* Updated documentation

\* Added support for compiling on CMS (another IBM mainframe OS)

CHANGES FROM 2.20pl2 to 2.30

\* Minor bug fixes, cosmetic improvements and portability improvements

\* Added support for compiling on MVS (IBM mainframe)

CHANGES FROM 2.20pl1 to 2.20pl2

bwb\_cmd.c

Fixed calling stack level logic in RETURN statement to prevent erroneous

"RETURN without GOSUB" messages.

bwb\_cnd.c

bwb\_stc.c

Changed continuation condition for WHILE, ELSEIF, and LOOP UNTIL

to be != FALSE, not == TRUE. More in line with common commercial

BASIC implementations.

bwb\_mth.c

Fixed initialization in VAL function so that old results are not later

returned as values.

bwb\_var.c

Added parenthesis level checking to dim\_getparams. Using multi-level

expressions as array subscripts was causing the program to bomb.

bwx\_iqc.c

bwx\_tty.c

bwb\_mes.h

Added second copyright notice.

bwb\_dio.c

bwb\_str.c

Added support for strings longer than 255 characters.

bwb\_prn.c

Disabled tab expansion and print width checks when not printing to a file.

bwb\_inp.c

Fixed LINE INPUT file reads to accommodate strings of length MAXSTRINGSIZE.

bwx\_ncu.h

bwx\_ncu.c

New files. Code for UNIX ncurses interface, compliments of L.C. Benschop,

Eindhoven, The Netherlands.

Makefile.ncu

New files. Sample makefile for ncurses implementation.

bwbasic.h

Revised defines for MININTSIZE and MAXINTSIZE from 16-bit to 32-bit limits.

Revised define for MAXSTRINGSIZE from 255 to 5000 characters.

Changed string length from unsigned char to unsigned int to support strings

longer than 255 characters.

Added support for new ncurses package.

Revised VERSION define to reflect above changes.

CHANGES FROM 2.20 to 2.20pl1

bwb\_cnd.c

Moved init routine for bwb\_while so that it would be initialized regardless

of expression value, not just if TRUE. This was causing some segmentation

faults in WHILE-WEND loops.

bwb\_elx.c

Plugged gaping memory leak. Temp variable space for expression evaluation

was being allocated but not freed when done (oops!).

bwb\_fnc.c

Added check for NULL return from getenv to prevent segmentation faults.

bwbasic.h

Revised VERSION define to reflect above changes.

CHANGES FROM 2.10 to 2.20:

\* Plugged numerous memory leaks, resolved memory overruns and allocation

difficulties.

\* General cleanup and bug fixes, too many to list in detail here.

The major problem areas addressed were:

- RUN command with file name argument

- nested and cascaded FOR-NEXT loops

- PRINT USING

- EOF, LOF functions

- string concatenation

- operator hierarchy

- multi-level expression evaluation

- hex constant interpretation

- hex and octal constants in INPUT and DATA statements

\* Added a CLOSE all files feature (when no argument supplied).

\* Added a unary minus sign operator.

\* Added a MID$ command to complement the MID$ function.

\* Added a RENUM facility in a standalone program.

\* Added checking in configure for unistd.h (important on Sun systems).