

PRINTCBL

A program to print Cobol Source code with all Copy statements included in along with all comments.

Set up and Usage Manual



Under FSF GPL v3 -



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Support for Printcbl

Please read all of these notes before use along with the Changelog file and ensure that the later latest entry matches the current source file version number!!!

Latest version at <http://sourceforge.net/p/open-cobol/code/HEAD/tree/trunk/contrib/tools/printcbl>
or <http://applewoodbbs.dtdns.net/files/printcbl-latest.zip>
or via ftp applewoodbbs.dtdns.net : cd pub & get printcbl-latest.zip

If using ftp you may find (but unlikely) Alpha releases present, that is under initial testing.
One's marked Beta are somewhat safer to use for production purposes.

Suggestions for updates to vbcoen at gmail.com

Message subject must be 'printcbl requests' or 'printcbl bugs' subject to the issue or problem.

And of course you can use the GNUCobol website bug reporting tool for all tools.

If you wish to be on an update & bug report email list for: Printcbl, Cobxref, Profiler (Cobol), Dectrans and anything else related to Cobol development tools send your details to above address with subject: 'Update lists' and you will be added to my address list for such purposes.

This is the only list used to notify of updates and/or also include the newly released files.

Copy Support (v2.01.10+):

Case is not sensitive, so ' COPY ' ' copy ' and any variation is OK, same as in GNUCobol.

- 1: COPY foo.
- 2: COPY "foo".
- 3: COPY foo (or "foo") IN/OF "../par".
- 4: COPY foo + .EXT different .ext **NOT** searched for
- 5: COPY filename.ext | IN | OF path | "relative path" SUPPRESS | SUPPRESS PRINTING.

6. Support for REPLACING sub clause

Form 1A = Word	by word
1B = Literal	by literal
1C = Identifier	by Identifier
1D = ==pseudo-text-1==	by ==pseudo-text-2==
= ==text-3==	by ==text-4==

Cases 1 through 3 (if not found, then searched with .exts of .CPY, .CBL, .COB (and lower case)

All cases searched in current directory and all search paths in order supplied

As per the Cobol standards **ALL COPY** statements **MUST** be followed directly with '.' (period).

Note: In 1 through 5) the copy file name and the copy library is case sensitive.

Replacing all, other than literals are **NOT** case sensitive.

Literals must be on same line. There is no support for continuation on the COPY statements or the source target but this allows for partial, line by line replacement.

Warnings:

- 1.. When using fixed format source it is the programmers **responsibility** to ensure that the replacing clause element fits within the area available and does NOT exceed column 72. The same no doubt applies to the compiler. (See the Cobol standards manual).

Pre usage actions on first install:

Program Source code Set up

1. Change settings in variable Print-Report:

- A. Change field PSN to your normal Cups Print Spool Name currently set to "[Officejet_Pro_8600](#)"
- B. Change variable PR-Name size from x(32) if your 'output file' names are longer. (A)
Along with variables WS-Print-File-Name and if needed the input file name area:
WS-Input-File-Name.
- C. The current setting for the lpr command is set to keep output file after printing, If you want it deleted, uncomment next line starting with *> "-r " &
- D. The variable Print-It-Out is set to zero and this will force no printing and this has been set during testing, however if you wish that the program output is normally printed then set it to 1 (one).
This can be overridden with the use of NOPRINT in line one of the source file OR used as P4 (parameter). See the sections **Program Usage** and **Print Format Commands** for more information.
- E. Information on additional data that is set up is:
Print font size at (cpi) 16.6 chars per inch and (lpi) 9 lines per inch, double sided (if your printer can't it should be ignored) 1/4 inch or 6mm margins top, left and right edge.
This should give 99 lines per page and the variable 'WS-Page-Lines' that has this value should be changed if your printout is wrong, e.g., too much space left on page not printed on or it prints on next page before a heading is printed.
- F. If you need to place prints into a ring binder you might want increase the value 'page-left=24' to a larger number. note that this is in pixels and there are 72 per inch/26mm, so say to 48.

2. With this sorted you must still provide the value in PSN as P4 when running just in case you decide to use another printer but in any event it is still a mandatory parameter. as I have no easy way to recognise P5 instead of it. If you don't have it set to print just use any characters, e.g., abc.

3. Change value in WS-Local-Time-Zone to your Time Zone format. This is currently set to Intl (Linux/unix) by setting it to:

For USA format	value 2. e.g.,	mm/dd/ccyy
For UK format	value 1. e.g.,	dd/mm/ccyy
Otherwise leave it for		ccyy/mm/dd

From v2.01.16

The program will examine the Environment Variable LC_TIME for values :

en_GB to set to UK format (1)

en_US to set to USA format (2)

anything else it is left as 3 = International (Unix) format.

You can add a check for other value/s for your country/region but please let the programmer know [by email to vbcoen at gmail dot com with subject Printcbl] so it can be added to the main source files held at the SF GnuCobol contrib tools sources SVN website areas.

In all cases, this along with the time is printed in the headings.

Note that in the first heading page the program parameters are also printed for reference purposes. As supplied it also displays the same information, however if you wish this to be stopped change the value of Testing to zero. [Testing2 through to Testing4 are set off but are used within the code during, yep, you have it, testing] !

4. You are now ready to compile as:

```
cobc -x printcbl.cbl  
chmod +x printcbl  
mv printcbl ~/bin or whatever other bin directory that is in your environment path variable.  
The program has been tested with GC v1.1 but all current testing is with v2,0/v2.1
```

5. You can now use it from any working directory.

6. Read the following notes on requirements and usage.

Printcbl: Program Usage:

Caution: This program has only been tested against source files that have gone through the GnuCobol compiler with **no** reported errors and I recommend that you do the same.

Printcbl P1 P2 P3 P4 P5

where: (P1 to P4 is Mandatory)

P1: Cobol source file

P2: Output Print File

P3: Source format = -free or -FREE or -fixed or -FIXED (You can omit the '-')

P4: Name of cups Spool/prINTER (If not needed just use any name 'e.g., fred').

From v2.01.16

Can be NOPRINT | noprint to produce a updated source file without any headings etc.

This is the same action as using the NOPRINT directive, see Print Format Commands.

P5: Temporary path to copy library, in or out of quotes e.g., '../foo' or "../foo:../foo/bar" or for just one ../foo multiple paths should be in quotes if running under windows, e.g., "foo:bar:wag:moo". There is a maximum of ten (10) copy library paths allowed, including the ones detailed below under COBCPY and COB_COPY_DIR.

From v2.01.16

If this field is omitted (blank) then the current directory is used for P5.

This will be placed first in search list over that in GNU Cobol environment variables:

COBCPY and COB_COPY_DIR

You may need to set this if you are using copy book sources in the same directory as the program source.

Note that if both env. vars. are found and have the same contents just one is used, otherwise they are searched in order of P5 (if present), COBCPY then COB_COPY_DIR

Warning: There is a total of 10 paths allowed including P5 So only the first 10 are used.

e.g., if both envs are used and you have:

COBCPY=a:b:c:d:e:f

COB_COPY_DIR=g:h:i:j:k:l:m

Only a through j are search and one less if P5 is used with one path (or has been omitted), which is searched first.

If parameters (are less than four e.g., P1 P2 P3 P4) are not supplied at execution time then the program will request:

[P1]: Input File,

[P2]: Output File,

[P3]: Source Format (fixed | -fixed | free | -free),

[P4]: PSN (Print Spool Name) or (for v2.01.16 and later) NOPRINT|noprint.

There will **NOT** be a request for temp search paths and therefore current directory will not be searched unless specified in the environment variables.

Print format Commands

Full listing:

/	Fixed only
EJECT	Both, different pretext, ** or *>
NOLIST	Both, different pretext
LIST	Both, different pretext
NOPRINT	Both, different pretext

Other than for the fixed format / (in cc 7), all of them can be used in both formats however, if using in fixed format (**starting** in column 7), they must be preceded by '**' e.g.
'**EJECT', '**NOLIST', '**LIST', '**NOPRINT'.

and for free format (**starting** in column 1) must be preceded by '*>' e.g.,
'*>EJECT', '*>NOLIST', '*>LIST', '*>NOPRINT'.

Note: The starting columns are **mandatory** and the case is immaterial .e.g., upper or lower or a mixture of the two.

/ or EJECT

Will print new headings before any more source.

NOLIST

Will stop listing the source from this point.

LIST

Will start listing the source at this point

Notes These commands will be listed so you can see why listings have stopped, started or new page started in common with many mainframe compilers.

The usage of ** or *> are to avoid issues if these are present when compiling with GNU Cobol or any other compiler. as they will be ignored by the compiler **but** if using the output from printcbl as input to GNU Cobol you must specify the source format of this line even if line 2 contains a >>source statement if not in the default GC. form.

Lines starting with the following are **ignored** but still listed:

Free formats: '\$', '#', '*>' in column one.

Fixed formats: '\$', '#', '*' in column seven [In case of MF or IBM code from a listing or other generated file

also anything after the floating '*>' in both formats as well as blank lines

Special case command

NOPRINT

Coded as ****NOPRINT** or ***>NOPRINT** for fixed / free (same as above commands)

This command, if on the **first source line only**, will turn off the formatted listings including headings etc. and just produce a new source file which includes all COPY statement contents. This will allow you to create a standalone source file without the need to also provide the copy library contents when passing on such files to others. Note that all COPY statements are remarked out and the first line omitted.

This function is also available using program parameter 4 set to NOPRINT or noprint in place of a print spool name as of version 2.01.16.

Compiler Requirements

Any version that supports:

1. Function upper-case and CBL-READ-FILE etc.
2. Function substitute
3. Environment variable capture e.g.:
 - accept Cobcpy from Environment "COBCPY".
 - accept Cob_Copy_Dir from Environment "COB_COPY_DIR"
 - accept Arg-Number from argument-number.
 - accept Arg-Value (4) from argument-value

As far as I know all versions (v1.1 & v2) do so, but not tested against v1.0 as it has been superseded by v1.1 (Feb 2009) and is classed as redundant. There may be a problem with v1.1 and Substitute if you do not have the patches installed.

If this is a problem let me know and I will look at recoding it to replace this.

In any event I will have to do so sometime, to ensure the LEADING and TRAILING sub-clauses are correctly honoured.

TODO List.

1. Support for REPLACING LEADING, TRAILING sub-clauses, see Future Updates for more info.
These are processed by the program but have no special treatment.

Future Updates:

1. LEADING (1D)
(means only the first occurrence).
2. TRAILING (1D)

Noticeable changes from v1.01

For more details see the file Changelog included with the program and this manual.

1. Added support for SUPPRESS. : Which does **not** print contents of the specified copy library
2. Produce a file as P2 (parameter 2) as an updated source file instead of a print report by specifying for
free format ">>NOPRINT" column 1 or
fixed format "*">NOPRINT" column 7
in line **ONE** of the source file.

This create a new source file as P2 with all copy libraries added and all COPY statements remarked out e.g., for fixed cc7 has '*' and for free cc1 has '*>' along with the first line that contained the NOPRINT. statement omitted.

The same result will occur if (from version 2.01.16) P4 contains NOPRINT or noprint.

This way the file will go through GNU Cobol without any errors.

3. Support for multiple depths for copy statements instead of 1.
i.e., copy within a copy is depth 2. It will now go to a depth of 9, e.g., source and nine copy within copy.

According to the Cobol standards, GNU Cobol should go to 5 levels at least.

4. Support for up to 50 REPLACING sub-clauses per COPY, but LEADING, TRAILING is ignored.
(This is a result of the usage of the function substitute that has no support for such).
I may have to re-look at this subject if support of substitute in v1.1 of GC has been retro included by patch.

5. Limitations for current version based on tables sizes etc.:

- A. Total number of copy's with copy's within original source file 10, e.g., depth 9.
- B. Maximum number of REPLACING clauses with a COPY: 50.
- C. Maximum size of a Replacing Source or Target field: 2048 bytes/Chars.
- D. Maximum size of complete COPY statement: 1 MB (1024 * 1024).
- E. Maximum file buffer size: 1 MB. [Source files are read in 1 MB blocks].
- F. Warning, Error, Caution messages held in table currently 10 in English.
[This can be added to for other languages, please supply translations].
- G. Maximum size of a free format source line: 255 Chars [as per Cobol standards].
- H. Maximum number of source file extensions: 7 [.cpy.CPY.cbl.CBL.cob.COB,] and space.

Literal Treatment

Please note the way (or not) literals are processed.

No processing takes place of continuation of literals both in the COPY clause or the source code as such.

So if you need to change one line of literal you only need to specify the content of that one line in a COPY statement.

E.g., source code:

```
03 filler pic x any length value "This is an example of left hand heads"
```

```
03 filler pic x any length value " but this is an extension line of more rubbish" &  
    " as such makes absolutely no sense".
```

COPY foo.bar replacing

```
"This is an example of left hand heads" by "Top form for Fred"
```

```
" but this is an extension line of more rubbish" by "Centre heading 1"
```

```
" as such makes absolutely no sense" by "Page number ".
```

Also if in line 3 of source, started in fixed form as:

```
-      " as such makes absolutely no sense".
```

It should also work.

NOTE that it has always been the responsibility of the programmer that when using fixed format sources to ensure that replacing clauses will result in the same limitations of no line exceeding column 72. This applies to the compiler as well as per the Cobol standards.

Messages used

Listings:

1. Error: Too many levels (9) of COPY
3. Error: Copy File Not Found
4. Error: Cannot Find File, & tried six different .Exts
5. Error: Abnormal end of input
6. Caution: One or more replacing sources not found
7. (P): On Read. Ret.code = nn
8. Info: Total Copy Depth Used = nn
9. Caution messages issued = nn

Displays:

1. Error: Too many levels (9) of COPY
2. Error: File Not Found
5. Error: Abnormal end of input
7. (P): On Read. Ret.code = nn
10. Error: Invalid Format, try again!
11. (P): File Not Closed? = xxx.yyy
12. Error: When opening I/P file got = nn
13. (P): Bad RT on Get-Directory

Message Explanations:

1. Your program exceeded nine levels of copy e.g., source file copy calls copy that calls 9+.
2. Source file not found, program will request parameters one at a time.
3. Cannot find the file specified in the Copy statement that has an extension in the name.
4. Cannot find the file specified in the Copy statement that does not have an extension.
5. Unexpected end of file. You did *NOT* terminate a copy statement with a full stop / period!
6. Listed after a copy statement when one or more replacing sources NOT found in the copy file.
7. Possible program issue, file terminated with unexpected error condition. Please report this to the lead programmer listed on inside front cover via email with any other helpful details.
8. Information: As it says. Printed at end of a listing along with number of copy files not found (see line after each copy statement and warning if any Caution (see 6.) messages listed.
9. Warning that one or more message 6. listed.
10. Invalid format specified for P3.[Only accepts in any case; -free | free | -fixed | fixed also see 2.
11. Possible program issue, unexpected error value when closing file. Please report this to the lead programmer listed on inside front cover via email with any other helpful details.
12. Possible program issue, unexpected error value when opening file but was tested present. Please report this to the lead programmer listed on inside front cover via email with any other helpful details.
13. Failure when trying to get the current directory. This would be caused by a compiler error.

Appendix A

Regression test samples

Regression Test Pack 1. (testpak1.zip)

Steps used as functionality added.

1, 'File not found':

```
IDENTIFICATION DIVISION.  
PROGRAM-ID.    prog.  
DATA DIVISION  
WORKING-STORAGE SECTION.  
COPY "copy.inx".  
PROCEDURE      DIVISION.  
STOP RUN.  
> 'File not found'
```

1B.. Same again but with copy copy.

1C.. Same again but with copy copy.inx.

1D. -- ditto ---- copy "copy".

1E. --- ditto ----- copy "copy.inx" in "../path".

1F. --- ditto ----- copy "copy.inx" of "../path".

2G. --- ditto ----- copy "copy.inx" in ../path.

When implemented!

2. Replacement order

```
[copy.inc] = [  
01 TEST-VAR PIC X(2) VALUE "OK".  
]
```

```
IDENTIFICATION  DIVISION.  
PROGRAM-ID.    prog.  
DATA          DIVISION.  
WORKING-STORAGE SECTION.  
COPY "copy.inc"  
    REPLACING ==TEST-VAR== BY ==FIRST-MATCH==  
              ==TEST-VAR== BY ==SECOND-MATCH==.  
PROCEDURE      DIVISION.  
    DISPLAY FIRST-MATCH NO ADVANCING  
    END-DISPLAY.  
    STOP RUN.
```

> 'OK'

3. Separators

```
[copy.inc], [  
01 TEST-VAR PIC X(2) VALUE "OK".  
]  
IDENTIFICATION  DIVISION.  
PROGRAM-ID.    prog.  
DATA          DIVISION.
```

WORKING-STORAGE SECTION.

COPY "copy.inc"

REPLACING ==TEST-VAR==, BY ==FIRST-MATCH==,
 , ==TEST-VAR==; BY ==SECOND-MATCH==;
 ; ==TEST-VAR== , BY ==THIRD-MATCH==
 ==TEST-VAR== ; BY ==FOURTH-MATCH==.

PROCEDURE DIVISION.

DISPLAY FIRST-MATCH NO ADVANCING

STOP RUN.

> 'OK'

4: partial replacement

[copy.inx], [

01 :TEST:-VAR PIC X(2) VALUE "OK".

01 (TEST)-VAR PIC X(2) VALUE "OK".

]

IDENTIFICATION DIVISION.

PROGRAM-ID. prog.

DATA DIVISION.

WORKING-STORAGE SECTION.

COPY "copy.inx"

REPLACING ==:TEST:== BY ==COLON==
 ==(TEST)== BY ==PAREN==.

PROCEDURE DIVISION.

DISPLAY COLON-VAR NO ADVANCING

END-DISPLAY.

DISPLAY PAREN-VAR NO ADVANCING

END-DISPLAY.

STOP RUN.

> 'OKOK'

5: LEADING replacement

[copy.inc], [

01 TEST-VAR PIC X(2) VALUE "OK".

01 NORM-VAR PIC X(2) VALUE "OK".

]

IDENTIFICATION DIVISION.

PROGRAM-ID. prog.

DATA DIVISION.

WORKING-STORAGE SECTION.

COPY "copy.inc"

REPLACING LEADING ==TEST== BY ==FIRST==
 LEADING ==NORM== BY ==SECOND==.

PROCEDURE DIVISION.

DISPLAY FIRST-VAR NO ADVANCING

END-DISPLAY.

DISPLAY SECOND-VAR NO ADVANCING

END-DISPLAY.

STOP RUN.

> 'OKOK'

6: TRAILING replacement

[copy.ina], [

01 TEST-FIRST PIC X(2) VALUE "OK".

01 TEST-SECOND PIC X(2) VALUE "OK".

]


```

IDENTIFICATION DIVISION.
PROGRAM-ID.    prog.
DATA          DIVISION.
WORKING-STORAGE SECTION.
COPY "copy.ina"
    REPLACING TRAILING ==FIRST== BY ==VAR1==
        TRAILING ==SECOND== BY ==VAR2==.
PROCEDURE      DIVISION.
    DISPLAY TEST-VAR1 NO ADVANCING
    END-DISPLAY.
    DISPLAY TEST-VAR2 NO ADVANCING
    END-DISPLAY.
    STOP RUN.
> 'OKOK'

```

7: recursive replacement

```

[copy-2.inc], [
    01 TEST-VAR PIC X(2) VALUE "OK".
]

```

```

[copy-1.inc], [
    COPY "copy-2.inc".
]
    IDENTIFICATION DIVISION.
    PROGRAM-ID.    prog.
    DATA          DIVISION.
    WORKING-STORAGE SECTION.
    COPY "copy-1.inc"
        REPLACING ==TEST-VAR== BY ==COPY-VAR==.
    PROCEDURE      DIVISION.
        DISPLAY COPY-VAR NO ADVANCING
        END-DISPLAY.
        STOP RUN.
> 'OK'

```

8: fixed/free format comp as -free

```

[copy.ind], [
    >>SOURCE FIXED
    01 TEST-VAR PIC X(2) VALUE "OK".
]
    IDENTIFICATION DIVISION.
    PROGRAM-ID.    prog.
    DATA          DIVISION.
    WORKING-STORAGE SECTION.
    COPY "copy.ind".
    PROCEDURE      DIVISION.
        DISPLAY TEST-VAR NO ADVANCING
        END-DISPLAY.
        STOP RUN.
> 'OK'

```

End Test Pack. (So far)

Test pack 2 covers (Internal use only, not supplied):

Copy statements to a depth of three.

Copy statements with extra variations of REPLACING.

Appendix B

Copy statement formats

WARNING: This does NOT mean that all variants are implemented in a given version of GNU Cobol.

With definitions as per ISO/IEC 1989:20xx CD 1.1 (E)

7.2.1.2 Source text and library text

Source text is the primary input to the compiler for a single compilation group. Library text is secondary input to the compiler as a result of processing a COPY statement.

The source text and library text processed by text manipulation consists of indicators, character-strings, comments, and separators. A character-string is either a text-word or the word 'COPY'.

7.2.1.3 Pseudo-text

Pseudo-text is an operand in the REPLACE statement and in the REPLACING phrase of the COPY statement. Pseudo-text may be any sequence of zero or more text-words, comments, and the separator space bounded by, but not including, pseudo-text delimiters. The opening pseudo-text delimiter and the closing pseudo-text delimiter consist of the two contiguous COBOL characters '=='.

7.2.1.4 Text-words

A text-word is a character-string in source text or in library text that constitutes an element processed by text manipulation. A text-word may be one of the following:

- 1) a separator, except for: a space; a pseudo-text delimiter; and the opening and closing delimiters for alphanumeric, boolean, and national literals. In determining which character sequences form text-words, the colon, the right parenthesis, and the left parenthesis characters, in any context except within alphanumeric or national literals, are treated as separators;
- 2) an alphanumeric, boolean, or national literal including the opening and closing delimiters that bound the literal;
- 3) any other sequence of contiguous COBOL characters bounded by separators, except for: comments and the word 'COPY'.

7.2.2 COPY statement

The COPY statement incorporates library text into a COBOL compilation group.

7.2.2.1 General format

7.2.2.2 Syntax rules

- 1) A COPY statement may be specified anywhere in source text or in library text that a character-string or a separator, other than the closing delimiter of a literal, may appear except that a COPY statement shall not appear within a COPY statement.
- 2) A COPY statement shall be preceded by a space except when it is the first statement in a compilation group.
- 3) Within one COBOL library, each text-name shall be unique.
- 4) A concatenation expression or figurative constant shall not be specified for literal-1, literal-2, literal-3, or literal-4.
- 5) Literal-1 and literal-2 shall be alphanumeric literals. The allowable value of literal-1 and literal-2 is defined by the implementor.
- 6) Pseudo-text-1 shall contain one or more text-words, at least one of which shall be neither a separator comma nor a separator semicolon.
- 7) Pseudo-text-2 shall contain zero, one, or more text-words.
- 8) Character-strings within pseudo-text-1 and pseudo-text-2 may be continued in accordance with the rules of reference format.
- 9) Text-1 and text-2 shall be one of the following formats of identifiers: function-identifier, qualified-data-name with-subscripts, reference-modification, qualified-lineage-counter, or qualified-report-counter.

NOTE Text-1 and text-2 are archaic features and their use should be avoided.

If subscripting is specified, it shall not include any arithmetic expressions as subscripts with the exception of a single literal or identifier, or an identifier plus or minus an integer.

The format of any identifier specified in

```

COPY      literal-1
           text-name-1
           OF/IN      literal-2
                     library-name-1

[ SUPPRESS PRINTING ]
  REPLACING

           == pseudo-text-1 ==
           text-1
           literal-3
           word-1

           BY

           == pseudo-text-2 ==
           text-2
           literal-4
           word-2

           LEADING/TRAILING

           == partial-word-1 == BY == partial-word-2 ==
```

subscripts, reference modifiers, or function arguments shall be: a function-identifier, qualified-data-name with subscripts, reference-modification, qualified-lineage-counter, or qualified-report-counter. Function identifiers in text-1 or text-2 shall be intrinsic function references only.

10) Word-1 or word-2 may be any single COBOL word except 'COPY', the compiler directive indicator, or the comment indicator.

11) The length of a text-word within pseudo-text and within library text shall be from 1 through 65,535 character positions.

12) Compiler directive lines shall not be specified within pseudo-text-1, pseudo-text-2, partial-word-1, or partial-word-2.

13) Partial-word-1 shall consist of one text-word.

14) Partial-word-2 shall consist of zero or one text-word.

15) An alphanumeric, boolean, or national literal shall not be specified as partial-word-1 or partial-word-2.

7.2.2.3 General rules

1) Text-name-1 or literal-1 identifies the library text to be processed by the COPY statement.

2) Library-name-1 names a resource that shall be available to the compiler and shall provide access to the library text referenced by text name-1.

3) The implementer shall define the rules for locating the library text referenced by text-name-1 or literal-1. When neither library-name-1 nor literal-2 is specified, a default COBOL library is used. The implementer defines the mechanism for identifying the default COBOL library.

4) If the SUPPRESS phrase is specified, library text incorporated as a result of COPY statement processing is not listed. If a listing is being produced, the COPY statement itself is listed.

5) At the completion of copying the library text into the compilation group, the LISTING directive that is in effect for the COPY statement itself is considered to be in effect, regardless of any LISTING directives in the library text.

6) The effect of processing a COPY statement is that the library text associated with text-name-1 or the value of literal-1 is copied into the compilation group, logically replacing the entire COPY statement beginning with the reserved word COPY and ending with the separator period, inclusive.

7) If the REPLACING phrase is not specified, the library text is included in the resultant text unchanged.

8) If the REPLACING phrase is specified, library text is modified during creation of the structured compilation group that is described in 7.2, Text manipulation. Each matched occurrence of pseudo-text-1, text-1, word-1, literal-3, or partial-word-1 in the library text is replaced by the corresponding pseudo-text-2, text-2, word-2, literal-4, or partial-word-2 in accordance with subsequent rules of the COPY statement.

9) For purposes of matching, text-1, word-1, and literal-3 are treated as pseudo-text containing only text-1, word-1, or literal-3, respectively.

10) The comparison operation to determine text replacement occurs in the following manner:

a) The leftmost library text-word that is not a separator comma or a separator semicolon is the first text-word used for comparison. Any text-word or space preceding this text-word is copied into the resultant text.

Starting with the first text-word for comparison and first pseudo-text-1, text-1, word-1, literal-3, or partial-word-1 that was specified in the REPLACING phrase, the entire REPLACING phrase operand that precedes the reserved word BY is compared to an equivalent number of contiguous library text-words.

b) Pseudo-text-1, text-1, word-1, or literal-3 match the library text only if the ordered sequence of text-words that forms pseudo-text-1, text-1, word-1, or literal-3 is equal, character for character, to the ordered sequence of library text-words. When the LEADING phrase is specified, partial-word-1 matches the library text only if the contiguous sequence of characters that forms partial-word-1 is equal, character for character, to an equal number of contiguous characters starting with the leftmost character position of a library text-word. When the TRAILING phrase is specified, partial-word-1 matches the library text only if the contiguous sequence of characters that forms partial-word-1 is equal, character for character, to an equal number of contiguous characters ending with the rightmost character position of a library text-word.

c) The following rules apply for the purpose of matching:

1. Each occurrence of a separator comma, semicolon, or space in pseudo-text-1 or in the library text is considered to be a single space. Each sequence of one or more space separators is considered to be a single space.

2. Each operand and operator of a concatenation expression is a separate text-word.

3. Except when used in the non-hexadecimal formats of alphanumeric and national literals, each alphanumeric character is equivalent to its corresponding national character and each lower case letter is equivalent to its corresponding upper case letter, as specified for the COBOL character repertoire in the COBOL character repertoire.

4. For alphanumeric, boolean and national literals:

a. The two representations of the quotation symbol match when specified in the opening and closing delimiters of the literal.

NOTE The opening and closing delimiters are required to be in the same representation.

b. In the content of the literal, two contiguous occurrences of the character used as the quotation symbol in the opening delimiter are treated as a single occurrence of that character.

5. Each occurrence of a compiler directive line is treated as a single space.

6. Comments, if any, are treated as a single space.

NOTE Because comments are removed during logical conversion, none are expected.

d) If no match occurs, the comparison is repeated with each next successive pseudo-text-1, text-1, word-1, literal-3, or partial-word-1, if any, in the REPLACING phrase until either a match is found or there is no next successive REPLACING operand.

e) When all the REPLACING phrase operands have been compared and no match has occurred, the leftmost library text-word is copied into the resultant text. The next successive library text-word is then considered as the leftmost library text-word, and the comparison cycle starts again with the first pseudo-text-1, text-1, word-1, literal-3, or partial-word-1 specified in the REPLACING phrase.

f) When a match occurs between pseudo-text-1, text-1, word-1, or literal-3 and the library text, the corresponding pseudo-text-2, text-2, word-2, or literal-4 is placed into the resultant text. When a match occurs between partial-word-1 and the library text-word, the library text-word is placed into the resultant text with the matched characters either replaced by partial-word-2 or deleted when partial-word-2 consists of zero text-words. The library text-word immediately following the rightmost text-word that participated in the match is then considered as the leftmost text-word. The comparison cycle starts again with the first pseudo-text-1, text-1, word-1, literal-3, or partial-word-1 specified in the REPLACING phrase.

g) The comparison operation continues until the rightmost text-word in the library text has either participated in a match or been considered as a leftmost library text-word and participated in a complete comparison cycle.

11) If the REPLACING phrase is specified, the library text shall not contain a COPY statement.

12) The resultant text after replacement shall be in logical free-form reference format. When copying text-words into the resultant text, additional spaces may be introduced only between text-words where there already exists a space or where a space is assumed.

NOTE A space is assumed at the end of a source line.

13) If the REPLACING phrase is not specified, the library text may contain a COPY statement that does not include a REPLACING phrase. The implementation shall support nesting of at least 5 levels, including the first COPY statement in the sequence. The library text being copied shall not cause the processing of a COPY statement that directly or indirectly copies itself.

14) The replacing action of a COPY statement shall not introduce a COPY statement, a SOURCE FORMAT directive, a comment, or a blank line.

7.2.3 REPLACE statement

The REPLACE statement modifies text in a compilation group.

7.2.3.1 General format

Format 1 (replacing):

Format 2 (off):

7.2.3.2 Syntax rules

- 1) A REPLACE statement may be specified anywhere in source text or in library text that a character-string or a separator, other than the closing delimiter of a literal, may appear.
- 2) A REPLACE statement shall be preceded by a space except when it is the first statement in a compilation group.
- 3) Pseudo-text-1 shall contain one or more text-words, at least one of which shall be neither a separator comma nor a separator semicolon.
- 4) Pseudo-text-2 shall contain zero, one, or more text-words.
- 5) Partial-word-1 shall consist of one text-word.
- 6) Partial-word-2 shall consist of zero or one text-word.
- 7) An alphanumeric, boolean, or national literal shall not be specified as partial-word-1 or partial-word-2.
- 8) Character-strings within pseudo-text-1 and pseudo-text-2 may be continued in accordance with the rules of reference format.
- 9) The length of a text-word within pseudo-text shall be from 1 through 65,535 characters.
- 10) Compiler directive lines shall not be specified within pseudo-text-1, pseudo-text-2, partial-word-1, or partial-word-2.

7.2.3.3 General Rules

- 1) In subsequent general rules of the REPLACE statement, 'source text' refers to the conditionally-processed compilation group.
- 2) Pseudo-text-1 specifies the text to be replaced by pseudo-text-2.
- 3) Partial-word-1 specifies the text to be replaced by partial-word-2.
- 4) Once encountered, a format 1 REPLACE statement has one of three states:

REPLACE [ALSO]

== pseudo-text-1 == BY == pseudo-text-2 ==
LEADING/TRAILING
== partial-word-1 == BY == partial-word-2 ==

... .

REPLACE [LAST] OFF .

- a) active, meaning it is the current statement in use for replace processing for the compilation group;
 - b) inactive, meaning it is not currently in use for replace processing but is held in a last-in first-out queue, from which it may be popped and made active or cancelled in accordance with the rules for subsequent REPLACE statements encountered in the compilation group;
 - c) cancelled, meaning it is removed from use for replace processing for the remainder of the compilation group or, if inactive, it is removed from the queue of inactive statements for the remainder of the compilation group.
- 5) A REPLACE statement that is placed in the active state remains active until it is placed in the inactive state, it is cancelled, or the end of the compilation group is reached, whichever occurs first.
- 6) When there is no REPLACE statement in the active state:
- a) A format 1 REPLACE statement is placed in the active state at the point at which it is encountered in the compilation group. The ALSO phrase, if specified, has no effect.
 - b) A format 2 REPLACE statement has no effect.
- 7) When there is a REPLACE statement in the active state:
- a) A format 1 REPLACE statement with the ALSO phrase results in the following:
 1. the active REPLACE statement is made inactive and is pushed into the queue of inactive REPLACE statements.
 2. The current REPLACE statement is expanded into a single REPLACE statement, without the ALSO phrase, having as its operands all the operands of the current statement followed by the operands of the most recent statement pushed into the queue of inactive REPLACE statements. The expanded REPLACE statement is placed in the active state.
 - b) A format 1 REPLACE statement without the ALSO phrase cancels the active REPLACE statement and cancels any REPLACE statements in the queue of inactive REPLACE statements. Then the current REPLACE statement is placed in the active state.
 - c) A format 2 REPLACE statement with the LAST phrase cancels the active REPLACE statement and pops the last statement that was pushed into the queue of inactive REPLACE statements, if any. The popped statement, if any, is placed in the active state.
 - d) A format 2 REPLACE statement without the LAST phrase cancels the active REPLACE statement and

cancels all REPLACE statements in the queue of inactive REPLACE statements, if any.

8) The comparison operation to determine text replacement begins with the text immediately following the REPLACE statement and occurs in the following manner:

a) Starting with the leftmost source text-word and the first pseudo-text-1 or partial-word-1, pseudo-text-1 or partial-word-1 is compared to an equivalent number of contiguous source text-words.

b) Pseudo-text-1 matches the source text if, and only if, the ordered sequence of text-words that forms pseudo-text-1 is equal, character for character, to the ordered sequence of source text-words. When the LEADING phrase is specified, partial-word-1 matches the source text-word only if the contiguous sequence of characters that forms partial-word-1 is equal, character for character, to an equal number of contiguous characters starting with the leftmost character position of that source text-word. When the TRAILING phrase is specified, partial-word-1 matches the source text-word only if the contiguous sequence of characters that forms partial-word-1 is equal, character for character, to an equal number of contiguous characters ending with the rightmost character position of that source text-word.

c) The following rules apply for the purpose of matching:

1. Each occurrence of a separator comma, semicolon, or space in pseudo-text-1 or in the source text is considered to be a single space. Each sequence of one or more space separators is considered to be a single space.

WARNING: Regardless of the above text, it does ***not*** mean that these procedures have been implemented into this program, or for that matter GNU Open Cobol.

What it does show is that when processing literals or text that goes over one line that this program may well adopt the free source format for the COPY libraries that are called for inclusion in order to expand said literals correctly and this format may well be used in the listings in a similar manner to GNU Open Cobol (see the .i file when produced by various OC parameters including '--save-temps' , -E etc).

See the other parts of this manual for what exactly, ***is*** implemented for any specific version of the program.

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Appendix C

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Version 1.3, 3 November 2008

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