



Fujitsu Siemens Computers GmbH

COBOL2000-BC and COBOL2000 (BS2000/OSD)

\*1 Version 1.4B

\*1 May 2008

Release Notice

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# 1 General

COBOL2000, the COBOL compiler for object-oriented programming in BS2000/OSD \*), enables programming to the COBOL Standard ANSI X3.23-1985 (= ISO/IEC 1989-1985 = EN 21989 = DIN 66028-1986).

- \*1 COBOL2000 (BS2000/OSD) V1.4B \*\*) supports the supplement to the ANSI Standard X3.23a-1989 and ISO/IEC 1989 Amendment 1, Intrinsic Function Module as well as the COBOL Standard X3.23-1985 High Level.

The optional modules "Report Writer" and "Segmentation" are provided in their full functionality in addition to the mandatory modules required by the standard.

COBOL2000 also contains the "Data Manipulation Language DML" for operating the UDS database system.

- \*1 COBOL2000 V1.4B supports the COBOL85 Standard as well as the main object-oriented functions and basic functionality from the COBOL2002 Standard (= ISO/IEC 1989:2002(E) Programming Language COBOL).

- \*1 In addition to the language extensions, COBOL2000 V1.4B also supports the POSIX and XPG4 programming interfaces.

- \*1 The COBOL2000 (BS2000/OSD) V1.4B compiler is supplied **without** the runtime system. The common runtime system for COBOL85, COBOL2000, C and C++ in BS2000 is the Common Run-Time Environment CRTE.

- \*1 COBOL2000 V1.4B is available in two configurations:

- Basic configuration (BC)
- Full configuration

- \*1 The following functions are **not** supported in the basic configuration COBOL2000-BC V1.4B:

- REPORT WRITER
- CODASYL-DML (native UDS support)
- Symbolic debugging with AID
- Output of a list of all error messages
- POSIX interfaces
- Starter phase.

- \*1 This Release Notice is a summary of the major extensions, requirements and operating information with regard to COBOL2000 V1.4B under the BS2000/OSD operating system.

This Release Notice describes the full configuration unless otherwise stated.

- \*1 The release level is that of May 2008.

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\*\*) COBOL2000 (BS2000/OSD) (R)  
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This Release Notice is supplied as a file in uppercase and lowercase. Customers will receive an updated version of this file should any subsequent changes be made.

To print this file, use

```
/PRINT-DOCUMENT FROM-FILE=SYSFGM.COBOL2000-GEM.014.E, -  
/ DOC-FORM=*TEXT(LINE-SPACING=BY-EBCDIC-CONTR)  
                                (English version)
```

This Release Notice is also available online under  
<http://manuals.fujitsu-siemens.com>.

If one or more previous versions are skipped when this product version is used, the information from the Release Notices (and README files) of the previous versions must be noted.

### 1.1 Ordering

- \*1 COBOL2000 V1.4B can be ordered from your local distributors and is subject to the general terms and conditions of the software product use and service agreement.

### 1.2 Delivery

- \*1 The COBOL2000 V1.4B files are supplied via SOLIS.

#### 1.2.1 Delivery components of the basic configuration

The following delivery components are required regardless of the hardware type (HSI):

SYSFGM.COBOL2000-GEM.014.D	Release Notice (German)
SYSFGM.COBOL2000-GEM.014.E	Release Notice (English)
SYSMES.COBOL2000-BC.014	Message file (MSGMAKER format)
SYSPRG.COBOL2000-BC.014	Compiler
SYSSDF.COBOL2000-BC.014	System syntax file
SYSSDF.COBOL2000-BC.014.USER	User syntax file
SYSSII.COBOL2000-BC.014	IMON information file
SYSSII.COBOL2000-GEM.014	IMON information file for common delivery components
SYSSPR.COBOL2000-BC.014.COMPIL	SDF start procedure for compiler

### 1.2.2 Delivery components of the full configuration

The following delivery components are required regardless of the hardware type (HSI):

SINLIB.COBOL2000.014	Library for installation in POSIX
SYSGM.COBOL2000-GEM.014.D	Release Notice (German)
SYSGM.COBOL2000-GEM.014.E	Release Notice (English)
SYSMES.COBOL2000.014	Message file (MSGMAKER format)
SYSPRG.COBOL2000.014	Compiler
SYSPRG.COBOL2000.014.START	Starter phase, installed under the file name COBOL2000
SYSSDF.COBOL2000.014	System syntax file
SYSSDF.COBOL2000.014.USER	User syntax file
SYSSII.COBOL2000.014	IMON information file
SYSSII.COBOL2000-GEM.014	IMON information file for common delivery components
SYSSPR.COBOL2000-BC.014.COMPIL	SDF start procedure for compiler

The current file and volume characteristics are listed in the SOLIS2 delivery cover letter.

### 1.3 Documentation

\*1 The following documentation is available for COBOL2000 V1.4B:

Title	Order number
COBOL2000 (BS2000/OSD) V1.4 Sprachbeschreibung	U41112-J-Z125-5
COBOL2000 (BS2000/OSD) V1.4 Language Reference Manual	see manual server <a href="http://manuals.fujitsu-siemens.com">http:// manuals.fujitsu-siemens.com</a>
COBOL2000 (BS2000/OSD) V1.4 Benutzerhandbuch	U41113-J-Z125-5
COBOL2000 (BS2000/OSD) V1.4 User Guide	see manual server <a href="http://manuals.fujitsu-siemens.com">http:// manuals.fujitsu-siemens.com</a>

In addition, for CRTE as of V2.5 the manual

Title	Order number
CRTE 2.5A (BS2000/OSD) Benutzerhandbuch	U21446-J-Z125-11
CRTE 2.5A (BS2000/OSD) User Guide	U21446-J-Z125-11-76

\*1 and the BS2000/OSD basic configuration manuals are also required for operating COBOL2000 V1.4B.

The following manuals are recommended when using the full configuration of the compiler:

- the relevant AID manuals for debugging with AID,
- the relevant POSIX manuals for working with POSIX.

The BS2000/OSD documentation is also available in German and English on CD-ROM under the title BS2000/OSD Softbooks.

The documentation is also available as an online manual under <http://manuals.fujitsu-siemens.com> or can be ordered at extra cost under <http://FSC-manualshop.com>.

There may be additional README files for these manuals. They contain the latest changes and extensions for the manual of the product concerned.

The file names have the following structure:

SYSRME.<product>.<version>.D (file with German text)  
SYSRME.<product>.<version>.E (file with English text)

The CONTR-CHAR=EBCDIC operand should be specified in the PRINT-FILE command for printing these files.

## 2 Software extensions

COBOL2000 V1.4A represents a further step towards implementing the COBOL2002 standard.

The following functions have been implemented as of this version in addition to the functional scope of the previous version COBOL2000 V1.3A:

- Support of the NATIONAL data type for representing characters in the Unicode UTF-16 character set.
  - PICTURE N, USAGE NATIONAL and GROUP-USAGE NATIONAL
  - national literals and national figurative constants
  - implicit conversion from EBCDIC to UTF-16 for transfers (MOVE) and conditions
  - explicit conversion with the NATIONAL-OF and DISPLAY-OF functions
  - substitution character and exception handling with conversions
  - support of national data by existing language constructs (particularly conditions, INITIALIZE, INSPECT, STRING, UNSTRING, SORT, MERGE and the NUMVAL, LOWER-CASE, UPPER-CASE, LENGTH, REVERSE, MAX, MIN, ORD-MAX, ORD-MIN and ORD functions)
  - new intrinsic functions BYTE-LENGTH and CHAR-NATIONAL
- user-defined types in tables
- data fields and data records with a length of 0
- optimization of SORT calls
- option of using different compiler versions installed in parallel and
- extension of the compressed source code list (VERDI list) for merging-in addresses of statements

Support for Unicode (NATIONAL) requires openNet Server V3.2A (see section Technical information).

Please refer to the COBOL2000 V1.4A documentation for more details on this.

\*1 COBOL2000 V1.4B supports some extensions of internal restrictions.  
\*1 New functionality, influencing the user interface, is  
\*1 not included in this version.

## 3 Technical information

### 3.1 Resource requirements

- The files supplied with the product occupy
- \*1 approximately 1900 PAM pages for the basic configuration
  - \*1 approximately 5600 PAM pages for the full configuration

If the POSIX file system is not used with the full configuration, the library SINLIB.COBOL2000.014 can be deleted. The Software Configuration Inventory (SCI) is thereby not adapted.

- \*1 40 MB virtual address space should be made available to the compiler for compilation.

If the POSIX functions (ENABLE-UFS-ACCESS=YES) are used, this increases the space required by the linked programs. The space requirement can be reduced again by linking with the CRTE library SYSLNK.CRTE.PARTIAL-BIND and preloading the CRTESIS subsystem, a component of CRTE.

### 3.2 Software configuration

- \*1 COBOL2000 V1.4B is released for BS2000/OSD-BC as of V6.0B and OSD/XC as of V2.0.

You need the following delivery components for the /390 system architecture:

- BS2GA.LLMAM as of V6.0
- BS2GA.SDF as of V6.0
- BS2GA.CRTE-BAS as of V6.0

- \*1 If no explicit SOLIS change release was specified, the correction levels of correction package 1/2008 are required. This also includes CRTE-MSG V1.6B.
- \*1

- \*1 The product "Common Run-Time Environment" CRTE V2.6B must be installed for running COBOL2000 V1.4B modules. CRTE is an independent delivery unit and must be ordered separately for models with /390 architecture. CRTE V2.6B is released for BS2000/OSD-BC as of V6.0B.
- \*1

- \*1 For the SX servers with RISC-SPARC architecture, you need the correction level of correction package 1/2008 for the following delivery components, unless a newer SOLIS change release is specified:

- BXC.BS20SD as of V2.0
- BXC.CRTE-BAS as of V2.0.

- \*1 This also includes CRTE V2.6B and CRTE-MSG V1.6B.

- \*1 The POSIX subsystem must be loaded to enable the compiler to use the POSIX file system. The POSIX applications produced with CRTE V2.6B require the POSIX-BC version released for the OSD version concerned.

- \*1 openNet Server V3.2A is required for support of Unicode (NATIONAL). openNet Server V3.2A for BS2000/OSD-BC as of V6.0B is released for the /390 system architecture.
- \*1 For SX servers with RISC-SPARC architecture, openNet Server 3.2A is a component part for OSD/XC as of V2.2.

\*1 The following products are required for compilation:

- CRTE as of V2.6B
- JV (1) as of V14.0
- UDS/SQL (1) as of V2.3
- XHCS (1) ab V2.0A

(1) only if the relevant COBOL language resources/system services are used

\*1 The following products are required to run COBOL2000 modules:

- AID (1) as of V3.2
- CRTE as of V2.6B
- LMS (2) as of V3.3
- SORT (1) as of V7.8
- UDS/SQL (1) as of V2.3
- UTM (3) as of V5.2

(1) only if the relevant COBOL language resources/system services are used

(2) only if LINE-SEQUENTIAL I/O is used

(3) only if COBOL modules are to run as UTM subroutines

To run multiple versions of the COBOL2000 compiler concurrently, COBOL2000 as of V1.0B is required.

### **3.3 Product installation**

Installation of the product COBOL2000 with the installation monitor IMON is mandatory. The information concerning installation in the delivery cover letter and in the product documentation must be followed as well as the information given below.

The necessary inputs and the sequence of the installation are described in the IMON documentation.

The COBOL2000 compiler is installed by default under the default user ID. However, the compiler can also be installed under any other ID. Integration of the syntax file in the system syntax file and installation of the message files is performed automatically during standard installation with SOLIS/IMON.

#### **3.3.1 Installation for use in POSIX**

Note: this point does not apply for COBOL2000-BC.

To be able to install COBOL2000 in POSIX, you have to first install the component POSIX-SH in POSIX. POSIX-SH is part of the basic configuration and is included with BS2000/OSD-BC as of V6.0 and OSD/XC as of V2.0.

Proceed as follows if you also want to install COBOL2000 in the POSIX file system:

- If a version of the product COBOL85 is already installed in POSIX, this must first be deinstalled in all cases.
- To do this, call the POSIX installation program under TSOS (refer to the "POSIX Basics" manual for details) with:  
/CALL-PROCEDURE (SINPRC.POSIX-BC.<version>,POSINST).  
Select 'Delete packages from POSIX', enter COBOL85 as the product and the relevant version as the product version (e.g. 023 for V02.3A).
- A previous version of the product COBOL2000 that is installed in POSIX must also first be deinstalled. Proceed analogously for this.
- You can then install COBOL2000 in the POSIX file system either
  - directly with IMON (select POSIX installation) or alternatively
  - after successful IMON installation (without POSIX installation), with the POSIX installation tool.  
To do this, after starting the POSIX installation tool, select the point "Install packages on POSIX" and then enter COBOL2000 as the product and 014 as the product version.

### 3.4 Product use

#### 3.4.1 Product use with the ESQL-COBOL precompiler

In addition to the information in the Release Notice for the product ESQL-COBOL, the following points must be observed when using the precompiler ESQL-COBOL for SESAM:

\*1 The following applies to generalization of the source format:  
\*1 ESQL as of V3.0B also supports programs in COBOL Free Reference format.

\*1 Because the ESQL-precompiler precedes the COBOL-Compiler, the  
\*1 conditional compilation as expressed in the COBOL language  
\*1 (such as ">> EVALUATE ..." or ">> IF ...") does not have any  
\*1 effect on the precompiler. The precompiler processes the ESQL  
\*1 language elements always, independent of the flow of the CO-  
\*1 BOL conditional compilation. This different interpretation of  
\*1 the same program text by the precompiler and the COBOL-  
\*1 compiler does not necessarily result in error messages.  
\*1 Therefore, SQL language elements as well as declare sections  
\*1 should not be contained in conditional compiled regions.

Syntactic restrictions with respect to mixing ESQL and new program structures for object orientation with recursive programs and associated local data areas are not known. In order to rule out problems with different visibilities of data and limited object lifetimes, we recommend that no SQL declare sections be defined in the local storage section and that SQL statements are only used in classic COBOL programs, but not in classes and methods.

The ESQL precompiler considers a compilation group to be a source program. Using SQL language resources in several compilation units leads to problems in the visibility of the referenced data.

### 3.4.2 Product use with UTM

The following points must be observed, in addition to the information given in the Release Notice for the UTM product:

- The subprograms produced using the COBOL2000 compiler can be generated with COMP=ILCS or COMP=COB1 for UTM, in the same way as the subprograms generated using the COBOL85 compiler. COMP=COB1 must be used when subprograms which are not ILCS compliant are called from the COBOL2000 module. If this is not the case, COMP=ILCS should be used.
- The programs compiled using the COBOL2000 compiler cannot use TCB entries, regardless of whether they are generated with COMP=COB1 or COMP=ILCS for UTM.
- The lifetime of the instance objects is limited to one subprogram run. When PEND is called, all new objects created within a subprogram run are released by the runtime system. This also applies to PEND variants without process change. This is why object references must not be retained beyond a subprogram run (in UTM memory areas, in shared memory or in a database), in order to pass them to subsequent subprograms. Object references are only valid in the subprogram run in which the object was created. Object references cannot be used beyond task boundaries in another program.
- Program replacement of LLMs which contain COBOL2000 modules with class definitions, require replacement of these LLMs together with all the LLMs that inherit or use the relevant class definitions.

### 3.4.3 Product use with COLUMBUS85

The following points must be observed, in addition to the information given in the Release Notice for the COLUMBUS85 product:

- COLUMBUS85 has no direct interface to the COBOL compiler. The COBOL programs processed with COLUMBUS85 tools can still generally be compiled with the COBOL2000 compiler. COLUMBUS85 only supports the COBOL85 language standard, as does the COBOL85 compiler.
- It is therefore not possible to continue developing COBOL programs using the new language resources of the COBOL2000 compiler while still using the COLUMBUS85 tools for these programs. The COLUMBUS85 tools react with error messages or faulty interpretations if language resources are used in the COBOL programs that cannot be compiled with the COBOL85 compiler. Among other things, these include:
  - the new COBOL2000 compilation units (e.g. class definitions, program prototypes)
  - violations against the source format rules (division into A area and B area or free format)
  - all directives
  - the new COBOL2000 keywords

### 3.4.4 Product use with AID

The following points should be observed at the start of a debug session when debugging with AID:

Immediately after loading a COBOL program, no initialization has taken place. Single commands can therefore cause error messages or additional qualifications may have to be entered.

Particularly with object-oriented programming, the classes and objects have not been initialized. AID can therefore not handle data and test points in objects and methods or object references correctly in all cases in the calling programs. This problem can be avoided by executing

```
/%TRACE 1 %STMT
```

before other AID commands to activate the AID run trace and start the program. The program is thereby initialized and proceeds to the first statement.

When displaying BASED data in recursive programs with:

```
/%SD
```

the contents of the data from the innermost and most current recursion is always shown. The contents of the outer recursions must be determined in another manner, e.g. by stopping the program at a suitable point and outputting the required data.

### 3.5 Obsolete functions (and those to be discontinued)

\*1 No functions have been deleted between COBOL2000 V1.3A and COBOL2000 V1.4.

The following flagging options are supported for the last time in this version:

- FLAG-ABOVE-MINIMUM,
- FLAG-ABOVE-INTERMEDIATE,
- FLAG-ALL-SEGMENTATION,
- FLAG-INTRINSIC-FUNCTIONS,
- FLAG-REPORT-WRITER,
- FLAG-SEGMENTATION-ABOVE1

This also applies for the respective ACTIVATE-FLAGGING options. If these are used, an appropriate informative message is output.

### 3.6 Incompatibilities

COBOL2000 V1.4A is fully compatible with the previous version COBOL2000 V1.3A, apart from the following restrictions:

- Incompatibilities in operating the compiler
  - the error weighting of a few compiler error messages has either been raised or lowered by one level.
- Incompatibilities in the language scope
  - Values that are not allowed for the ADVANCING parameter of the WRITE statement or alphanumeric values (the standard requires numeric values) will be acknowledged with an error message in the future. Making the test stricter increases the security for programming.
  - The keys with SORT (file/tables), with MERGE and the RECORD/ALTERNATE RECORD KEYS of ISAM files that do not lie within the records, will be rejected uniformly with the new message 81031 in the future. This test increases the security for programming.
  - The character N is no longer accepted as a CURRENCY-SIGN (see support of national characters).
  - BYTE-LENGTH has been added as a new keyword (see support of national characters).
  - The standard does not allow umlauts in user-defined names. This will also be tested as such in the future.
  - Class tests of numeric, packed data with a user-defined class are no longer allowed.
  - Support for data fields with zero length can cause previously undefined situations to be semantically defined. The relevant places in a COBOL source can easily be found with the directives >>FLAG-85 ZERO-LENGTH ON.
- Incompatibilities at runtime
  - With OPEN OUTPUT for files for which no linkname was set, sufficiently large primary and secondary areas are now selected to also allow these files to be opened if the system default values were set too low.
  - RELATIVE KEY also counts beyond 16777215 (x'FFFFFF') with AMODE=24.
  - With a MOVE of the figurative constant ALL 'literal' in a receiving field, the JUSTIFIED-RIGHT clause of the receiving field is ignored. This behavior corresponds to the description in the manual.
  - USE procedures for non-fatal exceptions must be explicitly exited or stopped with RESUME, EXIT, GOBACK or STOP RUN. This currently only affects the exceptions EC-STORAGE-NOT-AVAIL and EC-STORAGE-NOT-ALLOC.

\*1 COBOL2000 V1.4B is fully compatible with the previous version  
\*1 COBOL2000 V1.4A, apart from the following restrictions:

\*1 In exceptional cases, there may be differing reactions when programs implemented using the restriction extensions are affected.

\*1 If the program contains more than 65535 lines the error messages (COBRUN MERGE DIAGNOSTICS) are not merged in the list file.

### 3.7 Restrictions

Alias Catalog System (ACS)

Standard file names (xxxLST/FIL.COBO.L.<prog-id>) must not be entered as alias file names because ACS alias names with and without prefixed user ID are not taken to be identical.

Prelinked large modules or link-load modules that contain older COBOL85 runtime modules are not supported by the current runtime system. Relevant large modules must be re-linked. However, this does not constitute a restriction in upwards compatibility to old COBOL85 object modules.

Note: applications must always be linked with only a single CRTE.

In rare cases, with garbage collection for OO programs, the garbage collection routines themselves may not get any more memory from the system. In this case, the program is aborted with a corresponding error message.

### 3.8 Procedure in the event of errors

If an error occurs, the following error documentation will be required for diagnostic purposes:

- a detailed description of the error condition
- indication as to whether and how the error can be reproduced.
- options, source and error listing including expansion of the COPY elements (LISTING option)
- execution log (MSG=FH)
- source including the COPY elements and COSSD if required (COBOL subschema directory)
- linker listing
- input/output files
- expected result
- brief description of execution
- product version number
- Rep files used
- DUMP, if available
- subsystems used

## 4 Hardware support

\*1 COBOL2000 V1.4B will run on all central units supported by

- BS2000/OSD-BC as of V6.0B and
- OSD/XC as of V2.0



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