GnuCOBOL Manual

for GnuCOBOL 3.0-dst

Keisuke Nishida, Roger While, Brian Tiffin, Simon Sobisch

Edition 3.0-dst
Updated for GnuCOBOL 3.0-dst
20 March 2019

GnuCOBOL (formerly OpenCOBOL) is a free COBOL compiler and runtime. `cobc` translates COBOL source to executable using intermediate C together with a designated C compiler and linker. `libcob` provides the necessary runtime.

This manual corresponds to GnuCOBOL 3.0-dst.

Table of Contents

1 Getting started

1.1 Hello, world!

This is a sample program that displays "Hello, world!":

```
---- hello.cob -------------------------
      * Sample COBOL program
       IDENTIFICATION DIVISION.
       PROGRAM-ID. hello.
       PROCEDURE DIVISION.
       DISPLAY "Hello, world!".
       STOP RUN.
----------------------------------------
```

The compiler, `cobc`, is executed as follows:

```
$ cobc -x hello.cob
$ ./hello
Hello, world!
```

The executable file name (`hello` in this case) is determined by removing the extension from the source file name.

You can specify the executable file name by specifying the compiler option `-o` as follows:

```
$ cobc -x -o hello-world hello.cob
$ ./hello-world
Hello, world!
```

The program can be written in a more modern style, with free format code, inline comments, the `GOBACK` verb and an optional `END-DISPLAY` terminator:

```
---- hellonew.cob ----------------
*> Sample GnuCOBOL program
identification division.
program-id. hellonew.
procedure division.
display
   "Hello, new world!"
end-display
goback.
----------------------------------
```

To compile free-format code, you must use the `-free` compiler option.

```
$ cobc -x -free hellonew.cob
$ ./hellonew
Hello, new world!
```

2 Compile

This chapter describes how to compile COBOL programs using GnuCOBOL.

2.1 Compiler options

The compiler `cobc` accepts the options described in this section. The compiler arguments follow the general syntax `cobc` [options] file [file . . .]. A complete list of options can be displayed by using the help option.

2.1.1 Help options

The following switches display information about the compiler:

`--help, -h`
: Display help screen (see Appendix A [Appendix A], page 30). No further actions will be taken.

`--version`
: Display compiler version, author package date and executable build date. `-V` will also display version. No further actions will be taken.

`--info`
: Display build information along with the default and current compiler configurations. No further actions will be taken except for further display options.

`-v`
: Verbosely display the programs invoked during compilation.

`--list-reserved`
: Display reserved words (see Appendix B [Appendix B], page 36). A Y/N field shows if the word is supported.[1] The given options for reserved words specified for example by `-std` will be taken into account. No further actions will be taken except for further display options.

`--list-intrinsics`
: Display intrinsic functions (see Appendix C [Appendix C], page 55). A Y/N field shows if the function is implemented. No further actions will be taken except for further display options.

`--list-system`
: Display system routines (see Appendix D [Appendix D], page 58). No further actions will be taken except for further display options.

`--list-mnemonics`
: Display mnemonic names (see Appendix E [Appendix E], page 60). No further actions will be taken except for further display options.

2.1.2 Build target

The `cobc` compiler treats files like `*.cob`, `*.cbl` as COBOL source code, `*.c` as C source code, `*.o` as object code, `*.i` as preprocessed code and `*.so` as dynamic modules and knows how to handle such files in the generation, compilation, and linking steps.

The special input name `-` takes input from `stdin` which is assumed to be COBOL source, and uses a default output name of `a.out` (or `a.so/c/o/i`, selected as appropriate) for the build type.

By default, the compiler builds a dynamically loadable module.

[1] Support may be partial or complete.

The following options specify the target type produced by the compiler:

`-E` Preprocess only: compiler directives are executed, comment lines are removed and `COPY` statements are expanded. The output is saved in file `*.i`.

`-C` Translation only. COBOL source files are translated into C files. The output is saved in file `*.c`.

`-S` Compile only. Translated C files are compiled by the C compiler to assembler code. The output is saved in file `*.s`.

`-c` Compile and assemble. This is equivalent to `cc -c`. The output is saved in file `*.o`.

`-m` Compile, assemble, and build a dynamically loadable module (i.e., a shared library). The output is saved in file `*.so`.[2] This is the default behaviour.

`-b` Compile, assemble, and combine all input files into a single dynamically loadable module. Unless `-o` is also used, the output is saved using the first filename as `*.so`.

`-x` Include the main function in the output, creating an executable image. The main entry point being the first program in the file.

This option takes effect at the translation stage. If you give this option with `-C`, you will see the main function at the end of the generated C file.

`-j(=<args>), -job(=<args>)`
Run job after compilation. Either from executable with `-x`, or with `cobcrun` when compiling a module. Optional arguments, if given, are passed to the program or module command line.

`-I <directory>`
Add <directory> to copy/include search path.

`-L <directory>`
Add <directory> to library search path.

`-l <lib>` Link the library <lib>.

`-D <define>`
Pass <define> to the COBOL compiler.

`-o <file>` Place the output into <file>.

2.1.3 Source format

GnuCOBOL supports both fixed and free source format. The default format is the fixed format. This can be overridden either by the `>>SOURCE [FORMAT] [IS] {FIXED|FREE}` directive, or by one of the following options:

`-free, -F` Free format. The program-text area starts in column 1 and continues till the end of line (effectively 255 characters in GnuCOBOL).

`-fixed` Fixed format. Source code is divided into: columns 1-6, the sequence number area; column 7, the indicator area; columns 8-72, the program-text area; and columns 72-80 as the reference area.[3]

[2] The extension varies depending on your host.

[3] Historically, fixed format was based on 80-character punch cards.

2.1.4 Warning options

`-W` Enable every possible warning. This includes more information than `-Wall` would normally provide.

`-Wall` Enable all common warnings.

`-Warchaic`
Warn if archaic features are used, such as continuation lines or the `NEXT SENTENCE` statement.

`-Wcall-params`
Warn if non-01/77-level items are used as arguments in a `CALL` statement. This is *not* set with `-Wall`.

`-Wcolumn-overflow`
Warn if text after column 72 in FIXED format. This is *not* set with `-Wall`.

`-Wconstant`
Warn inconsistent constant

`-Wimplicit-define`
Warn if implicitly defined data items are used.

`-Wlinkage`
Warn dangling `LINKAGE` items. This is *not* set with `-Wall`.

`-Wobsolete`
Warn if obsolete features are used.

`-Wparentheses`
Warn about any lack of parentheses around `AND` within `OR`.

`-Wredefinition`
Warn about incompatible redefinitions of data items.

`-Wstrict-typing`
Warn about type mismatch strictly.

`-Wterminator`
Warn about the lack of scope terminator END-XXX. This is *not* set with `-Wall`.

`-Wtruncate`
Warn on possible field truncation. This is *not* set with `-Wall`.

`-Wunreachable`
Warn if statements are unreachable. This is *not* set with `-Wall`.

2.1.5 Configuration options

`-std=<dialect>`
Compiler uses the given dialect to determine certain compiler features and warnings. See Appendix F [Compiler Configuration], page 62, and `config/*.conf`.
Note: The GnuCOBOL compiler tries to limit both the feature-set and reserved words to the specified compiler when the "strict" dialects are used. COBOL sources compiled with these dialects are therefore likely to compile with the specified compiler and vice versa: sources that were compiled on the specified compiler should compile without any issues with GnuCOBOL.
With the "non-strict" dialects GnuCOBOL will activate the complete feature-set where it doesn't directly conflict with the specified dialect, including reserved words.

COBOL sources compiled with these dialects therefore may work only with GnuCOBOL. COBOL sources may need a change because of reserved words in GnuCOBOL, otherwise offending words may be removed by `-fno-reserved=word`.
COBOL-85, X/Open COBOL, COBOL 2002 and COBOL 2014 are always "strict".

`-std=default`
GnuCOBOL dialect, supporting many of the COBOL 2002 and COBOL 2014 features, many extensions found in other dialects and its own feature-set

`-std=cobol85`
COBOL-85 without any extensions other than the amendment Intrinsic Function Module (1989), source compiled with this dialect is likely to compile with most COBOL compilers

`-std=xopen`
X/Open COBOL (based on COBOL-85) without any vendor extensions, source compiled with this dialect is likely to compile with most COBOL compilers, will warn items that "should not be used in a conforming X/Open COBOL source program"

`-std=cobol2002, -std=cobol2014`
COBOL 2002 / COBOL 2014 without any vendor extensions, use `-Warchaic` and `-Wobsolete` if archaic/obsolete features should be flagged

`-std=ibm-strict, -std=ibm`
IBM compatible

`-std=mvs-strict, -std=mvs`
MVS compatible

`-std=mf-strict, -std=mf`
Micro Focus compatible

`-std=bs2000-strict, -std=bs2000`
BS2000 compatible

`-std=acu-strict, -std=acu`
ACUCOBOL-GT compatible

`-std=rm-strict, -std=rm`
RM/COBOL compatible

`-conf=<file>`
User-defined dialect configuration. See `-std=` above.

You can override each single configuration entry by using compiler configuration options on the command line.

Examples:

```
-frelax-syntax-checks
-frenames-uncommon-levels=warning
-fnot-reserved=CHAIN,SCREEN
-ftab-width=4
```

See Appendix A [`cobc --help`], page 30.

2.1.6 Listing options

`-t=<file>`
Generate and place the standard print listing into `*.lst`.

`-T=<file>`
: Generate and place a wide print listing into `*.lst`.

`--tlines=<lines>`
: Specify lines per page in print listing, default = 55. Set to zero for no additional page breaks.

`-ftsymbols`
: Generate symbol table in listing.

`-fno-theader`
: Suppress all headers from listing while keeping page breaks.

`-fno-tmessages`
: Suppress warning and error summary from listing.

`-fno-tsource`
: Suppress actual source from listing (for example to only produce the cross-reference).

`-P(=<dir or file>)`
: Generate and place a preprocessed listing (old format) into `*.lst`.

`-Xref`

`-X`
: Generate cross reference in the listing.

Here is an example program listing with the -t -ftsymbols option:

```
GnuCOBOL 3.0.0   test.cbl                    Mon May 14 10:23:45 2018  Page 0001

LINE    PG/LN  A...B.............................................................

000001         IDENTIFICATION   DIVISION.
000002         PROGRAM-ID.      prog.
000003         ENVIRONMENT DIVISION.
000004         CONFIGURATION SECTION.
000005         DATA             DIVISION.
000006         WORKING-STORAGE  SECTION.
000007         COPY 'values.cpy'.
000001C        78  I   VALUE 20.
000002C        78  J   VALUE 5000.
000003C        78  M   VALUE 5.
000008         01  SETUP-REC.
000009             05  FL1       PIC X(04).
000010             05  FL2       PIC ZZZZZ.
000011             05  FL3       PIC 9(04).
000012             05  FL4       PIC 9(08) COMP.
000013             05  FL5       PIC 9(04) COMP-4.
000014             05  FL6       PIC Z,ZZZ.99.
000015             05  FL7       PIC S9(05) SIGN LEADING SEPARATE.
000016             05  FL8       PIC X(04).
000017             05  FL9 REDEFINES FL8 PIC 9(04).
000018             05  FLA.
000019                 10  FLB OCCURS I TIMES.
000020                     15  FLC PIC X(02).
000021                 10  FLD   PIC X(20).
000022             05  FLD1      PIC X(100).
000023             05  FLD2 OCCURS M TO J TIMES DEPENDING ON FL5.
```

```
000024                 10  FILLER PIC X(01).
000025             05  FLD3      PIC X(3).
000026             05  FLD4      PIC X(4).
000027         PROCEDURE        DIVISION.
000028             STOP RUN.
```

The first part of the listing lists the program text. If the program text is a COPY the line number reflects the COPY line number and is appended with a 'C'.

When the wide list option is specified (-T), the SEQUENCE columns are included in the listing.

The second part of the listing file is the listing of the Symbol Table:

```
GnuCOBOL 3.0.0   test.cbl                    Mon May 14 10:23:45 2018  Page 0002

SIZE TYPE           LVL  NAME                           PICTURE

5204 GROUP          01   SETUP-REC
0004 ALPHANUMERIC   05     FL1                          X(04)
0005 ALPHANUMERIC   05     FL2                          ZZZZZ
0004 ALPHANUMERIC   05     FL3                          9(04)
0004 NUMERIC        05     FL4                          9(08) COMP
0002 NUMERIC        05     FL5                          9(04) COMP
0008 ALPHANUMERIC   05     FL6                          Z,ZZZ.99
0006 ALPHANUMERIC   05     FL7                          S9(05)
0004 ALPHANUMERIC   05     FL8                          X(04)
0004 ALPHANUMERIC-R 05     FL9                          9(04)
0060 ALPHANUMERIC   05     FLA
0040 ALPHANUMERIC   10       FLB                        OCCURS 20
0002 ALPHANUMERIC   15         FLC                      X(02)
0020 ALPHANUMERIC   10       FLD                        X(20)
0100 ALPHANUMERIC   05     FLD1                         X(100)
5000 ALPHANUMERIC   05     FLD2                         OCCURS 5 TO 5000
0001 ALPHANUMERIC   10       FILLER                     X(01)
0003 ALPHANUMERIC   05     FLD3                         X(3)
0004 ALPHANUMERIC   05     FLD4                         X(4)
```

If the symbol redefines another variable the TYPE is marked with 'R'. If the symbol is an array the OCCURS phrase is in the PICTURE field.

The last part of the listing file is the summary of warnings an error in the compilation group:

```
0 warnings in compilation group
2 errors in compilation group
```

2.1.7 Debug switches

`-debug, -d`
: Enable all run-time error checks.

`-g`
: Produce C debugging information in the output.

`-ftrace`
: Generate trace code (log executed procedures, if tracing is enabled).

`-ftraceall`
: Generate trace code (log executed procedures and statements, if tracing is enabled).

`-fsource-location`
: Generate source location code (implied by `-debug` or `-g`).

`-fstack-check`
: Enable `PERFORM` stack checking (implied by `-debug` or `-g`).

`-fdebugging-line`
: Enable debugging lines (`D` in indicator column; `>>D` directive).

`-O` : Enable optimization of code size and execution speed. See your C compiler documentation, for example `man gcc` for details.

`-O2` : Optimize even more.

`-Os` : Optimize for size. Optimizer will favour code size over execution speed.

`-fnotrunc`
: Do not truncate binary fields according to PICTURE.

2.1.8 Miscellaneous

`-ext <extension>`
: Add default file extension.

`-fsyntax-only`
: Check syntax only; don't emit any output.

`-fmfcomment`
: Treat lines with `*` or `/` in column 1 as comment (fixed-format only).

`-acucomment`
: Treat `|` as an inline comment marker.

`-fsign=ASCII`
: Numeric display sign ASCII (default on ASCII machines).

`-fsign=EBCDIC`
: Numeric display sign EBCDIC (default on EBCDIC machines).

`-fintrinsics=[ALL|intrinsic function name(,name,...)]`
: Allow use of all or specific intrinsic functions without `FUNCTION` keyword.

  Note: defining this within your source with `CONFIGURATION SECTION. REPOSITORY.` is preferred.

`-ffold-copy=LOWER`
: Fold `COPY` subject to lower case (default no transformation).

`-ffold-copy=UPPER`
: Fold `COPY` subject to upper case (default no transformation).

`-save-temps(=<dir>)`
: Save intermediate files (by default, in current directory).

`-fimplicit-init`
: Do automatic initialization of the COBOL runtime system.

2.2 Multiple sources

This section describes how to compile a program from multiple source files.

This section also describes how to build a shared library that can be used by any COBOL program and how to use external libraries in COBOL programs.

2.2.1 Static linking

The easiest way of combining multiple files is to compile them into a single executable.

One way is to compile all the files in one command:

```
$ cobc -x -o prog main.cob subr1.cob subr2.cob
```

Another way is to compile each file with the option `-c`, and link them at the end. The top-level program must be compiled with the option `-x`.

```
$ cobc -c subr1.cob
$ cobc -c subr2.cob
$ cobc -c -x main.cob
$ cobc -x -o prog main.o subr1.o subr2.o
```

You can link C routines as well using either method:

```
$ cobc -o prog main.cob subrs.c
```

or

```
$ cobc -c subrs.c
$ cobc -c -x main.cob
$ cobc -x -o prog main.o subrs.o
```

Any number of functions can be contained in a single C file.

The linked programs will be called dynamically; that is, the symbol will be resolved at run time. For example, the following COBOL statement

```
CALL "subr" USING X.
```

will be converted into equivalent C code like this:

```
int (*func)() = cob_resolve("subr");
if (func != NULL)
  func (X);
```

With the compiler option `-fstatic-call`, more efficient code will be generated:

```
subr(X);
```

Note that this option only takes effect when the called program name is in a literal (like `CALL "subr"`). With a data name (like `CALL SUBR`), the program is still called dynamically.

2.2.2 Dynamic linking

There are two methods to achieve this: a driver program, or compiling the main program and subprograms separately.

2.2.2.1 Driver program

Compile all programs with the option `-m`:

```
$ cobc -m main.cob subr.cob
```

This creates the shared object files `main.so` `subr.so`.[4]

Before running the main program, install the module files in your library directory:

```
$ cp subr.so /your/cobol/lib
```

Set the runtime variable `COB_LIBRARY_PATH` to your library directory, and run the main program:

```
$ export COB_LIBRARY_PATH=/your/cobol/lib
```

(Note: You may set the variable via a runtime configuration file, see Appendix H [Runtime Configuration], page 68. You may also set the variable to directly point to the directory where you compiled the sources.)

[4] The extension used depends on your operating system.

Now execute your program:

```
$ cobcrun main
```

2.2.2.2 Compiling programs separately

The main program is compiled as usual:

```
$ cobc -x -o main main.cob
```

Subprograms are compiled with the option `-m`:

```
$ cobc -m subr.cob
```

This creates a module file `subr.so`[5].

Before running the main program, install the module files in your library directory:

```
$ cp subr.so /your/cobol/lib
```

Now, set the environment variable `COB_LIBRARY_PATH` to your library directory, and run the main program:

```
$ export COB_LIBRARY_PATH=/your/cobol/lib
$ ./main
```

2.2.3 Building library

You can build a shared library by combining multiple COBOL programs and even C routines:

```
$ cobc -c subr1.cob
$ cobc -c subr2.cob
$ cc -c subr3.c
$ cc -shared -o libsubrs.so subr1.o subr2.o subr3.o
```

2.2.4 Using library

You can use a shared library by linking it with your main program.

Before linking the library, install it in your system library directory:

```
$ cp libsubrs.so /usr/lib
```

or install it somewhere else and set `LD_LIBRARY_PATH`:

```
$ cp libsubrs.so /your/cobol/lib
$ export LD_LIBRARY_PATH=/your/cobol/lib
```

Then, compile the main program, linking the library as follows:

```
$ cobc -x main.cob -L/your/cobol/lib -lsubrs
```

2.3 C interface

This chapter describes how to combine C programs with COBOL programs.

2.3.1 Writing Main Program in C

Include `libcob.h` in your C program and call `cob_init` before using any COBOL module. Do a cleanup afterwards, either by calling `cob_stop_run` (if your program should terminate) or by calling `cob_tidy` (if your program should go on without any further COBOL calls).

```
#include <libcob.h>

int
main (int argc, char **argv)
{
```

[5] The extension used depends on your operating system.

```
  /* initialize your program */
  ...

  /* initialize the COBOL run-time library */
  cob_init (argc, argv);

  /* rest of your program */
  ...

  /* Clean up and terminate - This does not return */
  cob_stop_run (return_status);
}
```

You can write `cobc_init(0, NULL);` if you do not want to pass command line arguments to COBOL.

You can compile your C program as follows:

```
cc -c `cob-config --cflags` main.c
```

The compiled object must be linked with libcob as follows:

```
cc -o main main.o `cob-config --libs`
```

2.3.2 Static linking with COBOL programs

Let's call the following COBOL module from a C program:

```
---- say.cob ---------------------------
       IDENTIFICATION DIVISION.
       PROGRAM-ID. say.
       ENVIRONMENT DIVISION.
       DATA DIVISION.
       LINKAGE SECTION.
       01 hello PIC X(7).
       01 world PIC X(6).
       PROCEDURE DIVISION USING hello world.
           DISPLAY hello world.
           EXIT PROGRAM.
----------------------------------------
```

This program accepts two arguments, displays them, and exits.

From the viewpoint of C, this is equivalent to a function having the following prototype:

```
extern int say(char *hello, char *world);
```

So, your main program will look like as follows:

```
---- hello.c ---------------------------
#include <libcob.h>

extern int say(char *hello, char *world);

int
main()
{
  int ret;
  char hello[8] = "Hello, ";
  char world[7] = "world!";
```

```
  /* initialize the COBOL run-time library */
  cob_init(0, NULL);

  /* call the static module and store its return code */
  ret = say(hello, world);

  /* shutdown the COBOL run-time library, keep program running */
  (void)cob_tidy();

  return ret;
}
---------------------------------------
```

Compile these programs as follows:

```
$ cc -c `cob-config --cflags` hello.c
$ cobc -c -static say.cob
$ cobc -x -o hello hello.o say.o
$ ./hello
Hello, world!
```

2.3.3 Dynamic linking with COBOL programs

You can find a COBOL module having a specific name by using the C function `cob_resolve`, which takes the module name as a string and returns a pointer to the module function.

`cob_resolve` returns `NULL` if there is no module. In this case, the function `cob_resolve_error` returns the error message.

Let's see an example:

```
---- hello-dynamic.c -------------------
#include <libcob.h>

static int (*say)(char *hello, char *world);

int main()
{
  int ret;
  char hello[8] = "Hello, ";
  char world[7] = "world!";

  /* initialize the COBOL run-time library */
  cob_init(0, NULL);

  /* Find the module with PROGRAM-ID "say". */
  say = cob_resolve("say");

  /* If there is no such module, show error and exit. */
  if(say == NULL) {
    fprintf(stderr, "%s\n", cob_resolve_error());
    exit(1);
  }

  /* Call the module found ... */
  ret = say(hello, world);
```

```
  /* ...and exit with the return code. */
  cob_stop_run(ret);
}
----------------------------------------
```

Compile these programs as follows:

```
$ cc -c `cob-config --cflags` hello-dynamic.c
$ cobc -x -o hello hello-dynamic.o
$ cobc -m say.cob
$ export COB_LIBRARY_PATH=.
$ ./hello
Hello, world!
```

2.3.4 Static linking with C programs

Let's call the following C function from COBOL:

```
---- say.c -----------------------------
int say(char *hello, char *world)
{
  int i;
  for(i = 0; i < 7; i++)
    putchar(hello[i]);
  for(i = 0; i < 6; i++)
    putchar(world[i]);
  putchar('\n');
  return 0;
}
----------------------------------------
```

This program is equivalent to the program in `say.cob` above.

Note that, unlike C, the arguments passed from COBOL programs are not terminated by the null character (i.e., `'\0'`).

You can call this function in the same way you call COBOL programs:

```
---- hello.cob -------------------------
       IDENTIFICATION DIVISION.
       PROGRAM-ID. hello.
       ENVIRONMENT DIVISION.
       DATA DIVISION.
       WORKING-STORAGE SECTION.
       01 hello PIC X(7) VALUE "Hello, ".
       01 world PIC X(6) VALUE "world!".
       PROCEDURE DIVISION.
       CALL "say" USING hello world.
       STOP RUN.
----------------------------------------
```

Compile these programs as follows:

```
$ cc -c say.c
$ cobc -c -static -x hello.cob
$ cobc -x -o hello hello.o say.o
$ ./hello
Hello, world!
```

2.3.5 Dynamic linking with C programs

You can create a dynamically-linked module from a C program by passing an option `-shared` to the C compiler:

```
$ cc -shared -o say.so say.c
$ cobc -x hello.cob
$ export COB_LIBRARY_PATH=.
$ ./hello
Hello, world!
```

2.3.6 Redirecting output to a (FILE *)

From a module written in C you may call cob_set_runtime_option to set the exact (FILE *) which trace data is to be written to. In common.h is the following:

```
enum cob_runtime_option_switch {
   COB_SET_RUNTIME_TRACE_FILE              /* 'p' is  FILE *  */
   COB_SET_RUNTIME_DISPLAY_PRINTER_FILE    /* 'p' is  FILE *  */
   COB_SET_RUNTIME_RESCAN_ENV              /* rescan environment variables */
   COB_SET_RUNTIME_DISPLAY_PUNCH_FILE      /* 'p' is  FILE *  */
};
COB_EXPIMP  void  cob_set_runtime_option   (enum cob_runtime_option_switch opt, void *p
```

So from you C code you can tell the GnuCOBOL runtime to redirect TRACE output by:

```
cob_set_runtime_option (COB_SET_RUNTIME_TRACE_FILE, (void*)((FILE*)myfd));
```

You could also redirect all DISPLAY UPON PRINTER output to a file by:

```
cob_set_runtime_option (COB_SET_RUNTIME_DISPLAY_PRINTER_FILE, (void*)((FILE*)myfd));
```

You could also redirect all DISPLAY UPON SYSPUNCH output to a file by:

```
cob_set_runtime_option (COB_SET_RUNTIME_DISPLAY_PUNCH_FILE, (void*)((FILE*)myfd));
```

Another routine can be used to return the current value of the option.

```
COB_EXPIMP  void  *cob_get_runtime_option    (enum cob_runtime_option_switch opt);
```

3 Customize

3.1 Customizing compiler

These settings are effective at compile-time.

Environment variables (default value in brackets):

`COB_CC` C compiler ("gcc")

`COB_CFLAGS`
: Flags passed to the C compiler ("-I$(PREFIX)/include")

`COB_LDFLAGS`
: Flags passed to the C compiler ("")

`COB_LIBS` Standard libraries linked with the program ("-L$(PREFIX)/lib -lcob")

`COB_LDADD`
: Additional libraries linked with the program ("")

3.2 Customizing library

These settings are effective at run-time. You can set them either via the environment or by a runtime configuration file.

To set the global runtime configuration file export `COB_RUNTIME_CONFIG` to point to your configuration file. To set an explicit runtime configuration file for a single run via `cobcrun` you can use its option `-c <file>, -config=<file>`.

For displaying the current runtime settings you can use the option `-r, -runtime-env` of `cobcrun`.

For a complete list of runtime variables, aliases, their default values and options to set them see Appendix H [Runtime Configuration], page 68.

4 Optimize

4.1 Optimize options

There are three compiler options for optimization: `-O`, `-Os` and `-O2`. These options enable optimization at both translation (from COBOL to C) and compilation (C to assembly) levels.

Currently, there is no difference between these optimization options at the translation level.

The option `-O`, `-Os` or `-O2` is passed to the C compiler as is and used for C level optimization.

4.2 Optimize call

When a `CALL` statement is executed, the called program is linked at run time. By specifying the compiler option `-fstatic-call`, you can statically link the program at compile time and call it efficiently. (see Section 2.2.1 [Static linking], page 9)

4.3 Optimize binary

By default, data items of usage binary or comp are stored in big-endian form. On those machines whose native byte order is little-endian, this is not quite efficient.

If you prefer, you can store binary items in the native form of your machine. Set the config option `binary-byteorder` to `native` in your config file (see Chapter 3 [Customize], page 15).

In addition, setting the option `binary-size` to `2-4-8` or `1-2-4-8` is more efficient than others.

5 Debug

5.1 Debug options

The compiler option `-debug` can be used during the development of your programs. It enables all run-time error checking, such as subscript boundary checks and numeric data checks, and displays run-time errors with source locations.

6 Non-standard extensions

6.1 SELECT ASSIGN TO

A file may be assigned to a literal file, a file in a variable, or a file in an environment variable.

6.1.1 Literal file.

Assign to a literal file.

```
Select <file> assign to "/tmp/myfile.txt".
```

6.1.2 <variable>

Assign to a file in a variable.

```
Select <file> assign to my-file.

01  my-file            pic x(512).

Move "/tmp/myfile.txt" to my-file.
Open output <file>.
```

6.1.3 <environment variable>

Assign to a file in an environment variable.

```
export myfile=/tmp/myfile.txt

Select <file> assign to external myfile.
```

6.2 Indexed file packages

<This section is in progress.>

6.3 Extended ACCEPT statement

Extended `ACCEPT` statements allow for full control of items accepted from the screen. Items accept by line and column positioning.

All commands following `WITH` are optional.

```
ACCEPT variable-1
   LINE variable-2 | literal-1 COLUMN variable-3 | literal-2
   WITH
      AUTO-SKIP | AUTO
      BACKGROUND-COLOR variable-4 | literal-3
      BELL | BEEP
      BLINK
      FOREGROUND-COLOR variable-5 | literal-4
      LOWLIGHT | HIGHLIGHT
      PROMPT
      PROTECTED
      SIZE [IS] variable-6 | literal-5
      UPDATE
   ON EXCEPTION
      <exception processing>
```

```
   NOT ON EXCEPTION
      <normal processing>
END-ACCEPT.
```

6.3.1 LINE

The line number of variable-2 or literal-1 to accept the field.

6.3.2 COLUMN

The column number of variable-3 or literal-2 to accept the field.

6.3.3 AUTO-SKIP

The word `AUTO` may be used for `AUTO-SKIP`.

With this option the `ACCEPT` statement returns after the last character is typed at the end of the field. This is the same as if the Enter key were pressed.

Without this option the cursor remains at the end of the field and waits for the user to press Enter.

The Right-Arrow key returns from the end of the field. The Left-Arrow key returns from the beginning. See Section 6.4 [ACCEPT special], page 20.

The Alt-Right-Arrow and Alt-Left-Arrow keys never `AUTO-SKIP`.

6.3.4 BACKGROUND-COLOR

The background color is the color used behind the characters.

Variable-4 or literal-3 must be numeric. See screenio.cpy for the color assignments to variable-4 or literal-3.

6.3.5 BELL

The word `BEEP` may be used for `BELL`.

The system beeps when the cursor moves to accept from this field. On some systems, there is no sound. Some other method may indicate a beep, such a flashing screen or pop up window.

6.3.6 BLINK

The field blinks while the user enters the data. This can help small menu selection fields to stand out.

6.3.7 FOREGROUND-COLOR

The foreground color is the color used for the characters.

Variable-5 or literal-4 must be numeric. See screenio.cpy for the color assignments to variable-5 or literal-4.

6.3.8 LOWLIGHT

The `LOWLIGHT` and `HIGHLIGHT` commands vary the intensity of the field.

`LOWLIGHT` displays with lower intensity and `HIGHLIGHT` displays with higher intensity. Having neither `LOWLIGHT` nor `HIGHLIGHT` displays at normal intensity.

These may have different levels of intensity, if at all, depending on the make and model of the screens.

6.3.9 PROMPT

Display the field with prompt characters as the cursor moves to accept from this field.

6.3.10 PROTECTED

`PROTECTED` is ignored.

6.3.11 SIZE

The size of variable-1 to accept from the screen.

Variable-6 or literal-5 must be numeric.

`SIZE <greater than zero>`
: If variable-6 or literal-5 is less than the length of variable-1 then only the `SIZE` number of characters accept into the field. Variable-1 pads with spaces after `SIZE` to the end of the field.

  If variable-6 or literal-5 is greater than variable-1, then the screen pads with spaces after variable-1 to the `SIZE` length.

`SIZE ZERO`
`<SIZE option not specified>`
: The variable-1 accepts to its field length.

6.3.12 UPDATE

The contents of variable-1 displays on the screen as the `ACCEPT` begins. This allows the user to update the field without having to type it all again.

Without this option, the `ACCEPT` field is always blank.

6.3.13 ON EXCEPTION

Check the special register cob-crt-status for the special key that was pressed. This includes Escape, Tab, Back-Tab, F-keys, arrows, etc... See screenio.cpy for the values.

6.3.14 NOT ON EXCEPTION

Reset any F-key indicator because no special key was pressed.

6.4 ACCEPT special keys

Special keys are available for extended `ACCEPT` statements.

The `COB-CRT-STATUS` values are in the screenio.cpy copy file.

6.4.1 Arrow keys

The Left-Arrow key moves the cursor to the left. Without `AUTO-SKIP` the cursor stops at the beginning of the field. With `AUTO-SKIP` it returns with the `COB-SCR-KEY-LEFT` value of 2009. See Section 6.3 [Extended ACCEPT], page 18.

The Alt-Left-Arrow key is the same as Left-Arrow except that it never returns, even for `AUTO-SKIP`.

The Right-Arrow key moves the cursor to the right. Without `AUTO-SKIP` the cursor stops at the end of the field. With `AUTO-SKIP` it returns with the `COB-SCR-KEY-RIGHT` value of 2010. See Section 6.3 [Extended ACCEPT], page 18.

The Alt-Right-Arrow key is the same as Right-Arrow except that it never returns, even for `AUTO-SKIP`.

6.4.2 Backspace key

The Backspace key moves the cursor, and the remainder of the text, to the left.

6.4.3 Delete keys

The Delete key deletes the cursor's character and moves the remainder of the text to the left. The cursor does not move.

The Alt-Delete key deletes all text from the cursor to the end of the field.

6.4.4 End key

The End key moves the cursor after the last non-space character. Pressing the End key again moves the cursor to the end of the field. Repeated pressing moves the cursor back and forth.

6.4.5 Home key

The Home key moves the cursor to the first non-space character. Pressing the Home key again moves the cursor to the beginning of the field. Repeated pressing moves the cursor back and forth.

6.4.6 Insert key

The Insert key changes the insert mode.

The value of the insert mode is used in all following `ACCEPT` statements while the program is running.

When the insert mode is on, typed characters move the existing characters to the right until field is full. When it is off, typed characters type over existing characters.

Note: The insert mode is ignored for fields with a size of 1.

The insert mode can also be changed by the `COB_INSERT_MODE` setting at any time, see Appendix H [Runtime Configuration], page 68.

6.4.7 Tab keys

The Tab key returns from the `ACCEPT` with the `COB-SCR-TAB` value of 2007.

The Shift-Tab key returns with the `COB-SCR-BACK-TAB` value of 2008.

6.5 Extended DISPLAY statement

Extended `DISPLAY` statements allow for full control of items that display on the screen. Items display by line and column positioning.

```
DISPLAY variable-1 | literal-1 | figurative constant
   LINE <line> COLUMN <column>
   WITH BELL
        BLANK LINE | SCREEN
        ERASE EOL | EOS
        SIZE [IS] variable-2 | literal-2
END-DISPLAY.
```

6.5.1 BELL

Ring the bell. It is optional.

6.5.2 BLANK

Clear the whole line or screen. It is optional.

`BLANK LINE`
: Clear the line from the beginning of the line to the end of the line.

`BLANK SCREEN`
: Clear the whole screen.

6.5.3 ERASE

Clear the line or screen from LINE and COLUMN. It is optional.

`ERASE EOL`
: Clear the line from LINE and COLUMN to the end of the line.

`ERASE EOS`
: Clear the screen from LINE and COLUMN to the end of the screen.

6.5.4 SIZE

The size of variable-1, literal-1, or figurative constant to display onto the screen. It is optional.

`SIZE <greater than zero>`
: If `SIZE` is less than the length of variable-1 or literal-1 then only the `SIZE` number of characters display.

  If `SIZE` is greater than the length of variable-1 or literal-1, then the screen pads with spaces after the field to the `SIZE` length.

  Figurative constants display repeatedly the number of times in `SIZE`. Except that `LOW-VALUES` always positions the cursor (see `SIZE` ZERO below).

`SIZE ZERO`
`<SIZE option not specified>`
: Variable-1 or literal-1 displays with the field length.

6.5.5 Figurative Constants

Certain figurative constants and values have special functions. All other figurative constants display as a single character.

`SPACE` Display spaces from LINE and COLUMN to the end of the screen. This is the same as WITH ERASE EOS.

`LOW-VALUE`
: Position the cursor to LINE and COLUMN. The next `DISPLAY` statement does not need a LINE or COLUMN to display at that position.

`ALL X"01"`
: Display spaces from LINE and COLUMN to the end of the line. This is the same as `WITH ERASE EOL`.

`ALL X"02"`
: Clear the whole screen. This is the same as `WITH BLANK SCREEN`.

`ALL X"07"`
: Ring the bell. This is the same as `WITH BELL`.

6.6 CONTENT-LENGTH

`FUNCTION CONTENT-LENGTH` returns the length of NUL byte terminated data given a pointer:

```
identification division.
program-id. zlen.
data division.
working-storage section.
01 ptr   usage pointer.
```

```
 01 str   pic x(4) value z"abc".

*> Testing CONTENT-LENGTH
 procedure division.

 set ptr to address of str
 display content-length(ptr)

 goback.
 end program hosted.
```

6.7 CONTENT-OF

`FUNCTION CONTENT-OF` returns an alphanumeric field given a pointer and optional length:

Data from pointer is returned as a COBOL field either by scanning for a NUL byte or using the optional length. Reference modification of result allowed.

```
 identification division.
 program-id. contents.
 data division.
 working-storage section.
 01 ptr   usage pointer.
 01 str   pic x(4) value z"abc".

*> Testing CONTENT-OF
 procedure division.

 set ptr to address of str
 display content-of(ptr)
 display content-of(ptr, 2)
 display content-of(ptr)(2:2)

 goback.
 end program hosted.
```

7 System Routines

For a complete list of supported system routines, see Appendix D [cobc –list-system], page 58.

7.1 CBL_GC_GETOPT

`CBL_GC_GETOPT` provides the quite well-known option parser, getopt, for GnuCOBOL. The usage of this system routine is described by the following example.

```
identification division.
program-id. prog.

data division.
working-storage section.
    78 shortoptions value "jkl".

    01 longoptions.
        05 optionrecord occurs 2 times.
            10 optionname   pic x(25).
            10 has-value    pic 9.
            10 valpoint     pointer value NULL.
            10 return-value pic x(4).

    01 longind     pic 99.
    01 long-only   pic 9 value 1.

    01 return-char pic x(4).
    01 opt-val     pic x(10).

    01 counter     pic 9 value 0.
```

We first need to define the necessary fields for getopt's shortoptions (so), longoptions (lo), longoption index (longind), long-only-option (long-only) and also the fields for return values return-char and opt-val (arbitrary size with trimming, see return codes).

The shortoptions are written down as an alphanumeric field (i.e., a string with arbitrary size) as follows:

```
"ab:c::d"
```

This means we want getopt to look for shortoptions named a, b, c or d and we demand an option value for b and we are accepting an optional one for c.

The longoptions are defined as a table of records with oname, has-value, valpoint and val.

- oname defines the name of a longoption.
- has-value defines if an option value is demanded (has-val = 1), optional (has-val = 2) or not required (has-val = 0).
- valpoint is a pointer used to specify an address to save getopt's return value to. The pointer is optional. If it is `NULL`, getopt returns a value as usual. If you use the pointer it has to point to a `PIC X(4)` field.
- The field val is a `PIC X(4)` character which is returned if the longoption was recognized.

The longoption structure is immutable! You can only vary the number of records.

Now we have the tools to run `CBL_GC_GETOPT` within the procedure division.

```
procedure division.
    move "version" to optionname   (1).
```

```
move 0         to has-value    (1).
move "v"       to return-value (1).

move "verbose" to optionname   (2).
move 0         to has-value    (2).
move "V"       to return-value (2).

perform with test after until return-code = -1
    call 'CBL_GC_GETOPT' using
       by reference shortoptions longoptions longind
       by value long-only
       by reference return-char opt-val
    end-call

    display return-char end-display
    display opt-val     end-display
end-perform
stop run.
```

The example shows how we initialize all parameters and call the routine until `CBL_GC_GETOPT` runs out of options and returns -1.

The return-char might contain the following:

- regular character if an option was recognized
- '?' if we have an undefined or ambiguous option
- '1' if we have a non-option (only if first byte of so is '-')
- '0' if valpoint != NULL and we are writing the return value to the specified address
- '-1' if we don't have any more options (or reach the first non-option if first byte of so is '+')

The return-codes of `CBL_GC_GETOPT` are:

- 1 if we've got a non-option (only if first byte of so is '-')
- 0 if valpoint != `NULL` and we are writing the return value to the specified address
- -1 if we don't have any more options (or reach the first non-option if first byte of so is '+')
- 2 if we have got an truncated option value in opt-val (because opt-val was too small)
- 3 if we got a regular answer from getopt

7.2 CBL_GC_HOSTED

`CBL_GC_HOSTED` provides access to the following C hosted variables:

- `argc` to binary-long by value
- `argv` to pointer to char **
- `stdin`, `stdout`, `stderr` to pointer
- `errno` giving address of errno in pointer to binary-long, use based for more direct access

and conditional access to the following variables:

- `tzname` pointer to pointer to array of two char pointers
- `timezone` C long, will be seconds west of UTC
- `daylight` C int, will be 1 during daylight savings

System will need to HAVE_TIMEZONE defined for these to return anything meaningful. Attempts made when they are not available return 1 from CBL_GC_HOSTED.

It returns 0 when match, 1 on failure, case matters as does length, "arg" won't match.

The usage of this system routine is described by the following example.

```
HOSTED identification division.
       program-id. hosted.
       data division.
       working-storage section.
       01 argc  usage binary-long.
       01 argv  usage pointer.

       01 stdin usage pointer.
       01 stdout usage pointer.
       01 stderr usage pointer.

       01 errno usage pointer.
       01 err   usage binary-long based.

       01 domain usage float-long value 3.0.

       01 tzname usage pointer.
       01 tznames usage pointer based.
          05 tzs usage pointer occurs 2 times.

       01 timezone   usage binary-long.
       01 daylight   usage binary-short.


      *> Testing CBL_GC_HOSTED
       procedure division.
       call "CBL_GC_HOSTED" using stdin "stdin"
       display "stdin                : " stdin
       call "feof" using by value stdin
       display "feof stdin           : " return-code

       call "CBL_GC_HOSTED" using stdout "stdout"
       display "stdout               : " stdout
       call "fprintf" using by value stdout by content "Hello" & x"0a"

       call "CBL_GC_HOSTED" using stderr "stderr"
       display "stderr               : " stderr
       call "fprintf" using by value stderr by content "on err" & x"0a"

       call "CBL_GC_HOSTED" using argc "argc"
       display "argc                 : " argc

       call "CBL_GC_HOSTED" using argv "argv"
       display "argv                 : " argv

       call "args" using by value argc argv

       call "CBL_GC_HOSTED" using errno "errno"
       display "&errno               : " errno
```

```
set address of err to errno
display "errno                : " err
call "acos" using by value domain
display "errno after acos(3.0): " err ", EDOM is 33"

call "CBL_GC_HOSTED" using argc "arg"
display "'arg' lookup         : " return-code
call "CBL_GC_HOSTED" using null "argc"
display "null with argc       : " return-code
display "argc is still        : " argc


*> the following only returns zero if the system has HAVE_TIMEZONE set

call "CBL_GC_HOSTED" using daylight "daylight "
display "'timezone' lookup    : " return-code

if return-code not = 0
   display "system doesn't has timezone"
else

   display "timezone is          : " timezone

   call "CBL_GC_HOSTED" using daylight "daylight "
   display "'daylight' lookup    : " return-code
   display "daylight is          : " daylight

   set environment "TZ" to "PST8PDT"
   call static "tzset" returning omitted on exception continue end-call

   call "CBL_GC_HOSTED" using tzname "tzname"
   display "'tzname' lookup      : " return-code

   *> tzs(1) will point to z"PST" and tzs(2) to z"PDT"
   if return-code equal 0 and tzname not equal null then
       set address of tznames to tzname
       if tzs(1) not equal null then
          display "tzs #1               : " tzs(1)
       end-if
       if tzs(2) not equal null then
          display "tzs #2               : " tzs(2)
       end-if
   end-if

end-if

goback.
end program hosted.
```

7.3 CBL_GC_NANOSLEEP

CBL_GC_NANOSLEEP allows you to pause the program for nanoseconds. The actual precision depends on the system.

```
*> Waiting a half second
 call "CBL_GC_NANOSLEEP" using "500000000" end-call

*> Waiting five seconds using compiler string catenation for readability
 call "CBL_GC_NANOSLEEP" using "500" & "0000000"  end-call
```

7.4 CBL_GC_FORK

CBL_GC_FORK allows you to fork the current COBOL process to a new one. The current content of the process' storage (including LOCAL-STORAGE) will be identical, any file handles get invalid in the new process, positions and file / record locks are only available to the original process.

This system routine is not available on Windows (exception: GCC on Cygwin).

Parameters: none Returns: PID (the child process gets '0' returned, the calling process gets the PID of the created children). Negative values are returned for system dependent error codes and -1 if the function is not available on the current system.

```
IDENTIFICATION DIVISION.
PROGRAM-ID. prog.
DATA DIVISION.
WORKING-STORAGE SECTION.
01 CHILD-PID   PIC S9(9) BINARY.
01 WAIT-STS    PIC S9(9) BINARY.
PROCEDURE DIVISION.

    CALL "CBL_GC_FORK" RETURNING CHILD-PID END-CALL
    EVALUATE TRUE
       WHEN CHILD-PID = ZERO
          PERFORM CHILD-CODE
       WHEN CHILD-PID > ZERO
          PERFORM PARENT-CODE
       WHEN CHILD-PID = -1
          DISPLAY 'CBL_GC_FORK is not available '
                  'on the current system!'
          END-DISPLAY
          PERFORM CHILD-CODE
          MOVE 0 TO CHILD-PID
          PERFORM PARENT-CODE
       WHEN OTHER
          MULTIPLY CHILD-PID BY -1 END-MULTIPLY
          DISPLAY 'CBL_GC_FORK returned system error: '
                  CHILD-PID
          END-DISPLAY
    END-EVALUATE

    STOP RUN.

CHILD-CODE.
    CALL "C$SLEEP" USING 1 END-CALL
    DISPLAY "Hello, I am the child"
```

```
           END-DISPLAY
           MOVE 2 TO RETURN-CODE

           CONTINUE.

       PARENT-CODE.
           DISPLAY "Hello, I am the parent"
           END-DISPLAY
           CALL "CBL_GC_WAITPID" USING CHILD-PID RETURNING WAIT-STS
           END-CALL
           MOVE 0 TO RETURN-CODE
           EVALUATE TRUE
              WHEN WAIT-STS >= 0
                 DISPLAY 'Child ended with status: '
                         WAIT-STS
                 END-DISPLAY
              WHEN WAIT-STS = -1
                 DISPLAY 'CBL_GC_WAITPID is not available '
                         'on the current system!'
                 END-DISPLAY
              WHEN WAIT-STS < -1
                 MULTIPLY -1 BY WAIT-STS END-MULTIPLY
                 DISPLAY 'CBL_GC_WAITPID returned system error: ' WAIT-STS
                 END-DISPLAY
           END-EVALUATE

           CONTINUE.
```

7.5 CBL_GC_WAITPID

CBL_GC_WAITPID allows you to wait until another system process ended. Additional you can check the process' return code.

Parameters: none Returns: function-status / child-status Negative values are returned for system dependent error codes and -1 if the function is not available on the current system.

```
CALL "CBL_GC_WAITPID" USING CHILD-PID RETURNING WAIT-STS
END-CALL
MOVE 0 TO RETURN-CODE
DISPLAY 'CBL_GC_WAITPID ended with status: ' WAIT-STS
END-DISPLAY
```

Appendix A `cobc --help`

```
GnuCOBOL compiler for most COBOL dialects with lots of extensions

Usage: cobc [options]... file...

Options:
  -h, -help             display this help and exit
  -V, -version          display compiler version and exit
  -i, -info             display compiler information (build/environment)
                        and exit
  -v, -verbose          display compiler version and the commands
                        invoked by the compiler
  -vv, -verbose=2       like -v but additional pass verbose option
                        to assembler/compiler
  -vvv, -verbose=3      like -vv but additional pass verbose option
                        to linker
  -q, -brief            reduced displays, commands invoked not shown
  -###                  like -v but commands not executed
  -x                    build an executable program
  -m                    build a dynamically loadable module (default)
  -j [<args>], -job[=<args>]    run program after build, passing <args>
  -std=<dialect>        warnings/features for a specific dialect
                        <dialect> can be one of:
                        default, cobol2014, cobol2002, cobol85, xopen,
                        ibm-strict, ibm, mvs-strict, mvs,
                        mf-strict, mf, bs2000-strict, bs2000,
                        acu-strict, acu, rm-strict, rm;
                        see configuration files in directory config
  -F, -free             use free source format
  -fixed                use fixed source format (default)
  -O, -O2, -O3, -Os     enable optimization
  -O0                   disable optimization
  -g                    enable C compiler debug / stack check / trace
  -d, -debug            enable all run-time error checking
  -o <file>             place the output into <file>
  -b                    combine all input files into a single
                        dynamically loadable module
  -E                    preprocess only; do not compile or link
  -C                    translation only; convert COBOL to C
  -S                    compile only; output assembly file
  -c                    compile and assemble, but do not link
  -T <file>             generate and place a wide program listing into <file>
  -t <file>             generate and place a program listing into <file>
  --tlines=<lines>      specify lines per page in listing, default = 55
  -P[=<dir or file>]    generate preprocessed program listing (.lst)
  -Xref                 specify cross reference in listing
  -I <directory>        add <directory> to copy/include search path
  -L <directory>        add <directory> to library search path
  -l <lib>              link the library <lib>
  -A <options>          add <options> to the C compile phase
  -Q <options>          add <options> to the C link phase
```

```
  -D <define>           define <define> for COBOL compilation
  -K <entry>            generate CALL to <entry> as static
  -conf=<file>          user-defined dialect configuration; see -std
  -list-reserved        display reserved words
  -list-intrinsics      display intrinsic functions
  -list-mnemonics       display mnemonic names
  -list-system          display system routines
  -save-temps[=<dir>]   save intermediate files
                        * default: current directory
  -ext <extension>      add file extension for resolving COPY

Warning options:
  -W                    enable all warnings
  -Wall                 enable most warnings (all except as noted below)
  -Wno-<warning>        disable warning enabled by -W or -Wall
  -Wno-unfinished       do not warn if unfinished features are used
                        * ALWAYS active
  -Wno-pending          do not warn if pending features are mentioned
                        * ALWAYS active
  -Wobsolete            warn if obsolete features are used
  -Warchaic             warn if archaic features are used
  -Wredefinition        warn about incompatible redefinition of data items
  -Wtruncate            warn about field truncation from constant assignments
  -Wpossible-truncate   warn about possible field truncation
                        * NOT set with -Wall
  -Woverlap             warn about overlapping MOVE of items
  -Wpossible-overlap    warn about MOVE of items that may overlap depending on variables
                        * NOT set with -Wall
  -Wparentheses         warn about lack of parentheses around AND within OR
  -Wstrict-typing       warn strictly about type mismatch
  -Wimplicit-define     warn about implicitly defined data items
  -Wcorresponding       warn about CORRESPONDING with no matching items
  -Winitial-value       warn if initial VALUE clause is ignored
  -Wprototypes          warn about missing FUNCTION prototypes/definitions
  -Warithmetic-osvs     warn if arithmetic expression precision has changed
  -Wcall-params         warn about non 01/77 items for CALL parameters
                        * NOT set with -Wall
  -Wconstant-expression  warn about expressions that always resolve to true/false
  -Wcolumn-overflow     warn about text after program-text area, FIXED format
                        * NOT set with -Wall
  -Wterminator          warn about lack of scope terminator END-XXX
                        * NOT set with -Wall
  -Wlinkage             warn about dangling LINKAGE items
                        * NOT set with -Wall
  -Wunreachable         warn about likely unreachable statements
                        * NOT set with -Wall
  -Wno-dialect          do not warn about dialect specific issues
                        * ALWAYS active
  -Wothers              do not warn about different issues
                        * ALWAYS active
  -Werror               treat all warnings as errors
  -Werror=<warning>     treat specified <warning> as error
```

```
Compiler options:
  -fsign=[ASCII|EBCDIC] define display sign representation
                        * default: machine native
  -ffold-copy=[UPPER|LOWER]     fold COPY subject to value
                        * default: no transformation
  -ffold-call=[UPPER|LOWER]     fold PROGRAM-ID, CALL, CANCEL subject to value
                        * default: no transformation
  -fdefaultbyte=<value> initialize fields without VALUE to value
                        * decimal 0..255 or any quoted character
                        * default: initialize to picture
  -fmax-errors=<number> maximum number of errors to report before
                        compilation is aborted
                        * default: 100
  -fdump=<scope>        dump data fields on abort, <scope> may be
                        a combination of: ALL, WS, LS, RD, FD, SC
  -fcallfh=<function>   use external provided EXTFH interface module
                        <function> for I/O
  -fintrinsics=[ALL|intrinsic function name(,name,...)]
                        intrinsics to be used without FUNCTION keyword

  -fno-recursive_check  disable check of recursive program call;
                        effectively compiling as RECURSIVE program
  -fno-remove-unreachable       disable remove of unreachable code
                        * turned off by -g
  -ftrace               generate trace code
                        * scope: executed SECTION/PARAGRAPH
  -ftraceall            generate trace code
                        * scope: executed SECTION/PARAGRAPH/STATEMENTS
                        * turned on by -debug
  -fsyntax-only         syntax error checking only; don't emit any output
  -fdebugging-line      enable debugging lines
                        * 'D' in indicator column or floating >>D
  -fsource-location     generate source location code
                        * turned on by -debug/-g/-ftraceall
  -fimplicit-init       automatic initialization of the COBOL runtime system
  -fstack-check         PERFORM stack checking
                        * turned on by -debug or -g
  -fwrite-after         use AFTER 1 for WRITE of LINE SEQUENTIAL
                        * default: BEFORE 1
  -fmfcomment           '*' or '/' in column 1 treated as comment
                        * FIXED format only
  -facucomment          '$' in indicator area treated as '*',
                        '|' treated as floating comment
  -fnotrunc             allow numeric field overflow
                        * non-ANSI behaviour
  -fodoslide            adjust items following OCCURS DEPENDING
                        * implies -fcomplex-odo
  -fsingle-quote        use a single quote (apostrophe) for QUOTE
                        * default: double quote
  -foptional-file       treat all files as OPTIONAL
                        * unless NOT OPTIONAL specified
```

```
Sequential & Relative files will match Micro Focus format
  -fno-theaders         suppress all headers and output of compilation
                        options from listing while keeping page breaks
  -fno-tsource          suppress source from listing
  -fno-tmessages        suppress warning and error summary from listing
  -ftsymbols            specify symbols in listing

Compiler dialect configuration options:
  -freserved-words=<value>      use of complete/fixed reserved words
  -ftab-width=1..12      set number of spaces that are assumed for tabs
  -ftext-column=72..255  set right margin for source (fixed format only)
  -fpic-length=<number>  maximum number of characters allowed in the PICTURE character-strin
  -fword-length=1..61    maximum word-length for COBOL (= programmer defined) words
  -fliteral-length=<number>     maximum literal size in general
  -fnumeric-literal-length=1..38        maximum numeric literal size
  -fassign-clause=<value>       set way of interpreting ASSIGN
  -fbinary-size=<value>  binary byte size - defines the allocated bytes according to PIC, ma
  -fbinary-byteorder=<value>    binary byte order, may be one of: native, big-endian
  -fscreen-section-rules=<value>        which compiler's rules to apply to SCREEN SECTION it
  -ffilename-mapping     resolve file names at run time using environment variables.
  -fpretty-display       alternate formatting of numeric fields
  -fbinary-truncate      numeric truncation according to ANSI
  -fcomplex-odo          allow complex OCCURS DEPENDING ON
  -findirect-redefines   allow REDEFINES to other than last equal level number
  -flarger-redefines-ok  allow larger REDEFINES items
  -frelax-syntax-checks  allow certain syntax variations (e.g. REDEFINES position)
  -frelax-level-hierarchy       allow non-matching level numbers
  -fselect-working       require ASSIGN USING items to be in WORKING-STORAGE
  -fsticky-linkage       LINKAGE-SECTION items remain allocated between invocations
  -fmove-ibm             MOVE operates as on IBM (left to right, byte by byte)
  -fperform-osvs         exit point of any currently executing perform is recognized if reac
  -farithmetic-osvs      limit precision in intermediate results to precision of final resul
  -fconstant-folding     evaluate constant expressions at compile time
  -fhostsign             allow hexadecimal value 'F' for NUMERIC test of signed PACKED DECIN
  -fprogram-name-redefinition   program names don't lead to a reserved identifier
  -faccept-update        set WITH UPDATE clause as default for ACCEPT dest-item, instead of
  -faccept-auto          set WITH AUTO clause as default for ACCEPT dest-item, instead of WI
  -fconsole-is-crt       assume CONSOLE IS CRT if not set otherwise
  -fno-echo-means-secure        NO-ECHO hides input with asterisks like SECURE
  -fline-col-zero-default       assume the first item in a field DISPLAY goes at LINE 0 COL
  -fdisplay-special-fig-consts  special behaviour of DISPLAY SPACE/ALL X'01'/ALL X'02'/ALL X
  -fbinary-comp-1        COMP-1 is a 16-bit signed integer
  -fmove-non-numeric-lit-to-numeric-is-zero     imply zero in move of non-numeric literal to
  -fcomment-paragraphs=<support>        comment paragraphs in IDENTIFICATION DIVISION (AUTHO
  -fmemory-size-clause=<support>        MEMORY-SIZE clause
  -fmultiple-file-tape-clause=<support> MULTIPLE-FILE-TAPE clause
  -flabel-records-clause=<support>      LABEL-RECORDS clause
  -fvalue-of-clause=<support>   VALUE-OF clause
  -fdata-records-clause=<support>       DATA-RECORDS clause
  -ftop-level-occurs-clause=<support>   OCCURS clause on top-level
  -fsynchronized-clause=<support>       SYNCHRONIZED clause
  -fgoto-statement-without-name=<support>       GOTO statement without name
```

```
-fstop-literal-statement=<support>    STOP-literal statement
-fstop-identifier-statement=<support> STOP-identifier statement
-fdebugging-mode=<support>    DEBUGGING MODE and debugging indicator
-fuse-for-debugging=<support> USE FOR DEBUGGING
-fpadding-character-clause=<support>  PADDING CHARACTER clause
-fnext-sentence-phrase=<support>      NEXT SENTENCE phrase
-flisting-statements=<support>        listing-directive statements EJECT, SKIP1, SKIP2, SK
-ftitle-statement=<support>   listing-directive statement TITLE
-fentry-statement=<support>   ENTRY statement
-fmove-noninteger-to-alphanumeric=<support>   move noninteger to alphanumeric
-fmove-figurative-constant-to-numeric=<support>       move figurative constants to numeric
-fmove-figurative-space-to-numeric=<support>  move figurative constant SPACE to numeric
-fmove-figurative-quote-to-numeric=<support>  move figurative constant QUOTE to numeric
-fodo-without-to=<support>    OCCURS DEPENDING ON without to
-fsection-segments=<support>  section segments
-falter-statement=<support>   ALTER statement
-fcall-overflow=<support>     OVERFLOW clause for CALL
-fnumeric-boolean=<support>   boolean literals (B'1010')
-fhexadecimal-boolean=<support>       hexadecimal-boolean literals (BX'A')
-fnational-literals=<support> national literals (N'UTF-16 string')
-fhexadecimal-national-literals=<support>     hexadecimal-national literals (NX'265E')
-fnational-character-literals=<support>       non-standard national literals (NC'UTF-16 st
-facu-literals=<support>      ACUCOBOL-GT literals (#B #O #H #X)
-fword-continuation=<support> continuation of COBOL words
-fnot-exception-before-exception=<support>    NOT ON EXCEPTION before ON EXCEPTION
-faccept-display-extensions=<support> extensions to ACCEPT and DISPLAY
-frenames-uncommon-levels=<support>   RENAMES of 01-, 66- and 77-level items
-fsymbolic-constant=<support> constants defined in SPECIAL-NAMES
-fconstant-78=<support>       constant with level 78 item (note: has left to right precede
-fconstant-01=<support>       constant with level 01 CONSTANT AS/FROM item
-fperform-varying-without-by=<support>        PERFORM VARYING without BY phrase (implies 1
-fprogram-prototypes=<support>        CALL/CANCEL with program-prototype-name
-freference-out-of-declaratives=<support>     references to sections not in DECLARATIVES f
-fnumeric-value-for-edited-item=<support>     numeric literals in VALUE clause of numeric-
-fincorrect-conf-sec-order=<support>  incorrect order of CONFIGURATION SECTION paragraphs
-fdefine-constant-directive=<support> allow >> DEFINE CONSTANT var AS literal
-ffree-redefines-position=<support>   REDEFINES clause not following entry-name in definit
-frecord-delimiter=<support>  RECORD DELIMITER clause
-fsequential-delimiters=<support>     BINARY-SEQUENTIAL and LINE-SEQUENTIAL phrases in REC
-frecord-delim-with-fixed-recs=<support>      RECORD DELIMITER clause on file with fixed-l
-fmissing-statement=<support> missing statement (e.g. empty IF / PERFORM)
-fzero-length-literals=<support>      zero-length literals, e.g. '' and ""
-fxml-generate=<support>      XML GENERATE statement
-fxml-generate-extra-phrases=<support>        XML GENERATE's phrases other than COUNT IN
-fjson-generate=<support>     JSON GENERATE statement
      where <support> is one of the following:
      'ok', 'warning', 'archaic', 'obsolete', 'skip', 'ignore', 'error', 'unconformable'
-fnot-reserved=<word>  word to be taken out of the reserved words list
-freserved=<word>     word to be added to reserved words list
-freserved=<word>:<alias>     word to be added to reserved words list as alias
-fnot-register=<word>  special register to disable
-fregister=<word>     special register to enable
```

```
Report bugs to: bug-gnucobol@gnu.org
or (preferably) use the issue tracker via the home page.
GnuCOBOL home page: <https://www.gnu.org/software/gnucobol/>
General help using GNU software: <https://www.gnu.org/gethelp/>
```

Appendix B `cobc --list-reserved`

Reserved Words	Implemented
3-D	Yes (Context sensitive)
ABSENT	Yes
ACCEPT	Yes
ACCESS	Yes
ACTION	Yes (Context sensitive)
ACTIVE-CLASS	No
ACTIVE-X	Yes (Context sensitive)
ADD	Yes
ADDRESS	Yes
ADJUSTABLE-COLUMNS	Yes (Context sensitive)
ADVANCING	Yes
AFTER	Yes
ALIGNED	No
ALIGNMENT	Yes (Context sensitive)
ALL	Yes
ALLOCATE	Yes
ALLOWING	Yes (Context sensitive)
ALPHABET	Yes
ALPHABETIC	Yes
ALPHABETIC-LOWER	Yes
ALPHABETIC-UPPER	Yes
ALPHANUMERIC	Yes
ALPHANUMERIC-EDITED	Yes
ALSO	Yes
ALTER	Yes
ALTERNATE	Yes
AND	Yes
ANY	Yes
ANYCASE	No
APPLY	Yes (Context sensitive)
ARE	Yes
AREA	Yes (aliased with AREAS)
AREAS	Yes (aliased with AREA)
ARGUMENT-NUMBER	Yes
ARGUMENT-VALUE	Yes
ARITHMETIC	Yes (Context sensitive)
AS	Yes
ASCENDING	Yes
ASCII	Yes (Context sensitive)
ASSIGN	Yes
AT	Yes
ATTRIBUTE	Yes (Context sensitive)
ATTRIBUTES	Yes (Context sensitive)
AUTO	Yes (Context sensitive) (aliased with AUTO-SKIP, AUTOTERMINA
AUTO-DECIMAL	Yes (Context sensitive)
AUTO-SKIP	Yes (aliased with AUTO, AUTOTERMINATE)
AUTO-SPIN	Yes (Context sensitive)
AUTOMATIC	Yes

```
AUTOTERMINATE                 Yes (aliased with AUTO, AUTO-SKIP)
AWAY-FROM-ZERO                Yes (Context sensitive)
B-AND                         No
B-NOT                         No
B-OR                          No
B-XOR                         No
BACKGROUND-COLOR              Yes (Context sensitive) (aliased with BACKGROUND-COLOUR)
BACKGROUND-COLOUR             Yes (aliased with BACKGROUND-COLOR)
BACKGROUND-HIGH               Yes
BACKGROUND-LOW                Yes
BACKGROUND-STANDARD           Yes
BAR                           Yes (Context sensitive)
BASED                         Yes
BEEP                          Yes (aliased with BELL)
BEFORE                        Yes
BELL                          Yes (Context sensitive) (aliased with BEEP)
BINARY                        Yes
BINARY-C-LONG                 Yes
BINARY-CHAR                   Yes
BINARY-DOUBLE                 Yes (aliased with BINARY-LONG-LONG)
BINARY-INT                    Yes (aliased with BINARY-LONG)
BINARY-LONG                   Yes (aliased with BINARY-INT)
BINARY-LONG-LONG              Yes (aliased with BINARY-DOUBLE)
BINARY-SEQUENTIAL             Yes (Context sensitive)
BINARY-SHORT                  Yes
BIT                           Yes
BITMAP                        Yes (Context sensitive)
BITMAP-END                    Yes (Context sensitive)
BITMAP-HANDLE                 Yes (Context sensitive)
BITMAP-NUMBER                 Yes (Context sensitive)
BITMAP-START                  Yes (Context sensitive)
BITMAP-TIMER                  Yes (Context sensitive)
BITMAP-TRAILING               Yes (Context sensitive)
BITMAP-TRANSPARENT-COLOR      Yes (Context sensitive)
BITMAP-WIDTH                  Yes (Context sensitive)
BLANK                         Yes
BLINK                         Yes (Context sensitive)
BLOCK                         Yes
BOOLEAN                       No
BOTTOM                        Yes
BOX                           Yes (Context sensitive)
BOXED                         Yes (Context sensitive)
BULK-ADDITION                 Yes (Context sensitive)
BUSY                          Yes (Context sensitive)
BUTTONS                       Yes (Context sensitive)
BY                            Yes
BYTE-LENGTH                   Yes (Context sensitive)
CALENDAR-FONT                 Yes (Context sensitive)
CALL                          Yes
CANCEL                        Yes
CANCEL-BUTTON                 Yes (Context sensitive)
CAPACITY                      Yes (Context sensitive)
```

```
CARD-PUNCH                      Yes (Context sensitive)
CARD-READER                     Yes (Context sensitive)
CASSETTE                        Yes (Context sensitive)
CCOL                            Yes (Context sensitive)
CD                              Yes
CELL                            Yes (Context sensitive) (aliased with CELLS)
CELL-COLOR                      Yes (Context sensitive)
CELL-DATA                       Yes (Context sensitive)
CELL-FONT                       Yes (Context sensitive)
CELL-PROTECTION                 Yes (Context sensitive)
CELLS                           Yes (aliased with CELL)
CENTER                          Yes (Context sensitive)
CENTERED                        Yes (Context sensitive)
CENTERED-HEADINGS               Yes (Context sensitive)
CENTURY-DATE                    Yes (Context sensitive)
CF                              Yes
CH                              Yes
CHAIN                           No
CHAINING                        Yes
CHARACTER                       Yes
CHARACTERS                      Yes
CHECK-BOX                       Yes (Context sensitive)
CLASS                           Yes
CLASS-ID                        No
CLASSIFICATION                  Yes (Context sensitive)
CLEAR-SELECTION                 Yes (Context sensitive)
CLINE                           Yes (Context sensitive)
CLINES                          Yes (Context sensitive)
CLOSE                           Yes
COBOL                           Yes (Context sensitive)
CODE                            Yes
CODE-SET                        Yes
COL                             Yes
COLLATING                       Yes
COLOR                           Yes
COLORS                          Yes (Context sensitive) (aliased with COLOURS)
COLOURS                         Yes (aliased with COLORS)
COLS                            Yes
COLUMN                          Yes
COLUMN-COLOR                    Yes (Context sensitive)
COLUMN-DIVIDERS                 Yes (Context sensitive)
COLUMN-FONT                     Yes (Context sensitive)
COLUMN-HEADINGS                 Yes (Context sensitive)
COLUMN-PROTECTION               Yes (Context sensitive)
COLUMNS                         Yes
COMBO-BOX                       Yes (Context sensitive)
COMMA                           Yes
COMMAND-LINE                    Yes
COMMIT                          Yes
COMMON                          Yes
COMMUNICATION                   Yes
COMP                            Yes (aliased with COMPUTATIONAL)
```

```
COMP-0                          Yes (aliased with COMPUTATIONAL-0)
COMP-1                          Yes (aliased with COMPUTATIONAL-1)
COMP-2                          Yes (aliased with COMPUTATIONAL-2)
COMP-3                          Yes (aliased with COMPUTATIONAL-3)
COMP-4                          Yes (aliased with COMPUTATIONAL-4)
COMP-5                          Yes (aliased with COMPUTATIONAL-5)
COMP-6                          Yes (aliased with COMPUTATIONAL-6)
COMP-N                          Yes (aliased with COMPUTATIONAL-N)
COMP-X                          Yes (aliased with COMPUTATIONAL-X)
COMPUTATIONAL                   Yes (aliased with COMP)
COMPUTATIONAL-0                 Yes (aliased with COMP-0)
COMPUTATIONAL-1                 Yes (aliased with COMP-1)
COMPUTATIONAL-2                 Yes (aliased with COMP-2)
COMPUTATIONAL-3                 Yes (aliased with COMP-3)
COMPUTATIONAL-4                 Yes (aliased with COMP-4)
COMPUTATIONAL-5                 Yes (aliased with COMP-5)
COMPUTATIONAL-6                 Yes (aliased with COMP-6)
COMPUTATIONAL-N                 Yes (aliased with COMP-N)
COMPUTATIONAL-X                 Yes (aliased with COMP-X)
COMPUTE                         Yes
CONDITION                       Yes
CONFIGURATION                   Yes
CONSTANT                        Yes
CONTAINS                        Yes
CONTENT                         Yes
CONTINUE                        Yes
CONTROL                         Yes
CONTROLS                        Yes
CONVERSION                      Yes (Context sensitive)
CONVERTING                      Yes
COPY                            Yes
COPY-SELECTION                  Yes (Context sensitive)
CORR                            Yes (aliased with CORRESPONDING)
CORRESPONDING                   Yes (aliased with CORR)
COUNT                           Yes
CRT                             Yes
CRT-UNDER                       Yes
CSIZE                           Yes (Context sensitive)
CURRENCY                        Yes
CURSOR                          Yes
CURSOR-COL                      Yes (Context sensitive)
CURSOR-COLOR                    Yes (Context sensitive)
CURSOR-FRAME-WIDTH              Yes (Context sensitive)
CURSOR-ROW                      Yes (Context sensitive)
CURSOR-X                        Yes (Context sensitive)
CURSOR-Y                        Yes (Context sensitive)
CUSTOM-PRINT-TEMPLATE           Yes (Context sensitive)
CYCLE                           Yes (Context sensitive)
DASHED                          Yes (Context sensitive)
DATA                            Yes
DATA-COLUMNS                    Yes (Context sensitive)
DATA-POINTER                    No
```

```
DATA-TYPES                      Yes (Context sensitive)
DATE                            Yes
DATE-ENTRY                      Yes (Context sensitive)
DAY                             Yes
DAY-OF-WEEK                     Yes
DE                              Yes
DEBUGGING                       Yes
DECIMAL-POINT                   Yes
DECLARATIVES                    Yes
DEFAULT                         Yes
DEFAULT-BUTTON                  Yes (Context sensitive)
DEFAULT-FONT                    Yes
DELETE                          Yes
DELIMITED                       Yes
DELIMITER                       Yes
DEPENDING                       Yes
DESCENDING                      Yes
DESTINATION                     Yes
DESTROY                         Yes
DETAIL                          Yes
DISABLE                         Yes
DISC                            Yes (Context sensitive)
DISK                            Yes (Context sensitive)
DISPLAY                         Yes
DISPLAY-COLUMNS                 Yes (Context sensitive)
DISPLAY-FORMAT                  Yes (Context sensitive)
DIVIDE                          Yes
DIVIDER-COLOR                   Yes (Context sensitive)
DIVIDERS                        Yes (Context sensitive)
DIVISION                        Yes
DOTDASH                         Yes (Context sensitive)
DOTTED                          Yes (Context sensitive)
DOUBLE                          Yes (aliased with FLOAT-LONG)
DOWN                            Yes
DRAG-COLOR                      Yes (Context sensitive)
DROP-DOWN                       Yes (Context sensitive)
DROP-LIST                       Yes (Context sensitive)
DUPLICATES                      Yes
DYNAMIC                         Yes
EBCDIC                          Yes (Context sensitive)
EC                              Yes
ECHO                            Yes
EGI                             Yes
ELEMENT                         Yes (Context sensitive)
ELSE                            Yes
EMI                             Yes
EMPTY-CHECK                     Yes (aliased with REQUIRED)
ENABLE                          Yes
ENCODING                        Yes (Context sensitive)
ENCRYPTION                      Yes (Context sensitive)
END                             Yes
END-ACCEPT                      Yes
```

```
END-ADD                         Yes
END-CALL                        Yes
END-CHAIN                       No
END-COLOR                       Yes (Context sensitive)
END-COMPUTE                     Yes
END-DELETE                      Yes
END-DISPLAY                     Yes
END-DIVIDE                      Yes
END-EVALUATE                    Yes
END-IF                          Yes
END-JSON                        Yes
END-MODIFY                      Yes (Context sensitive)
END-MULTIPLY                    Yes
END-OF-PAGE                     Yes (aliased with EOP)
END-PERFORM                     Yes
END-READ                        Yes
END-RECEIVE                     Yes
END-RETURN                      Yes
END-REWRITE                     Yes
END-SEARCH                      Yes
END-START                       Yes
END-STRING                      Yes
END-SUBTRACT                    Yes
END-UNSTRING                    Yes
END-WRITE                       Yes
END-XML                         Yes
ENGRAVED                        Yes (Context sensitive)
ENSURE-VISIBLE                  Yes (Context sensitive)
ENTRY                           Yes
ENTRY-CONVENTION                Yes (Context sensitive)
ENTRY-FIELD                     Yes (Context sensitive)
ENTRY-REASON                    Yes (Context sensitive)
ENVIRONMENT                     Yes
ENVIRONMENT-NAME                Yes
ENVIRONMENT-VALUE               Yes
EO                              No
EOL                             Yes (Context sensitive)
EOP                             Yes (aliased with END-OF-PAGE)
EOS                             Yes (Context sensitive)
EQUAL                           Yes (aliased with EQUALS)
EQUALS                          Yes (aliased with EQUAL)
ERASE                           Yes (Context sensitive)
ERROR                           Yes
ESCAPE                          Yes
ESCAPE-BUTTON                   Yes (Context sensitive)
ESI                             Yes
EVALUATE                        Yes
EVENT                           Yes
EVENT-LIST                      Yes (Context sensitive)
EVERY                           Yes (Context sensitive)
EXCEPTION                       Yes
EXCEPTION-OBJECT                No
```

```
EXCEPTION-VALUE                 Yes (Context sensitive)
EXCLUSIVE                       Yes
EXIT                            Yes
EXPAND                          Yes (Context sensitive)
EXPANDS                         No (Context sensitive)
EXTEND                          Yes
EXTERN                          Yes (Context sensitive)
EXTERNAL                        Yes
EXTERNAL-FORM                   Yes
F                               Yes (Context sensitive)
FACTORY                         No
FALSE                           Yes
FD                              Yes
FH--FCD                         Yes (Context sensitive)
FH--KEYDEF                      Yes (Context sensitive)
FILE                            Yes
FILE-CONTROL                    Yes
FILE-ID                         Yes
FILE-NAME                       Yes (Context sensitive)
FILE-POS                        Yes (Context sensitive)
FILL-COLOR                      Yes (Context sensitive)
FILL-COLOR2                     Yes (Context sensitive)
FILL-PERCENT                    Yes (Context sensitive)
FILLER                          Yes
FINAL                           Yes
FINISH-REASON                   Yes (Context sensitive)
FIRST                           Yes
FIXED                           Yes
FIXED-FONT                      Yes
FIXED-WIDTH                     Yes (Context sensitive)
FLAT                            Yes (Context sensitive)
FLAT-BUTTONS                    Yes (Context sensitive)
FLOAT                           Yes (aliased with FLOAT-SHORT)
FLOAT-BINARY-128                No
FLOAT-BINARY-32                 No
FLOAT-BINARY-64                 No
FLOAT-DECIMAL-16                Yes
FLOAT-DECIMAL-34                Yes
FLOAT-EXTENDED                  No
FLOAT-INFINITY                  No
FLOAT-LONG                      Yes (aliased with DOUBLE)
FLOAT-NOT-A-NUMBER              No (Context sensitive)
FLOAT-SHORT                     Yes (aliased with FLOAT)
FLOATING                        Yes
FONT                            Yes
FOOTING                         Yes
FOR                             Yes
FOREGROUND-COLOR                Yes (Context sensitive) (aliased with FOREGROUND-COLOUR)
FOREGROUND-COLOUR               Yes (aliased with FOREGROUND-COLOR)
FOREVER                         Yes (Context sensitive)
FORMAT                          No
FRAME                           Yes (Context sensitive)
```

```
FRAMED                          Yes (Context sensitive)
FREE                            Yes
FROM                            Yes
FULL                            Yes (Context sensitive) (aliased with LENGTH-CHECK)
FULL-HEIGHT                     Yes (Context sensitive)
FUNCTION                        Yes
FUNCTION-ID                     Yes
FUNCTION-POINTER                No
GENERATE                        Yes
GET                             No
GIVING                          Yes
GLOBAL                          Yes
GO                              Yes
GO-BACK                         Yes (Context sensitive)
GO-FORWARD                      Yes (Context sensitive)
GO-HOME                         Yes (Context sensitive)
GO-SEARCH                       Yes (Context sensitive)
GOBACK                          Yes
GRAPHICAL                       Yes (Context sensitive)
GREATER                         Yes
GRID                            Yes (Context sensitive)
GROUP                           Yes
GROUP-USAGE                     No
GROUP-VALUE                     Yes (Context sensitive)
HANDLE                          Yes
HAS-CHILDREN                    Yes (Context sensitive)
HEADING                         Yes
HEADING-COLOR                   Yes (Context sensitive)
HEADING-DIVIDER-COLOR           Yes (Context sensitive)
HEADING-FONT                    Yes (Context sensitive)
HEAVY                           Yes (Context sensitive)
HEIGHT-IN-CELLS                 Yes (Context sensitive)
HIDDEN-DATA                     Yes (Context sensitive)
HIGH-COLOR                      Yes (Context sensitive)
HIGH-VALUE                      Yes (aliased with HIGH-VALUES)
HIGH-VALUES                     Yes (aliased with HIGH-VALUE)
HIGHLIGHT                       Yes (Context sensitive)
HOT-TRACK                       Yes (Context sensitive)
HSCROLL                         Yes (Context sensitive)
HSCROLL-POS                     Yes (Context sensitive)
I-O                             Yes
I-O-CONTROL                     Yes
ICON                            Yes (Context sensitive)
ID                              Yes
IDENTIFICATION                  Yes
IDENTIFIED                      Yes
IF                              Yes
IGNORE                          Yes
IGNORING                        Yes (Context sensitive)
IMPLEMENTS                      No (Context sensitive)
IN                              Yes
INDEPENDENT                     Yes (Context sensitive)
```

```
INDEX                          Yes
INDEXED                        Yes
INDICATE                       Yes
INHERITS                       No
INITIAL                        Yes
INITIALISE                     Yes (aliased with INITIALIZE)
INITIALISED                    Yes (aliased with INITIALIZED)
INITIALIZE                     Yes (aliased with INITIALISE)
INITIALIZED                    Yes (Context sensitive) (aliased with INITIALISED)
INITIATE                       Yes
INPUT                          Yes
INPUT-OUTPUT                   Yes
INQUIRE                        Yes
INSERT-ROWS                    Yes (Context sensitive)
INSERTION-INDEX                Yes (Context sensitive)
INSPECT                        Yes
INTERFACE                      No
INTERFACE-ID                   No
INTERMEDIATE                   Yes (Context sensitive)
INTO                           Yes
INTRINSIC                      Yes (Context sensitive)
INVALID                        Yes
INVOKE                         No
IS                             Yes
ITEM                           Yes (Context sensitive)
ITEM-TEXT                      Yes (Context sensitive)
ITEM-TO-ADD                    Yes (Context sensitive)
ITEM-TO-DELETE                 Yes (Context sensitive)
ITEM-TO-EMPTY                  Yes (Context sensitive)
ITEM-VALUE                     Yes (Context sensitive)
JSON                           Yes
JUST                           Yes (aliased with JUSTIFIED)
JUSTIFIED                      Yes (aliased with JUST)
KEPT                           Yes
KEY                            Yes
KEYBOARD                       Yes (Context sensitive)
LABEL                          Yes
LABEL-OFFSET                   Yes (Context sensitive)
LARGE-FONT                     Yes
LARGE-OFFSET                   Yes (Context sensitive)
LAST                           Yes
LAST-ROW                       Yes (Context sensitive)
LAYOUT-DATA                    Yes (Context sensitive)
LAYOUT-MANAGER                 Yes
LC_ALL                         No (Context sensitive)
LC_COLLATE                     No (Context sensitive)
LC_CTYPE                       No (Context sensitive)
LC_MESSAGES                    No (Context sensitive)
LC_MONETARY                    No (Context sensitive)
LC_NUMERIC                     No (Context sensitive)
LC_TIME                        No (Context sensitive)
LEADING                        Yes
```

```
LEADING-SHIFT                 Yes (Context sensitive)
LEFT                          Yes
LEFT-JUSTIFY                  No
LEFT-TEXT                     Yes (Context sensitive)
LEFTLINE                      Yes
LENGTH                        Yes
LENGTH-CHECK                  Yes (aliased with FULL)
LESS                          Yes
LIMIT                         Yes
LIMITS                        Yes
LINAGE                        Yes
LINAGE-COUNTER                Yes
LINE                          Yes
LINE-COUNTER                  Yes
LINE-SEQUENTIAL               Yes (Context sensitive)
LINES                         Yes
LINES-AT-ROOT                 Yes (Context sensitive)
LINKAGE                       Yes
LIST-BOX                      Yes (Context sensitive)
LM-RESIZE                     Yes
LOC                           Yes (Context sensitive)
LOCAL-STORAGE                 Yes
LOCALE                        Yes
LOCK                          Yes
LONG-DATE                     Yes (Context sensitive)
LOW-COLOR                     Yes (Context sensitive)
LOW-VALUE                     Yes (aliased with LOW-VALUES)
LOW-VALUES                    Yes (aliased with LOW-VALUE)
LOWER                         Yes (Context sensitive)
LOWERED                       Yes (Context sensitive)
LOWLIGHT                      Yes (Context sensitive)
MAGNETIC-TAPE                 Yes (Context sensitive)
MANUAL                        Yes
MASS-UPDATE                   Yes (Context sensitive)
MAX-LINES                     Yes (Context sensitive)
MAX-PROGRESS                  Yes (Context sensitive)
MAX-TEXT                      Yes (Context sensitive)
MAX-VAL                       Yes (Context sensitive)
MEDIUM-FONT                   Yes
MEMORY                        Yes (Context sensitive)
MENU                          Yes
MERGE                         Yes
MESSAGE                       Yes
METHOD                        No
METHOD-ID                     No
MIN-VAL                       Yes (Context sensitive)
MINUS                         Yes
MODE                          Yes
MODIFY                        Yes
MODULES                       Yes (Context sensitive)
MOVE                          Yes
MULTILINE                     Yes (Context sensitive)
```

```
MULTIPLE                        Yes
MULTIPLY                        Yes
NAME                            Yes (Context sensitive)
NAMESPACE                       Yes (Context sensitive)
NAMESPACE-PREFIX                Yes (Context sensitive)
NATIONAL                        Yes
NATIONAL-EDITED                 Yes
NATIVE                          Yes
NAVIGATE-URL                    Yes (Context sensitive)
NEAREST-AWAY-FROM-ZERO          Yes (Context sensitive)
NEAREST-EVEN                    Yes (Context sensitive)
NEAREST-TOWARD-ZERO             Yes (Context sensitive)
NEGATIVE                        Yes
NESTED                          Yes
NEW                             Yes
NEXT                            Yes
NEXT-ITEM                       Yes (Context sensitive)
NO                              Yes
NO-AUTO-DEFAULT                 Yes (Context sensitive)
NO-AUTOSEL                      Yes (Context sensitive)
NO-BOX                          Yes (Context sensitive)
NO-DIVIDERS                     Yes (Context sensitive)
NO-ECHO                         Yes
NO-F4                           Yes (Context sensitive)
NO-FOCUS                        Yes (Context sensitive)
NO-GROUP-TAB                    Yes (Context sensitive)
NO-KEY-LETTER                   Yes (Context sensitive)
NO-SEARCH                       Yes (Context sensitive)
NO-UPDOWN                       Yes (Context sensitive)
NONE                            No (Context sensitive)
NONNUMERIC                      Yes (Context sensitive)
NORMAL                          Yes (Context sensitive)
NOT                             Yes
NOTAB                           Yes (Context sensitive)
NOTHING                         Yes
NOTIFY                          Yes (Context sensitive)
NOTIFY-CHANGE                   Yes (Context sensitive)
NOTIFY-DBLCLICK                 Yes (Context sensitive)
NOTIFY-SELCHANGE                Yes (Context sensitive)
NULL                            Yes (aliased with NULLS)
NULLS                           Yes (aliased with NULL)
NUM-COL-HEADINGS                Yes (Context sensitive)
NUM-ROWS                        Yes (Context sensitive)
NUMBER                          Yes
NUMBERS                         Yes
NUMERIC                         Yes
NUMERIC-EDITED                  Yes
OBJECT                          Yes
OBJECT-COMPUTER                 Yes
OBJECT-REFERENCE                No
OCCURS                          Yes
OF                              Yes
```

```
OFF                             Yes
OK-BUTTON                       Yes (Context sensitive)
OMITTED                         Yes
ON                              Yes
ONLY                            Yes
OPEN                            Yes
OPTIONAL                        Yes
OPTIONS                         Yes
OR                              Yes
ORDER                           Yes
ORGANISATION                    Yes (aliased with ORGANIZATION)
ORGANIZATION                    Yes (aliased with ORGANISATION)
OTHER                           Yes
OTHERS                          Yes (Context sensitive)
OUTPUT                          Yes
OVERFLOW                        Yes
OVERLAP-LEFT                    Yes (Context sensitive) (aliased with OVERLAP-TOP)
OVERLAP-TOP                     Yes (Context sensitive) (aliased with OVERLAP-LEFT)
OVERLINE                        Yes
OVERRIDE                        No
PACKED-DECIMAL                  Yes
PADDING                         Yes
PAGE                            Yes
PAGE-COUNTER                    Yes
PAGE-SETUP                      Yes (Context sensitive)
PAGED                           Yes (Context sensitive)
PARAGRAPH                       Yes (Context sensitive)
PARENT                          Yes (Context sensitive)
PARSE                           Yes (Context sensitive)
PASSWORD                        Yes (Context sensitive)
PERFORM                         Yes
PERMANENT                       Yes (Context sensitive)
PF                              Yes
PH                              Yes
PHYSICAL                        Yes
PIC                             Yes (aliased with PICTURE)
PICTURE                         Yes (aliased with PIC)
PIXEL                           Yes (Context sensitive) (aliased with PIXELS)
PIXELS                          Yes (aliased with PIXEL)
PLACEMENT                       Yes (Context sensitive)
PLUS                            Yes
POINTER                         Yes
POP-UP                          Yes (Context sensitive)
POS                             Yes
POSITION                        Yes
POSITION-SHIFT                  Yes (Context sensitive)
POSITIVE                        Yes
PREFIXED                        No (Context sensitive)
PRESENT                         Yes
PREVIOUS                        Yes (Context sensitive)
PRINT                           Yes (Context sensitive)
PRINT-NO-PROMPT                 Yes (Context sensitive)
```

```
PRINT-PREVIEW                   Yes (Context sensitive)
PRINTER                         Yes (Context sensitive)
PRINTER-1                       Yes (Context sensitive)
PRINTING                        Yes
PRIORITY                        Yes
PROCEDURE                       Yes
PROCEDURE-POINTER               Yes (aliased with PROGRAM-POINTER)
PROCEDURES                      Yes
PROCEED                         Yes
PROCESSING                      Yes (Context sensitive)
PROGRAM                         Yes
PROGRAM-ID                      Yes
PROGRAM-POINTER                 Yes (aliased with PROCEDURE-POINTER)
PROGRESS                        Yes (Context sensitive)
PROHIBITED                      Yes (Context sensitive)
PROMPT                          Yes
PROPERTIES                      Yes (Context sensitive)
PROPERTY                        Yes
PROTECTED                       Yes (Context sensitive)
PROTOTYPE                       No
PURGE                           Yes
PUSH-BUTTON                     Yes (Context sensitive)
QUERY-INDEX                     Yes (Context sensitive)
QUEUE                           Yes
QUOTE                           Yes (aliased with QUOTES)
QUOTES                          Yes (aliased with QUOTE)
RADIO-BUTTON                    Yes (Context sensitive)
RAISE                           Yes
RAISED                          Yes (Context sensitive)
RAISING                         No
RANDOM                          Yes
RD                              Yes
READ                            Yes
READ-ONLY                       Yes (Context sensitive)
READERS                         Yes (Context sensitive)
RECEIVE                         Yes
RECORD                          Yes
RECORD-DATA                     Yes (Context sensitive)
RECORD-TO-ADD                   Yes (Context sensitive)
RECORD-TO-DELETE                Yes (Context sensitive)
RECORDING                       Yes
RECORDS                         Yes
RECURSIVE                       Yes (Context sensitive)
REDEFINES                       Yes
REEL                            Yes
REFERENCE                       Yes
REFERENCES                      Yes
REFRESH                         Yes (Context sensitive)
REGION-COLOR                    Yes (Context sensitive)
RELATION                        No (Context sensitive)
RELATIVE                        Yes
RELEASE                         Yes
```

```
REMAINDER                      Yes
REMOVAL                        Yes
RENAMES                        Yes
REPLACE                        Yes
REPLACING                      Yes
REPORT                         Yes
REPORTING                      Yes
REPORTS                        Yes
REPOSITORY                     Yes
REQUIRED                       Yes (Context sensitive) (aliased with EMPTY-CHECK)
RESERVE                        Yes
RESET                          Yes
RESET-GRID                     Yes (Context sensitive)
RESET-LIST                     Yes (Context sensitive)
RESET-TABS                     Yes (Context sensitive)
RESUME                         No
RETRY                          Yes
RETURN                         Yes
RETURNING                      Yes
REVERSE                        Yes
REVERSE-VIDEO                  Yes (Context sensitive)
REVERSED                       Yes
REWIND                         Yes
REWRITE                        Yes
RF                             Yes
RH                             Yes
RIGHT                          Yes
RIGHT-ALIGN                    Yes (Context sensitive)
RIGHT-JUSTIFY                  No
RIMMED                         Yes (Context sensitive)
ROLLBACK                       Yes
ROUNDED                        Yes
ROUNDING                       Yes (Context sensitive)
ROW-COLOR                      Yes (Context sensitive)
ROW-COLOR-PATTERN              Yes (Context sensitive)
ROW-DIVIDERS                   Yes (Context sensitive)
ROW-FONT                       Yes (Context sensitive)
ROW-HEADINGS                   Yes (Context sensitive)
ROW-PROTECTION                 Yes (Context sensitive)
RUN                            Yes
S                              Yes (Context sensitive)
SAME                           Yes
SAVE-AS                        Yes (Context sensitive)
SAVE-AS-NO-PROMPT              Yes (Context sensitive)
SCREEN                         Yes
SCROLL                         Yes (Context sensitive)
SCROLL-BAR                     Yes (Context sensitive)
SD                             Yes
SEARCH                         Yes
SEARCH-OPTIONS                 Yes (Context sensitive)
SEARCH-TEXT                    Yes (Context sensitive)
SECONDS                        Yes (Context sensitive)
```

```
SECTION                         Yes
SECURE                          Yes (Context sensitive)
SEGMENT                         Yes
SEGMENT-LIMIT                   Yes
SELECT                          Yes
SELECT-ALL                      Yes (Context sensitive)
SELECTION-INDEX                 Yes (Context sensitive)
SELECTION-TEXT                  Yes (Context sensitive)
SELF                            No
SELF-ACT                        Yes (Context sensitive)
SEND                            Yes
SENTENCE                        Yes
SEPARATE                        Yes
SEPARATION                      Yes (Context sensitive)
SEQUENCE                        Yes
SEQUENTIAL                      Yes
SET                             Yes
SHADING                         Yes (Context sensitive)
SHADOW                          Yes (Context sensitive)
SHARING                         Yes
SHORT-DATE                      Yes (Context sensitive)
SHOW-LINES                      Yes (Context sensitive)
SHOW-NONE                       Yes (Context sensitive)
SHOW-SEL-ALWAYS                 Yes (Context sensitive)
SIGN                            Yes
SIGNED                          Yes
SIGNED-INT                      Yes
SIGNED-LONG                     Yes
SIGNED-SHORT                    Yes
SIZE                            Yes
SMALL-FONT                      Yes
SORT                            Yes
SORT-MERGE                      Yes
SORT-ORDER                      Yes (Context sensitive)
SOURCE                          Yes
SOURCE-COMPUTER                 Yes
SOURCES                         No
SPACE                           Yes (aliased with SPACES)
SPACE-FILL                      No
SPACES                          Yes (aliased with SPACE)
SPECIAL-NAMES                   Yes
SPINNER                         Yes (Context sensitive)
SQUARE                          Yes (Context sensitive)
STANDARD                        Yes
STANDARD-1                      Yes
STANDARD-2                      Yes
STANDARD-BINARY                 Yes (Context sensitive)
STANDARD-DECIMAL                Yes (Context sensitive)
START                           Yes
START-X                         Yes (Context sensitive)
START-Y                         Yes (Context sensitive)
STATEMENT                       No (Context sensitive)
```

```
STATIC                          Yes (Context sensitive)
STATIC-LIST                     Yes (Context sensitive)
STATUS                          Yes
STATUS-BAR                      Yes (Context sensitive)
STATUS-TEXT                     Yes (Context sensitive)
STDCALL                         Yes (Context sensitive)
STEP                            Yes (Context sensitive)
STOP                            Yes
STRING                          Yes
STRONG                          No (Context sensitive)
STYLE                           Yes (Context sensitive)
SUB-QUEUE-1                     Yes
SUB-QUEUE-2                     Yes
SUB-QUEUE-3                     Yes
SUBTRACT                        Yes
SUBWINDOW                       Yes
SUM                             Yes
SUPER                           No
SUPPRESS                        Yes
SYMBOL                          No (Context sensitive)
SYMBOLIC                        Yes
SYNC                            Yes (aliased with SYNCHRONISED, SYNCHRONIZED)
SYNCHRONISED                    Yes (aliased with SYNC, SYNCHRONIZED)
SYNCHRONIZED                    Yes (aliased with SYNC, SYNCHRONISED)
SYSTEM-DEFAULT                  Yes
SYSTEM-INFO                     Yes (Context sensitive)
SYSTEM-OFFSET                   Yes
TAB                             Yes (Context sensitive)
TAB-TO-ADD                      Yes (Context sensitive)
TAB-TO-DELETE                   Yes (Context sensitive)
TABLE                           Yes
TALLYING                        Yes
TAPE                            Yes (Context sensitive)
TEMPORARY                       Yes (Context sensitive)
TERMINAL-INFO                   Yes (Context sensitive)
TERMINATE                       Yes
TERMINATION-VALUE               Yes (Context sensitive)
TEST                            Yes
TEXT                            Yes
THAN                            Yes
THEN                            Yes
THREAD                          Yes
THREADS                         Yes
THROUGH                         Yes (aliased with THRU)
THRU                            Yes (aliased with THROUGH)
THUMB-POSITION                  Yes (Context sensitive)
TILED-HEADINGS                  Yes (Context sensitive)
TIME                            Yes
TIME-OUT                        Yes (Context sensitive) (aliased with TIMEOUT)
TIMEOUT                         Yes (aliased with TIME-OUT)
TIMES                           Yes
TITLE                           Yes (Context sensitive)
```

```
TITLE-POSITION                  Yes (Context sensitive)
TO                              Yes
TOP                             Yes
TOWARD-GREATER                  Yes (Context sensitive)
TOWARD-LESSER                   Yes (Context sensitive)
TRADITIONAL-FONT                Yes
TRAILING                        Yes
TRAILING-SHIFT                  Yes (Context sensitive)
TRAILING-SIGN                   No
TRANSFORM                       Yes
TRANSPARENT                     Yes (Context sensitive)
TREE-VIEW                       Yes (Context sensitive)
TRUE                            Yes
TRUNCATION                      Yes (Context sensitive)
TYPE                            Yes
TYPEDEF                         No
U                               Yes (Context sensitive)
UCS-4                           Yes (Context sensitive)
UNBOUNDED                       Yes (Context sensitive)
UNDERLINE                       Yes (Context sensitive)
UNFRAMED                        Yes (Context sensitive)
UNIT                            Yes
UNIVERSAL                       No
UNLOCK                          Yes
UNSIGNED                        Yes
UNSIGNED-INT                    Yes
UNSIGNED-LONG                   Yes
UNSIGNED-SHORT                  Yes
UNSORTED                        Yes (Context sensitive)
UNSTRING                        Yes
UNTIL                           Yes
UP                              Yes
UPDATE                          Yes
UPDATERS                        Yes (Context sensitive)
UPON                            Yes
UPPER                           Yes (Context sensitive)
USAGE                           Yes
USE                             Yes
USE-ALT                         Yes (Context sensitive)
USE-RETURN                      Yes (Context sensitive)
USE-TAB                         Yes (Context sensitive)
USER                            Yes (Context sensitive)
USER-DEFAULT                    Yes
USING                           Yes
UTF-16                          Yes (Context sensitive)
UTF-8                           Yes (Context sensitive)
V                               Yes (Context sensitive)
VAL-STATUS                      No
VALID                           No
VALIDATE                        Yes
VALIDATE-STATUS                 No
VALIDATING                      Yes (Context sensitive)
```

```
VALUE                          Yes (aliased with VALUES)
VALUE-FORMAT                   Yes (Context sensitive)
VALUES                         Yes (aliased with VALUE)
VARIABLE                       Yes (Context sensitive)
VARIANT                        Yes
VARYING                        Yes
VERTICAL                       Yes (Context sensitive)
VERY-HEAVY                     Yes (Context sensitive)
VIRTUAL-WIDTH                  Yes (Context sensitive)
VOLATILE                       Yes
VPADDING                       Yes (Context sensitive)
VSCROLL                        Yes (Context sensitive)
VSCROLL-BAR                    Yes (Context sensitive)
VSCROLL-POS                    Yes (Context sensitive)
VTOP                           Yes (Context sensitive)
WAIT                           Yes
WEB-BROWSER                    Yes (Context sensitive)
WHEN                           Yes
WIDTH                          Yes (Context sensitive)
WIDTH-IN-CELLS                 Yes (Context sensitive)
WINDOW                         Yes
WITH                           Yes
WORDS                          Yes
WORKING-STORAGE                Yes
WRAP                           Yes (Context sensitive)
WRITE                          Yes
WRITERS                        Yes (Context sensitive)
X                              Yes (Context sensitive)
XML                            Yes
XML-DECLARATION                Yes (Context sensitive)
Y                              Yes (Context sensitive)
YYYYDDD                        Yes (Context sensitive)
YYYYMMDD                       Yes (Context sensitive)
ZERO                           Yes (aliased with ZEROES, ZEROS)
ZERO-FILL                      No (Context sensitive)
ZEROES                         Yes (aliased with ZERO, ZEROS)
ZEROS                          Yes (aliased with ZERO, ZEROES)

Extra (obsolete) context sensitive words
AUTHOR
DATE-COMPILED
DATE-MODIFIED
DATE-WRITTEN
INSTALLATION
REMARKS
SECURITY

Internal registers             Implemented     Definition
'ADDRESS OF' phrase            Yes             USAGE POINTER
COB-CRT-STATUS                 Yes             PICTURE 9(4) USAGE DISPLAY VALUE ZERO
DEBUG-ITEM                     Yes             PICTURE X(n) USAGE DISPLAY
'LENGTH OF' phrase             Yes             CONSTANT USAGE BINARY-LONG
```

NUMBER-OF-CALL-PARAMETERS	Yes	USAGE BINARY-LONG
RETURN-CODE	Yes	GLOBAL USAGE BINARY-LONG VALUE ZERO
SORT-RETURN	Yes	GLOBAL USAGE BINARY-LONG VALUE ZERO
TALLY	Yes	GLOBAL PICTURE 9(5) USAGE BINARY VALUE ZERO
WHEN-COMPILED	Yes	CONSTANT PICTURE X(16) USAGE DISPLAY
XML-CODE	Yes	GLOBAL PICTURE S9(9) USAGE BINARY VALUE 0
JSON-CODE	Yes	GLOBAL PICTURE S9(9) USAGE BINARY VALUE 0

Appendix C `cobc --list-intrinsics`

Intrinsic Function	Implemented	Parameters
ABS	Yes	1
ACOS	Yes	1
ANNUITY	Yes	2
ASIN	Yes	1
ATAN	Yes	1
BOOLEAN-OF-INTEGER	No	2
BYTE-LENGTH	Yes	1 - 2
CHAR	Yes	1
CHAR-NATIONAL	No	1
COMBINED-DATETIME	Yes	2
CONCATENATE	Yes	Unlimited
CONTENT-LENGTH	Yes	1
CONTENT-OF	Yes	1 - 2
COS	Yes	1
CURRENCY-SYMBOL	Yes	0
CURRENT-DATE	Yes	0
DATE-OF-INTEGER	Yes	1
DATE-TO-YYYYMMDD	Yes	1 - 3
DAY-OF-INTEGER	Yes	1
DAY-TO-YYYYDDD	Yes	1 - 3
DISPLAY-OF	No	1 - 2
E	Yes	0
EXCEPTION-FILE	Yes	0
EXCEPTION-FILE-N	No	0
EXCEPTION-LOCATION	Yes	0
EXCEPTION-LOCATION-N	No	0
EXCEPTION-STATEMENT	Yes	0
EXCEPTION-STATUS	Yes	0
EXP	Yes	1
EXP10	Yes	1
FACTORIAL	Yes	1
FORMATTED-CURRENT-DATE	Yes	1
FORMATTED-DATE	Yes	2
FORMATTED-DATETIME	Yes	4 - 5
FORMATTED-TIME	Yes	3 - 4
FRACTION-PART	Yes	1
HIGHEST-ALGEBRAIC	Yes	1
INTEGER	Yes	1
INTEGER-OF-BOOLEAN	No	1
INTEGER-OF-DATE	Yes	1
INTEGER-OF-DAY	Yes	1
INTEGER-OF-FORMATTED-DATE	Yes	2
INTEGER-PART	Yes	1
LENGTH	Yes	1 - 2
LENGTH-AN	Yes	1
LOCALE-COMPARE	Yes	2 - 3
LOCALE-DATE	Yes	1 - 2
LOCALE-TIME	Yes	1 - 2

```
LOCALE-TIME-FROM-SECONDS        Yes             1 - 2
LOG                             Yes             1
LOG10                           Yes             1
LOWER-CASE                      Yes             1
LOWEST-ALGEBRAIC                Yes             1
MAX                             Yes             Unlimited
MEAN                            Yes             Unlimited
MEDIAN                          Yes             Unlimited
MIDRANGE                        Yes             Unlimited
MIN                             Yes             Unlimited
MOD                             Yes             2
MODULE-CALLER-ID                Yes             0
MODULE-DATE                     Yes             0
MODULE-FORMATTED-DATE           Yes             0
MODULE-ID                       Yes             0
MODULE-PATH                     Yes             0
MODULE-SOURCE                   Yes             0
MODULE-TIME                     Yes             0
MONETARY-DECIMAL-POINT          Yes             0
MONETARY-THOUSANDS-SEPARATOR    Yes             0
NATIONAL-OF                     No              1 - 2
NUMERIC-DECIMAL-POINT           Yes             0
NUMERIC-THOUSANDS-SEPARATOR     Yes             0
NUMVAL                          Yes             1
NUMVAL-C                        Yes             2
NUMVAL-F                        Yes             1
ORD                             Yes             1
ORD-MAX                         Yes             Unlimited
ORD-MIN                         Yes             Unlimited
PI                              Yes             0
PRESENT-VALUE                   Yes             Unlimited
RANDOM                          Yes             0 - 1
RANGE                           Yes             Unlimited
REM                             Yes             2
REVERSE                         Yes             1
SECONDS-FROM-FORMATTED-TIME     Yes             2
SECONDS-PAST-MIDNIGHT           Yes             0
SIGN                            Yes             1
SIN                             Yes             1
SQRT                            Yes             1
STANDARD-COMPARE                No              2 - 4
STANDARD-DEVIATION              Yes             Unlimited
STORED-CHAR-LENGTH              Yes             1
SUBSTITUTE                      Yes             Unlimited
SUBSTITUTE-CASE                 Yes             Unlimited
SUM                             Yes             Unlimited
TAN                             Yes             1
TEST-DATE-YYYYMMDD              Yes             1
TEST-DAY-YYYYDDD                Yes             1
TEST-FORMATTED-DATETIME         Yes             2
TEST-NUMVAL                     Yes             1
TEST-NUMVAL-C                   Yes             2
```

TEST-NUMVAL-F	Yes	1
TRIM	Yes	1 - 2
UPPER-CASE	Yes	1
VARIANCE	Yes	Unlimited
WHEN-COMPILED	Yes	0
YEAR-TO-YYYY	Yes	1 - 3

Appendix D `cobc --list-system`

System routine	Parameters
SYSTEM	1
CBL_AND	3
CBL_CHANGE_DIR	1
CBL_CHECK_FILE_EXIST	2
CBL_CLOSE_FILE	1
CBL_COPY_FILE	2
CBL_CREATE_DIR	1
CBL_CREATE_FILE	5
CBL_DELETE_DIR	1
CBL_DELETE_FILE	1
CBL_EQ	3
CBL_ERROR_PROC	2
CBL_EXIT_PROC	2
CBL_FLUSH_FILE	1
CBL_GET_CSR_POS	1
CBL_GET_CURRENT_DIR	3
CBL_GET_SCR_SIZE	2
CBL_IMP	3
CBL_NIMP	3
CBL_NOR	3
CBL_NOT	2
CBL_OPEN_FILE	5
CBL_OR	3
CBL_READ_FILE	5
CBL_READ_KBD_CHAR	1
CBL_RENAME_FILE	2
CBL_SET_CSR_POS	1
CBL_TOLOWER	2
CBL_TOUPPER	2
CBL_WRITE_FILE	5
CBL_XOR	3
CBL_GC_FORK	0
CBL_GC_GETOPT	6
CBL_GC_HOSTED	2
CBL_GC_NANOSLEEP	1
CBL_GC_PRINTABLE	1 - 2
CBL_GC_WAITPID	1
CBL_OC_GETOPT	6
CBL_OC_HOSTED	2
CBL_OC_NANOSLEEP	1
C$CALLEDBY	1
C$CHDIR	2
C$COPY	3
C$DELETE	2
C$FILEINFO	2
C$GETPID	0

C$JUSTIFY	1 - 2
C$MAKEDIR	1
C$NARG	1
C$PARAMSIZE	1
C$PRINTABLE	1 - 2
C$SLEEP	1
C$TOLOWER	2
C$TOUPPER	2
EXTFH	2
X"91"	3
X"E4"	0
X"E5"	0
X"F4"	2
X"F5"	2

Appendix E `cobc --list-mnemonics`

```
System names
SYSIN                          device name
SYSIPT                         device name
STDIN                          device name
SYSOUT                         device name
SYSLIST                        device name
SYSLST                         device name
SYSPCH                         device name
SYSPUNCH                       device name
STDOUT                         device name
PRINT                          device name
PRINTER                        device name
PRINTER-1                      device name
SYSERR                         device name
STDERR                         device name
CONSOLE                        device name
C01                            feature name
C02                            feature name
C03                            feature name
C04                            feature name
C05                            feature name
C06                            feature name
C07                            feature name
C08                            feature name
C09                            feature name
C10                            feature name
C11                            feature name
C12                            feature name
S01                            feature name
S02                            feature name
S03                            feature name
S04                            feature name
S05                            feature name
CSP                            feature name
FORMFEED                       feature name
CALL-CONVENTION                feature name
SWITCH-0                       switch name
SWITCH-1                       switch name
SWITCH-2                       switch name
SWITCH-3                       switch name
SWITCH-4                       switch name
SWITCH-5                       switch name
SWITCH-6                       switch name
SWITCH-7                       switch name
SWITCH-8                       switch name
SWITCH-9                       switch name
SWITCH-10                      switch name
SWITCH-11                      switch name
SWITCH-12                      switch name
```

SWITCH-13	switch name
SWITCH-14	switch name
SWITCH-15	switch name
SWITCH-16	switch name
SWITCH-17	switch name
SWITCH-18	switch name
SWITCH-19	switch name
SWITCH-20	switch name
SWITCH-21	switch name
SWITCH-22	switch name
SWITCH-23	switch name
SWITCH-24	switch name
SWITCH-25	switch name
SWITCH-26	switch name
SWITCH-27	switch name
SWITCH-28	switch name
SWITCH-29	switch name
SWITCH-30	switch name
SWITCH-31	switch name
SWITCH-32	switch name
SWITCH-33	switch name
SWITCH-34	switch name
SWITCH-35	switch name
SWITCH-36	switch name

Appendix F Compiler Configuration

The following list was extracted from `config/default.conf`.

```
# Value: any string
name: "GnuCOBOL"

# Value: enum
standard-define                 0
#        CB_STD_OC = 0,
#        CB_STD_MF,
#        CB_STD_IBM,
#        CB_STD_MVS,
#        CB_STD_BS2000,
#        CB_STD_ACU,
#        CB_STD_85,
#        CB_STD_2002,
#        CB_STD_2014

# Value: int
tab-width:                      8
text-column:                    72
# Maximum word-length for COBOL words / Programmer defined words
# Be aware that GC checks the word length against COB_MAX_WORDLEN
# first (currently 61)
word-length:                    61

# Maximum literal size in general
literal-length:                 8191

# Maximum numeric literal size (absolute maximum: 38)
numeric-literal-length:         38

# Maximum number of characters allowed in the character-string (max. 255)
pic-length:                     255

# Value: 'mf', 'ibm'
#
assign-clause:                  mf

# If yes, file names are resolved at run time using
# environment variables.
# For example, given ASSIGN TO "DATAFILE", the file name will be
#  1. the value of environment variable 'DD_DATAFILE' or
#  2. the value of environment variable 'dd_DATAFILE' or
#  3. the value of environment variable 'DATAFILE' or
#  4. the literal "DATAFILE"
# If no, the value of the assign clause is the file name.
#
filename-mapping:               yes
```

```
# Alternate formatting of numeric fields
pretty-display:                 yes

# Allow complex OCCURS DEPENDING ON
complex-odo:                    no

# Allow REDEFINES to other than last equal level number
indirect-redefines:             no

# Binary byte size - defines the allocated bytes according to PIC
# Value:          signed  unsigned  bytes
#                 ------  --------  -----
# '2-4-8'          1 -  4    same        2
#                  5 -  9    same        4
#                 10 - 18    same        8
#
# '1-2-4-8'        1 -  2    same        1
#                  3 -  4    same        2
#                  5 -  9    same        4
#                 10 - 18    same        8
#
# '1--8'           1 -  2    1 -  2      1
#                  3 -  4    3 -  4      2
#                  5 -  6    5 -  7      3
#                  7 -  9    8 -  9      4
#                 10 - 11   10 - 12      5
#                 12 - 14   13 - 14      6
#                 15 - 16   15 - 16      7
#                 17 - 18   17 - 18      8
#
binary-size:                    1-2-4-8

# Numeric truncation according to ANSI
binary-truncate:                yes

# Binary byte order
# Value: 'native', 'big-endian'
binary-byteorder:               big-endian

# Allow larger REDEFINES items
larger-redefines-ok:            no

# Allow certain syntax variations (eg. REDEFINES position)
relax-syntax-checks:            no

# Perform type OSVS - If yes, the exit point of any currently
# executing perform is recognized if reached.
perform-osvs:                   no

# Compute intermediate decimal results like IBM OSVS
arithmetic-osvs:                no
```

```
# MOVE like IBM (mvc); left to right, byte by byte
move-ibm:                       no

# SELECT RELATIVE KEY and ASSIGN fields must be in WORKING-STORAGE
select-working:         no

# If yes, linkage-section items remain allocated
# between invocations.
sticky-linkage:                 no

# If yes, allow non-matching level numbers
relax-level-hierarchy:          no

# If yes, evaluate constant expressions at compile time
constant-folding:               yes

# Allow Hex 'F' for NUMERIC test of signed PACKED DECIMAL field
hostsign:                       no

# If yes, set WITH UPDATE clause as default for ACCEPT dest-item,
# except if WITH NO UPDATE clause is used
accept-update:                  no

# If yes, set WITH AUTO clause as default for ACCEPT dest-item,
# except if WITH TAB clause is used
accept-auto:                    no

# If yes, DISPLAYs and ACCEPTs are, by default, done on the CRT (i.e., using
# curses).
console-is-crt:                 no

# If yes, allow redefinition of the current program's name. This prevents its
# use in a prototype-format CALL/CANCEL statement.
program-name-redefinition:      yes

# If yes, NO ECHO/NO-ECHO/OFF is the same as SECURE (hiding input with
# asterisks, not spaces).
no-echo-means-secure:           no

# If yes, the first item in a field screen ACCEPT/DISPLAY (e.g. DISPLAY x UPON
# CRT) is located after the previous ACCEPT/DISPLAY (as though LINE 0 COL 0 had
# been specified).
line-col-zero-default:          yes

# If yes, DISPLAY SPACES acts as ERASE EOS, DISPLAY X"01" acts as ERASE EOL,
# DISPLAY X"02" acts as BLANK SCREEEN and DISPLAY X"07" acts as BELL. Note
# DISPLAY LOW-VALUE is excluded from this; it will always just position the
# cursor.
display-special-fig-consts:     no

# If yes, COMP-1 is a signed 16-bit integer and any PICTURE clause is ignored.
binary-comp-1:                  no
```

```
# auto-adjust to zero like MicroFocus does
move-non-numeric-lit-to-numeric-is-zero: no

# What rules to apply to SCREEN SECTION items clauses
screen-section-rules:           gc

# Dialect features
# Value: 'ok', 'warning', 'archaic', 'obsolete', 'skip', 'ignore', 'error',
#        'unconformable'

alter-statement:                        obsolete
comment-paragraphs:                     obsolete
call-overflow:                          archaic
data-records-clause:                    obsolete
debugging-mode:                         ok
use-for-debugging:                      ok
listing-statements:                     skip    # may be a user-defined word
title-statement:                        skip    # may be a user-defined word
entry-statement:                        ok
goto-statement-without-name:            obsolete
label-records-clause:                   obsolete
memory-size-clause:                     obsolete
move-noninteger-to-alphanumeric:        error
move-figurative-constant-to-numeric:    archaic
move-figurative-space-to-numeric:       error
move-figurative-quote-to-numeric:       obsolete
multiple-file-tape-clause:              obsolete
next-sentence-phrase:                   archaic
odo-without-to:                         warning
padding-character-clause:               obsolete
section-segments:                       ignore
stop-literal-statement:                 obsolete
stop-identifier-statement:              obsolete
synchronized-clause:                    ok
top-level-occurs-clause:                ok
value-of-clause:                        obsolete
numeric-boolean:                        ok
hexadecimal-boolean:                    ok
national-literals:                      ok
hexadecimal-national-literals:          ok
national-character-literals:            warning
acu-literals:                           unconformable
word-continuation:                      warning
not-exception-before-exception:         ok
accept-display-extensions:              ok
renames-uncommon-levels:                ok
symbolic-constant:                      ok
constant-78:                            ok
constant-01:                            ok
perform-varying-without-by:             ok
program-prototypes:                     ok
```

```
reference-out-of-declaratives:          warning
numeric-value-for-edited-item:          ok
incorrect-conf-sec-order:               ok
define-constant-directive:              archaic
free-redefines-position:                warning
record-delimiter:                       ok
sequential-delimiters:                  ok
record-delim-with-fixed-recs:           ok
missing-statement:                      warning
zero-length-literals:                   ok
xml-generate:                           ok
xml-generate-extra-phrases:             ok
json-generate:                          ok

# use complete word list; synonyms and exceptions are specified below
reserved-words:         default

# not-reserved:
# Value: Word to be taken out of the reserved words list
not-reserved:   TERMINAL
# reserved:
#   Entries of the form word-1=word-2 define word-1 as an alias for default
# reserved word word-2. No spaces are allowed around the equal sign.
reserved:       AUTO-SKIP=AUTO
reserved:       AUTOTERMINATE=AUTO
reserved:       BACKGROUND-COLOUR=BACKGROUND-COLOR
reserved:       BEEP=BELL
reserved:       BINARY-INT=BINARY-LONG
reserved:       BINARY-LONG-LONG=BINARY-DOUBLE
reserved:       CELLS=CELL
reserved:       COLOURS=COLORS
reserved:       EMPTY-CHECK=REQUIRED
reserved:       EQUALS=EQUAL
reserved:       FOREGROUND-COLOUR=FOREGROUND-COLOR
reserved:       HIGH-VALUES=HIGH-VALUE
reserved:       INITIALISE=INITIALIZE
reserved:       INITIALISED=INITIALIZED
reserved:       LENGTH-CHECK=FULL
reserved:       LOW-VALUES=LOW-VALUE
reserved:       ORGANISATION=ORGANIZATION
reserved:       PIXELS=PIXEL
reserved:       SYNCHRONISED=SYNCHRONIZED
reserved:       TIMEOUT=TIME-OUT
reserved:       VALUES=VALUE
reserved:       ZEROES=ZERO
reserved:       ZEROS=ZERO
```

Appendix G cobcrun --help

```
GnuCOBOL module loader

Usage: cobcrun [options] PROGRAM [parameter ...]
  or:  cobcrun options

Options:
  -h, -help                       display this help and exit
  -V, -version                    display cobcrun and runtime version and exit
  -i, -info                       display runtime information (build/environment)
  -c <file>, -config=<file>       set runtime configuration from <file>
  -r, -runtime-config             display current runtime configuration
                                  (value and origin for all settings)
  -M <module>, -module=<module>   set entry point module name and/or load path
                                  where -M module prepends any directory to the
                                  dynamic link loader library search path
                                  and any basename to the module preload list
                                  (COB_LIBRARY_PATH and/or COB_PRELOAD)

Report bugs to: bug-gnucobol@gnu.org
or (preferably) use the issue tracker via the home page.
GnuCOBOL home page: <https://www.gnu.org/software/gnucobol/>
General help using GNU software: <https://www.gnu.org/gethelp/>
```

Appendix H Runtime configuration

The following list was extracted from `config/runtime.cfg`.

H.1 General instructions

The initial runtime.cfg file is found in the `$COB_CONFIG_DIR/config` (`COB_CONFIG_DIR defaults to installdir/gnucobol`). The environment variable `COB_RUNTIME_CONFIG` may define a different runtime configuration file to read.
If settings are included in the runtime environment file multiple times then the last setting value is used, no warning occurs.
Settings via environment variables always take precedence over settings that are given in runtime configuration files. And the environment is checked after completing processing of the runtime configuration file(s)
All values set to string variables or environment variables are checked for `${envvar}` and replacement is done at the time of the setting. You can also specify a default value for the case that envvar is not set: ${envvar:default} or ${envvar:-default}.
Any environment variable may be set with the directive `setenv` . Example: `setenv COB_LIBARAY_PATH ${LD_LIBRARY_PATH}`
Any environment variable may be unset with the directive `unsetenv` (one var per line). Example: `unsetenv COB_LIBRARY_PATH`
Runtime configuration files can include other files with the directive include. Example: `include my-runtime-configuration-file`
To include another configuration file only if it is present use the directive includeif. You can also use `${envvar}` inside this. Example: `includeif ${HOME}/mygc.cfg`
If you want to reset a parameter to its default value use: `reset parametername`
Most runtime variables have boolean values, some are switches, some have string values, integer values and some are size values. The boolean values will be evaluated as following: to true: `1, Y, ON, YES, TRUE` (no matter of case) to false: `0, N, OFF` A 'size' value is an integer optionally followed by K, M, or G for kilo, mega or giga.
For convenience a parameter in the runtime.cfg file may be defined by using either the environment variable name or the parameter name. In most cases the environment variable name is the parameter name (in upper case) with the prefix `COB_` .
Note: If you want to *slightly* speed up a program's startup time, remove all `of the comments from the actual real configuration file that is processed`

H.2 General environment

```
Environment name:  COB_DISABLE_WARNINGS
  Parameter name:  disable_warnings
         Purpose:  turn off runtime warning messages
            Type:  boolean
         Default:  false
         Example:  DISABLE_WARNINGS  TRUE
```

```
Environment name:  COB_ENV_MANGLE
  Parameter name:  env_mangle
         Purpose:  names checked in the environment would get non alphanumeric
                   change to '_'
            Type:  boolean
         Default:  false
         Example:  ENV_MANGLE  TRUE

Environment name:  COB_SET_DEBUG
  Parameter name:  debugging_mode
         Purpose:  to enable USE ON DEBUGGING procedures that were active
                   during compile-time because of WITH DEBUGGING MODE,
                   otherwise the code generated will be skipped
            Type:  boolean
         Default:  false
         Example:  COB_SET_DEBUG  1

Environment name:  COB_SET_TRACE
  Parameter name:  set_trace
         Purpose:  to enable COBOL trace feature
            Type:  boolean
         Default:  false
         Example:  SET_TRACE  TRUE

Environment name:  COB_TRACE_FILE
  Parameter name:  trace_file
         Purpose:  to define where COBOL trace output should go
            Type:  string       : $$ is replaced by process id
         Default:  stderr
         Example:  TRACE_FILE  ${HOME}/mytrace.$$

Environment name:  COB_TRACE_FORMAT
  Parameter name:  trace_format
         Purpose:  to define format of COBOL trace output
            Type:  string
         Default:  "%P %S Line: %L"
                   %P is replaced by Program-Id/Function-Id minimal length 29
                      with prefix
                   %I is replaced by Program-Id/Function-Id variable length,
                      without prefix
                   %L is replaced by Line number, right justified, length 6
                   %S is replaced by statement type and name
                   %F is replaced by source file name
         Example:  TRACE_FORMAT  "Line: %L %S"
            Note:  format of GC2.2 and older: "PROGRAM-ID: %I   Line: %L        %S"

Environment name:  COB_DUMP_FILE
  Parameter name:  dump_file
         Purpose:  to define where COBOL dump output should go
            Note:  The -fdump=all compile option prepares for dump
            Type:  string       : $$ is replaced by process id
```

```
         Default:  stderr
         Example:  DUMP_FILE  ${HOME}/mytrace.log

Environment name:  COB_DUMP_WIDTH
  Parameter name:  dump_width
         Purpose:  to define COBOL dump line length
            Type:  integer
         Default:  100
         Example:  dump_width 120

Environment name:  COB_CURRENT_DATE
  Parameter name:  current_date
         Purpose:  specify an alternate Date/Time to be returned to ACCEPT
                   clauses this is used for testing purposes or to tweak
                   a missing offset partial setting is allowed
            Type:  numeric string in format YYYYDDMMHH24MISS or date string
         Default:  the operating system date is used
         Example:  COB_CURRENT_DATE "2016/03/16 16:40:52"
                   current_date YYYYMMDDHHMMSS+01:00
```

H.3 Call environment

```
Environment name:  COB_LIBRARY_PATH
  Parameter name:  library_path
         Purpose:  paths for dynamically-loadable modules
            Type:  string
            Note:  the default paths .:/installpath/extras are always
                   added to the given paths
         Example:  LIBRARY_PATH    /opt/myapp/test:/opt/myapp/production

Environment name:  COB_PRE_LOAD
  Parameter name:  pre_load
         Purpose:  modules that are loaded during startup, can be used
                   to CALL COBOL programs or C functions that are part
                   of a module library
            Type:  string
            Note:  the modules listed should NOT include extensions, the
                   runtime will use the right ones on the various platforms,
                   COB_LIBRARY_PATH is used to locate the modules
         Example:  PRE_LOAD      COBOL_function_library:external_c_library

Environment name:  COB_LOAD_CASE
  Parameter name:  load_case
         Purpose:  resolve ALL called program names to UPPER or LOWER case
            Type:  Only use  UPPER  or  LOWER
         Default:  if not set program names in CALL are case sensitive
         Example:  LOAD_CASE  UPPER
```

```
Environment name:  COB_PHYSICAL_CANCEL
  Parameter name:  physical_cancel
         Purpose:  physically unload a dynamically-loadable module on CANCEL,
                   this frees some RAM and allows the change of modules during
                   run-time but needs more time to resolve CALLs (both to
                   active and not-active programs)
           Alias:  default_cancel_mode, LOGICAL_CANCELS (0 = yes)
            Type:  boolean (evaluated for true only)
         Default:  false
         Example:  PHYSICAL_CANCEL  TRUE
```

H.4 File I/O

```
kamal079 - added mf format (start)
Environment name:  COB_VARSEQ_FORMAT
  Parameter name:  varseq_format
         Purpose:  declare format used for variable length sequential files
                   - different types and lengths precede each record
                   - 'length' is the data length, does not include the prefix
            Type:  0   means 2 byte record length (big-endian) + 2 NULs
                   1   means 4 byte record length (big-endian)
                   2   means 4 byte record length (local machine int)
                   3   means 2 byte record length (big-endian)
                   b32 means 4 byte record length (big-endian)
                   l32 means 4 byte record length (little-endian)
                   mf  means Micro Focus default
         Default:  0
         Example:  VARSEQ_FORMAT 1

Environment name:  COB_VARREL_FORMAT
  Parameter name:  varrel_format
         Purpose:  declare format to be used for variable length relative
                   files (different types and lengths preceding each record)
            Type:  0   means local machine 'size_t'
                   b32 means 4 byte record length (big-endian)
                   l32 means 4 byte record length (little-endian)
                   b64 means 8 byte record length (big-endian)
                   l64 means 8 byte record length (little-endian)
                   mf  means Micro Focus default
                   gc  means GnuCOBOL default (local 'size_t')
         Default:  0
         Example:  VARREL_FORMAT B32

Environment name:  COB_FIXREL_FORMAT
  Parameter name:  fixrel_format
         Purpose:  declare format to be used for fixed length relative
                   files (different types and lengths preceding each record)
            Type:  b32 means 4 byte record length (big-endian)
```

```
                  l32 means 4 byte record length (little-endian)
                  b64 means 8 byte record length (big-endian)
                  l64 means 8 byte record length (little-endian)
                  mf  means Micro Focus default
                  gc  means GnuCOBOL default (local 'size_t')
         Default: gc  fixed size with no record length prefix
         Example: FIXREL_FORMAT B32
kamal079 - added mf file format (end)
Environment name: COB_FILE_PATH
  Parameter name: file_path
         Purpose: define default location where data files are stored
            Type: file path directory
         Default: .  (current directory)
         Example: FILE_PATH ${HOME}/mydata

Environment name: COB_LS_FIXED
  Parameter name: ls_fixed
         Purpose: Defines if LINE SEQUENTIAL files should be fixed length
                  (or variable, by removing trailing spaces)
           Alias: STRIP_TRAILING_SPACES  (0 = yes)
            Type: boolean
         Default: false
         Example: LS_FIXED TRUE

Environment name: COB_LS_NULLS
  Parameter name: ls_nulls
         Purpose: Defines for LINE SEQUENTIAL files what to do with data
                  which is not DISPLAY type.  This could happen if a LINE
                  SEQUENTIAL record has COMP data fields in it.
            Type: boolean
         Default: false
            Note: The TRUE setting will handle files that contain COMP data
                  in a similar manner to the method used by Micro Focus
         Example: LS_NULL = TRUE

Environment name: COB_SYNC
  Parameter name: sync
         Purpose: Should the file be synced to disk after each write/update
            Type: boolean
         Default: false
         Example: SYNC: TRUE

Environment name: COB_SORT_MEMORY
  Parameter name: sort_memory
         Purpose: Defines how much RAM to assign for sorting data
                  if this size is exceeded the  SORT  will be done
                  on disk instead of memory
            Type: size  but must be more than 1M
         Default: 128M
         Example: SORT_MEMORY 64M

Environment name: COB_SORT_CHUNK
```

```
  Parameter name:  sort_chunk
         Purpose:  Defines how much RAM to assign for sorting data in chunks
            Type:  size  but must be within 128K and 16M
         Default:  256K
         Example:  SORT_CHUNK 1M
```

H.5 Screen I/O

```
Environment name:  COB_BELL
  Parameter name:  bell
         Purpose:  Defines how a request for the screen to beep is handled
            Type:  FLASH, SPEAKER, FALSE, BEEP
         Default:  BEEP
         Example:  BELL SPEAKER

Environment name:  COB_REDIRECT_DISPLAY
  Parameter name:  redirect_display
         Purpose:  Defines if DISPLAY output should be sent to 'stderr'
            Type:  boolean
         Default:  false
         Example:  redirect_display Yes

Environment name:  COB_SCREEN_ESC
  Parameter name:  screen_esc
         Purpose:  Enable handling of ESC key during ACCEPT
            Type:  boolean
         Default:  false
            Note:  is only evaluated if COB_SCREEN_EXCEPTIONS is active
         Example:  screen_esc Yes

Environment name:  COB_SCREEN_EXCEPTIONS
  Parameter name:  screen_exceptions
         Purpose:  enable exceptions for function keys during ACCEPT
            Type:  boolean
         Default:  false
         Example:  screen_exceptions Yes

Environment name:  COB_TIMEOUT_SCALE
  Parameter name:  timeout_scale
         Purpose:  specify translation in milliseconds for ACCEPT clauses
                   BEFORE TIME value / AFTER TIMEOUT
            Type:  integer
                   0 means 1000 (Micro Focus COBOL compatible), 1 means 100
                   (ACUCOBOL compatible), 2 means 10, 3 means 1
         Default:  0
         Example:  timeout_scale 3

Environment name:  COB_INSERT_MODE
```

```
  Parameter name:  insert_mode
         Purpose:  specify default insert mode for ACCEPT; 0=off, 1=on
            Type:  boolean
         Default:  false
            Note:  also sets the cursor type (if available)
         Example:  insert_mode Y

Environment name:  COB_DISPLAY_PRINT_PIPE
  Parameter name:  display_print_pipe
         Purpose:  Defines command line used for sending output of
                   DISPLAY UPON PRINTER to (via pipe)
                   This is very similar to Micro Focus COBPRINTER
            Note:  Each executed DISPLAY UPON PRINTER statement causes a
                   new invocation of command-line (= new process start).
                   Each invocation receives the data referenced in
                   the DISPLAY statement and is followed by an
                   end-of-file condition.
                   COB_DISPLAY_PRINT_FILE, if set, takes precedence
                   over COB_DISPLAY_PRINT_PIPE.
           Alias:  COBPRINTER
            Type:  string
         Default:  not set
         Example:  print 'cat >>/tmp/myprt.log'

Environment name:  COB_DISPLAY_PRINT_FILE
  Parameter name:  display_print_file
         Purpose:  Defines file to be appended to by DISPLAY UPON PRINTER
            Note:  Each DISPLAY UPON PRINTER opens, appends and closes the file.
            Type:  string       : $$ is replaced by process id
         Default:  not set
         Example:  display_printer '/tmp/myprt.log'

Environment name:  COB_DISPLAY_PUNCH_FILE
  Parameter name:  display_punch_file
         Purpose:  Defines file to be created on first DISPLAY UPON SYSPUNCH/SYSPCH
            Note:  The file will be only be closed on runtime exit.
            Type:  string       : $$ is replaced by process id
         Default:  not set
         Example:  display_punch './punch_$$.out'

Environment name:  COB_LEGACY
  Parameter name:  legacy
         Purpose:  keep behavior of former runtime versions, currently only
                   for setting screen attributes for non input fields
            Type:  boolean
         Default:  not set
         Example:  legacy true

Environment name:  COB_EXIT_WAIT
  Parameter name:  exit_wait
         Purpose:  to wait on main program exit if an extended screenio
                   DISPLAY was issued without an ACCEPT following
```

```
           Type:  boolean
        Default:  true
        Example:  COB_EXIT_WAIT off

Environment name:  COB_EXIT_MSG
  Parameter name:  exit_msg
        Purpose:  string to display if COB_EXIT_WAIT is processed, set to ''
                  if no actual display but an ACCEPT should be done
           Type:  string
        Default:  'end of program, please press a key to exit' (localized)
        Example:  COB_EXIT_MSG ''
```

H.6 Report I/O

```
Environment name:  COB_COL_JUST_LRC
  Parameter name:  col_just_lrc
        Purpose:  If true, then COLUMN defined as LEFT, RIGHT or CENTER
                  will have the data justified within the field limits
                  If false, then the data is just copied into the column as is
           Type:  boolean
        Default:  TRUE
        Example:  col_just_lrc True
```

Appendix I GNU Free Documentation License

Version 1.3, 3 November 2008

0. PREAMBLE

   The purpose of this License is to make a manual, textbook, or other functional and useful document *free* in the sense of freedom: to assure everyone the effective freedom to copy and redistribute it, with or without modifying it, either commercially or noncommercially. Secondarily, this License preserves for the author and publisher a way to get credit for their work, while not being considered responsible for modifications made by others.

   This License is a kind of "copyleft", which means that derivative works of the document must themselves be free in the same sense. It complements the GNU General Public License, which is a copyleft license designed for free software.

   We have designed this License in order to use it for manuals for free software, because free software needs free documentation: a free program should come with manuals providing the same freedoms that the software does. But this License is not limited to software manuals; it can be used for any textual work, regardless of subject matter or whether it is published as a printed book. We recommend this License principally for works whose purpose is instruction or reference.

1. APPLICABILITY AND DEFINITIONS

   This License applies to any manual or other work, in any medium, that contains a notice placed by the copyright holder saying it can be distributed under the terms of this License. Such a notice grants a world-wide, royalty-free license, unlimited in duration, to use that work under the conditions stated herein. The "Document", below, refers to any such manual or work. Any member of the public is a licensee, and is addressed as "you". You accept the license if you copy, modify or distribute the work in a way requiring permission under copyright law.

   A "Modified Version" of the Document means any work containing the Document or a portion of it, either copied verbatim, or with modifications and/or translated into another language.

   A "Secondary Section" is a named appendix or a front-matter section of the Document that deals exclusively with the relationship of the publishers or authors of the Document to the Document's overall subject (or to related matters) and contains nothing that could fall directly within that overall subject. (Thus, if the Document is in part a textbook of mathematics, a Secondary Section may not explain any mathematics.) The relationship could be a matter of historical connection with the subject or with related matters, or of legal, commercial, philosophical, ethical or political position regarding them.

   The "Invariant Sections" are certain Secondary Sections whose titles are designated, as being those of Invariant Sections, in the notice that says that the Document is released under this License. If a section does not fit the above definition of Secondary then it is not allowed to be designated as Invariant. The Document may contain zero Invariant Sections. If the Document does not identify any Invariant Sections then there are none.

   The "Cover Texts" are certain short passages of text that are listed, as Front-Cover Texts or Back-Cover Texts, in the notice that says that the Document is released under this License. A Front-Cover Text may be at most 5 words, and a Back-Cover Text may be at most 25 words.

A "Transparent" copy of the Document means a machine-readable copy, represented in a format whose specification is available to the general public, that is suitable for revising the document straightforwardly with generic text editors or (for images composed of pixels) generic paint programs or (for drawings) some widely available drawing editor, and that is suitable for input to text formatters or for automatic translation to a variety of formats suitable for input to text formatters. A copy made in an otherwise Transparent file format whose markup, or absence of markup, has been arranged to thwart or discourage subsequent modification by readers is not Transparent. An image format is not Transparent if used for any substantial amount of text. A copy that is not "Transparent" is called "Opaque".

Examples of suitable formats for Transparent copies include plain ASCII without markup, Texinfo input format, LaTeX input format, SGML or XML using a publicly available DTD, and standard-conforming simple HTML, PostScript or PDF designed for human modification. Examples of transparent image formats include PNG, XCF and JPG. Opaque formats include proprietary formats that can be read and edited only by proprietary word processors, SGML or XML for which the DTD and/or processing tools are not generally available, and the machine-generated HTML, PostScript or PDF produced by some word processors for output purposes only.

The "Title Page" means, for a printed book, the title page itself, plus such following pages as are needed to hold, legibly, the material this License requires to appear in the title page. For works in formats which do not have any title page as such, "Title Page" means the text near the most prominent appearance of the work's title, preceding the beginning of the body of the text.

The "publisher" means any person or entity that distributes copies of the Document to the public.

A section "Entitled XYZ" means a named subunit of the Document whose title either is precisely XYZ or contains XYZ in parentheses following text that translates XYZ in another language. (Here XYZ stands for a specific section name mentioned below, such as "Acknowledgements", "Dedications", "Endorsements", or "History".) To "Preserve the Title" of such a section when you modify the Document means that it remains a section "Entitled XYZ" according to this definition.

The Document may include Warranty Disclaimers next to the notice which states that this License applies to the Document. These Warranty Disclaimers are considered to be included by reference in this License, but only as regards disclaiming warranties: any other implication that these Warranty Disclaimers may have is void and has no effect on the meaning of this License.

2. VERBATIM COPYING

   You may copy and distribute the Document in any medium, either commercially or noncommercially, provided that this License, the copyright notices, and the license notice saying this License applies to the Document are reproduced in all copies, and that you add no other conditions whatsoever to those of this License. You may not use technical measures to obstruct or control the reading or further copying of the copies you make or distribute. However, you may accept compensation in exchange for copies. If you distribute a large enough number of copies you must also follow the conditions in section 3.

   You may also lend copies, under the same conditions stated above, and you may publicly display copies.

3. COPYING IN QUANTITY

   If you publish printed copies (or copies in media that commonly have printed covers) of the Document, numbering more than 100, and the Document's license notice requires Cover Texts, you must enclose the copies in covers that carry, clearly and legibly, all these Cover Texts: Front-Cover Texts on the front cover, and Back-Cover Texts on the back cover. Both

covers must also clearly and legibly identify you as the publisher of these copies. The front cover must present the full title with all words of the title equally prominent and visible. You may add other material on the covers in addition. Copying with changes limited to the covers, as long as they preserve the title of the Document and satisfy these conditions, can be treated as verbatim copying in other respects.

If the required texts for either cover are too voluminous to fit legibly, you should put the first ones listed (as many as fit reasonably) on the actual cover, and continue the rest onto adjacent pages.

If you publish or distribute Opaque copies of the Document numbering more than 100, you must either include a machine-readable Transparent copy along with each Opaque copy, or state in or with each Opaque copy a computer-network location from which the general network-using public has access to download using public-standard network protocols a complete Transparent copy of the Document, free of added material. If you use the latter option, you must take reasonably prudent steps, when you begin distribution of Opaque copies in quantity, to ensure that this Transparent copy will remain thus accessible at the stated location until at least one year after the last time you distribute an Opaque copy (directly or through your agents or retailers) of that edition to the public.

It is requested, but not required, that you contact the authors of the Document well before redistributing any large number of copies, to give them a chance to provide you with an updated version of the Document.

4. MODIFICATIONS

   You may copy and distribute a Modified Version of the Document under the conditions of sections 2 and 3 above, provided that you release the Modified Version under precisely this License, with the Modified Version filling the role of the Document, thus licensing distribution and modification of the Modified Version to whoever possesses a copy of it. In addition, you must do these things in the Modified Version:

   A. Use in the Title Page (and on the covers, if any) a title distinct from that of the Document, and from those of previous versions (which should, if there were any, be listed in the History section of the Document). You may use the same title as a previous version if the original publisher of that version gives permission.
   B. List on the Title Page, as authors, one or more persons or entities responsible for authorship of the modifications in the Modified Version, together with at least five of the principal authors of the Document (all of its principal authors, if it has fewer than five), unless they release you from this requirement.
   C. State on the Title page the name of the publisher of the Modified Version, as the publisher.
   D. Preserve all the copyright notices of the Document.
   E. Add an appropriate copyright notice for your modifications adjacent to the other copyright notices.
   F. Include, immediately after the copyright notices, a license notice giving the public permission to use the Modified Version under the terms of this License, in the form shown in the Addendum below.
   G. Preserve in that license notice the full lists of Invariant Sections and required Cover Texts given in the Document's license notice.
   H. Include an unaltered copy of this License.
   I. Preserve the section Entitled "History", Preserve its Title, and add to it an item stating at least the title, year, new authors, and publisher of the Modified Version as given on the Title Page. If there is no section Entitled "History" in the Document, create one stating the title, year, authors, and publisher of the Document as given on its

Title Page, then add an item describing the Modified Version as stated in the previous sentence.

J. Preserve the network location, if any, given in the Document for public access to a Transparent copy of the Document, and likewise the network locations given in the Document for previous versions it was based on. These may be placed in the "History" section. You may omit a network location for a work that was published at least four years before the Document itself, or if the original publisher of the version it refers to gives permission.

K. For any section Entitled "Acknowledgements" or "Dedications", Preserve the Title of the section, and preserve in the section all the substance and tone of each of the contributor acknowledgements and/or dedications given therein.

L. Preserve all the Invariant Sections of the Document, unaltered in their text and in their titles. Section numbers or the equivalent are not considered part of the section titles.

M. Delete any section Entitled "Endorsements". Such a section may not be included in the Modified Version.

N. Do not retitle any existing section to be Entitled "Endorsements" or to conflict in title with any Invariant Section.

O. Preserve any Warranty Disclaimers.

If the Modified Version includes new front-matter sections or appendices that qualify as Secondary Sections and contain no material copied from the Document, you may at your option designate some or all of these sections as invariant. To do this, add their titles to the list of Invariant Sections in the Modified Version's license notice. These titles must be distinct from any other section titles.

You may add a section Entitled "Endorsements", provided it contains nothing but endorsements of your Modified Version by various parties—for example, statements of peer review or that the text has been approved by an organization as the authoritative definition of a standard.

You may add a passage of up to five words as a Front-Cover Text, and a passage of up to 25 words as a Back-Cover Text, to the end of the list of Cover Texts in the Modified Version. Only one passage of Front-Cover Text and one of Back-Cover Text may be added by (or through arrangements made by) any one entity. If the Document already includes a cover text for the same cover, previously added by you or by arrangement made by the same entity you are acting on behalf of, you may not add another; but you may replace the old one, on explicit permission from the previous publisher that added the old one.

The author(s) and publisher(s) of the Document do not by this License give permission to use their names for publicity for or to assert or imply endorsement of any Modified Version.

5. COMBINING DOCUMENTS

You may combine the Document with other documents released under this License, under the terms defined in section 4 above for modified versions, provided that you include in the combination all of the Invariant Sections of all of the original documents, unmodified, and list them all as Invariant Sections of your combined work in its license notice, and that you preserve all their Warranty Disclaimers.

The combined work need only contain one copy of this License, and multiple identical Invariant Sections may be replaced with a single copy. If there are multiple Invariant Sections with the same name but different contents, make the title of each such section unique by adding at the end of it, in parentheses, the name of the original author or publisher of that section if known, or else a unique number. Make the same adjustment to the section titles in the list of Invariant Sections in the license notice of the combined work.

In the combination, you must combine any sections Entitled "History" in the various original documents, forming one section Entitled "History"; likewise combine any sections Entitled "Acknowledgements", and any sections Entitled "Dedications". You must delete all sections Entitled "Endorsements."

6. COLLECTIONS OF DOCUMENTS

   You may make a collection consisting of the Document and other documents released under this License, and replace the individual copies of this License in the various documents with a single copy that is included in the collection, provided that you follow the rules of this License for verbatim copying of each of the documents in all other respects.

   You may extract a single document from such a collection, and distribute it individually under this License, provided you insert a copy of this License into the extracted document, and follow this License in all other respects regarding verbatim copying of that document.

7. AGGREGATION WITH INDEPENDENT WORKS

   A compilation of the Document or its derivatives with other separate and independent documents or works, in or on a volume of a storage or distribution medium, is called an "aggregate" if the copyright resulting from the compilation is not used to limit the legal rights of the compilation's users beyond what the individual works permit. When the Document is included in an aggregate, this License does not apply to the other works in the aggregate which are not themselves derivative works of the Document.

   If the Cover Text requirement of section 3 is applicable to these copies of the Document, then if the Document is less than one half of the entire aggregate, the Document's Cover Texts may be placed on covers that bracket the Document within the aggregate, or the electronic equivalent of covers if the Document is in electronic form. Otherwise they must appear on printed covers that bracket the whole aggregate.

8. TRANSLATION

   Translation is considered a kind of modification, so you may distribute translations of the Document under the terms of section 4. Replacing Invariant Sections with translations requires special permission from their copyright holders, but you may include translations of some or all Invariant Sections in addition to the original versions of these Invariant Sections. You may include a translation of this License, and all the license notices in the Document, and any Warranty Disclaimers, provided that you also include the original English version of this License and the original versions of those notices and disclaimers. In case of a disagreement between the translation and the original version of this License or a notice or disclaimer, the original version will prevail.

   If a section in the Document is Entitled "Acknowledgements", "Dedications", or "History", the requirement (section 4) to Preserve its Title (section 1) will typically require changing the actual title.

9. TERMINATION

   You may not copy, modify, sublicense, or distribute the Document except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, or distribute it is void, and will automatically terminate your rights under this License.

   However, if you cease all violation of this License, then your license from a particular copyright holder is reinstated (a) provisionally, unless and until the copyright holder explicitly and finally terminates your license, and (b) permanently, if the copyright holder fails to notify you of the violation by some reasonable means prior to 60 days after the cessation.

   Moreover, your license from a particular copyright holder is reinstated permanently if the copyright holder notifies you of the violation by some reasonable means, this is the first time you have received notice of violation of this License (for any work) from that copyright holder, and you cure the violation prior to 30 days after your receipt of the notice.

Termination of your rights under this section does not terminate the licenses of parties who have received copies or rights from you under this License. If your rights have been terminated and not permanently reinstated, receipt of a copy of some or all of the same material does not give you any rights to use it.

10. FUTURE REVISIONS OF THIS LICENSE

The Free Software Foundation may publish new, revised versions of the GNU Free Documentation License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns. See `https://www.gnu.org/licenses/`.

Each version of the License is given a distinguishing version number. If the Document specifies that a particular numbered version of this License "or any later version" applies to it, you have the option of following the terms and conditions either of that specified version or of any later version that has been published (not as a draft) by the Free Software Foundation. If the Document does not specify a version number of this License, you may choose any version ever published (not as a draft) by the Free Software Foundation. If the Document specifies that a proxy can decide which future versions of this License can be used, that proxy's public statement of acceptance of a version permanently authorizes you to choose that version for the Document.

11. RELICENSING

"Massive Multiauthor Collaboration Site" (or "MMC Site") means any World Wide Web server that publishes copyrightable works and also provides prominent facilities for anybody to edit those works. A public wiki that anybody can edit is an example of such a server. A "Massive Multiauthor Collaboration" (or "MMC") contained in the site means any set of copyrightable works thus published on the MMC site.

"CC-BY-SA" means the Creative Commons Attribution-Share Alike 3.0 license published by Creative Commons Corporation, a not-for-profit corporation with a principal place of business in San Francisco, California, as well as future copyleft versions of that license published by that same organization.

"Incorporate" means to publish or republish a Document, in whole or in part, as part of another Document.

An MMC is "eligible for relicensing" if it is licensed under this License, and if all works that were first published under this License somewhere other than this MMC, and subsequently incorporated in whole or in part into the MMC, (1) had no cover texts or invariant sections, and (2) were thus incorporated prior to November 1, 2008.

The operator of an MMC Site may republish an MMC contained in the site under CC-BY-SA on the same site at any time before August 1, 2009, provided the MMC is eligible for relicensing.

ADDENDUM: How to use this License for your documents

To use this License in a document you have written, include a copy of the License in the document and put the following copyright and license notices just after the title page:

```
Copyright (C)  year  your name.
Permission is granted to copy, distribute and/or modify this document
under the terms of the GNU Free Documentation License, Version 1.3
or any later version published by the Free Software Foundation;
with no Invariant Sections, no Front-Cover Texts, and no Back-Cover
Texts.  A copy of the license is included in the section entitled ``GNU
Free Documentation License''.
```

If you have Invariant Sections, Front-Cover Texts and Back-Cover Texts, replace the "with. . . Texts." line with this:

```
with the Invariant Sections being list their titles, with
the Front-Cover Texts being list, and with the Back-Cover Texts
being list.
```

If you have Invariant Sections without Cover Texts, or some other combination of the three, merge those two alternatives to suit the situation.

If your document contains nontrivial examples of program code, we recommend releasing these examples in parallel under your choice of free software license, such as the GNU General Public License, to permit their use in free software.

Index

(Index is nonexistent)