

Fujitsu Software BS2000 CRTE

Version 21.0A

June 2025



Release Notice

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1 General

This Release Notice is a summary of the major extensions, requirements and operating information with regard to the following technical delivery unit:

BS2OS.CRTE V21.0A for BS2000 OS DX V1.0.

This technical delivery unit contains the components CRTE V21.0A, CRTE-BASYS V21.0A, CRTE-MSG V21.0A and POSIX-HEADER V21.0A.

The Common Run-Time Environment CRTE V21.0A is the common runtime system for all variants of the following compilers:
COBOL85 as of V2.3, COBOL2000 as of V1.6, C/C++ as of V4.0 in BS2000 OS DX as of V1.0.

CRTE comprises language-specific and non-language-specific libraries, e.g. for program linking, mathematics and uniform event and error handling as well as memory and I/O management. The header files of the C and C++ library functions are also part of the CRTE.

The CRTE is software prerequisite for COBOL85, COBOL2000, C and C++ applications and for the above-mentioned versions of the compilers for the languages COBOL, C and C++. CRTE is also a prerequisite for applications with a "foreign" language mix. CRTE also supports the COBOL85, COBOL2000, C and C++ compilers and their applications in POSIX.

Some of the CRTE libraries are shareable and can be preloaded as a subsystem.

- *8 The release level is that of June 2025.
- *1 Changes to release level June 2021 are marked with "*1".
- *2 Changes to release level November 2021 are marked with "*2".
- *3 Changes to release level June 2022 are marked with "*3".
- *4 Changes to release level November 2022 are marked with "*4".
- *5 Changes to release level June 2023 are marked with "*5".
- *6 Changes to release level November 2023 are marked with "*6".
- *7 Changes to release level June 2024 are marked with "*7".
- *8 Changes to release level November 2024 are marked with "*8".

- *2 This and other Release Notice(s) are available online at
- *2 <https://bs2manuals.ts.fujitsu.com/>.

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

1.1 Ordering

CRTE V21.0A is included in BS2000 OS DX V1.0.

1.2 Delivery

The CRTE V21.0A files are supplied via SOLIS.

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

	SINLIB.CRTE.210	Library for installation in POSIX
	SINPRC.CRTE.210	Library with Installation procedures
	SKULNK.CRTE.210	Modules (X86)
	SKULNK.CRTE.210.COMPL	Modules for complete partial bind (X86)
	SKULNK.CRTE.210.CPP-COMPL	Modules for complete partial bind of ANSI-C++ programs (X86)
	SKULNK.CRTE.210.PARTIAL-BIND	Modules for standard partial bind (X86)
	SKULNK.CRTE.210.POSIX	POSIX link switch (X86)
	SKULNK.CRTE.210.RTSCPP	C++ runtime system for C/C++ (X86)
	SKULNK.CRTE.210.STDCPP	C++ library for C/C++ (X86)
	SKULNK.CRTE.210.TIME	Time link switch (X86)
	SKULNK.CRTE.210.TIMESHIFT	Timeshift link switch (X86)
	SKULNK.CRTE.210.TIME38	Time functions for special applications (X86)
	SKULNK.CRTE.210.TIME50	Timeshift link switch (X86)
	SKULNK.CRTE.210.TOOLS	C++ library Tools.h++ for C/C++ (X86)
*5	SKULNK.CRTE.210.CXX01	X86 variant of the standard C++ library and C++ runtime system for library version 1 (as of CPP V4.0A, standard >= C++ 2017)
*5		
*5		
*5	SKULNK.CRTE.210.CXX02	X86 variant of the standard C++ library and C++ runtime system for library version 2 (as of CPP V4.0B03, standard >= C++ 2017)
*5		
*5		
	SYSLIB.CRTE.210	Headers and macros for C/C++
	SYSLIB.CRTE.210.CPP	Headers and macros for C/C++ (Cfront)
*5	SYSLIB.CRTE.210.CXX01	Include-Header of the C++ library functions for library version 1
*5		
*5	SYSLIB.CRTE.210.CXX02	Include-Header of the C++ library functions for library version 2
*5		
*8	SYSDOC.CRTE.210.OSS	Readme and licences of the Open Source software included in the C++ runtime system for library version 1 and 2
*8		
*8		
	SYSLNK.CRTE.210	Macro/module library
	SYSLNK.CRTE.210.CFCPP	Module library for C/C++ (Cfront)
*5	SYSLNK.CRTE.210.CXX01	Standard C++ library and runtime system for C++ library version 1
*5		
*5	SYSLNK.CRTE.210.CXX02	Standard C++ library and runtime system for C++ library version 2
*5		
	SYSLNK.CRTE.210.COMPL	Modules for complete partial bind
	SYSLNK.CRTE.210.COMPV1	Compatibility library C V1.0
	SYSLNK.CRTE.210.COMPV2	Compatibility library C V2.0
	SYSLNK.CRTE.210.CPP	Macro/module library for C++ (Cfront)
	SYSLNK.CRTE.210.CPP-COMPL	Modules for complete partial bind of C++ programs
	SYSLNK.CRTE.210.PARTIAL-BIND	Modules for standard partial bind
	SYSLNK.CRTE.210.POSIX	POSIX link switch
	SYSLNK.CRTE.210.RTSCPP	Standard C++ runtime system for C/C++
	SYSLNK.CRTE.210.SHARE	Shareable components
	SYSLNK.CRTE.210.STDCPP	Standard C++ library for C/C++
	SYSLNK.CRTE.210.TIME	Time link switch
	SYSLNK.CRTE.210.TIMESHIFT	Timeshift link switch
	SYSLNK.CRTE.210.TIME38	Time functions for special applications
	SYSLNK.CRTE.210.TIME50	Timeshift link switch
	SYSLNK.CRTE.210.TOOLS	C++ library Tools.h++ for C/C++

SYSSSC.CRTE.210.C	Subsystem declarations (CRTEC)
SYSSSC.CRTE.210.C.LOW	
SYSSSC.CRTE.210.COBOLE	Subsystem declarations (CRTECOB)
SYSSSC.CRTE.210.COBOLE.LOW	
SYSSSC.CRTE.210.COBOLE-PART	Subsystem declarations (COBPART)
SYSSSC.CRTE.210.COBOLE-PART.LOW	
SYSSSC.CRTE.210.PARTIAL	Subsystem declarations (CRTEPART)
SYSSSC.CRTE.210.PARTIAL.LOW	
SYSSSC.CRTE.210.SIS	Subsystem declarations (CRTESIS)
SYSSSC.CRTE.210.SIS.LOW	
SYSSII.CRTE.210	IMON information file
SYSLNK.CRTE-BASYS.210	C runtime system
SYSLNK.CRTE-BASYS.210.ASSRTS	Assembler runtime system
SYSLNK.CRTE-BASYS.210.ASSRTSSH	
SYSLNK.CRTE-BASYS.210.CLIB	programs
SYSLNK.CRTE-BASYS.210.ILCS	ILCS module library
SYSLNK.CRTE-BASYS.210.PTH	Libraries for PThreads
SYSLNK.CRTE-BASYS.210.PTH-LOAD	
SYSSSC.CRTE-BASYS.210	Subsystem declarations (CRTEBASY)
SYSSSC.CRTE-BASYS.210.LOW	
SYSSSC.CRTE-BASYS.210.PTH	Subsystem declarations (CRTEPTH)
SYSSSC.CRTE-BASYS.210.PTH.LOW	
SINPRC.CRTE-BASYS.210	Library with installation procedures
SYSSII.CRTE-BASYS.210	IMON information file
SYSMES.CRTE-MSG.210	Message file for C, COBOL and assembler runtime system
SYSSII.CRTE-MSG.210	IMON information file
SINLIB.POSIX-HEADER.210	Library for installation in POSIX
SYSLIB.POSIX-HEADER.210	Header for C applications in POSIX
SINPRC.POSIX-HEADER.210	Library with installation procedures
SYSSII.POSIX-HEADER.210	IMON information file

The files identified as X86 can only be used for producing applications for X86 hardware. They are not needed for normal operation, but are supplied for optimizing availability if required. Their use is not generally released.

The following delivery components are only required on a x86 server unit in SE Servers:

SKUSSC.CRTE.210.PARTIAL	Subsystem declarations (CRTEPARK)
SKUSSC.CRTE.210.SIS	Subsystem declarations (CRTESIK)
SKULNK.CRTE-BASYS.210	C runtime system
SKULNK.CRTE-BASYS.210.ASSRTS	Assembler runtime system
SKULNK.CRTE-BASYS.210.ASSRTSSH	
SKULNK.CRTE-BASYS.210.PTH	Libraries for PThreads
SKULNK.CRTE-BASYS.210.PTH-LOAD	
SKUSSC.CRTE-BASYS.210	Subsystem declarations (CRTEBASK)
SKUSSC.CRTE-BASYS.210.PTH	Subsystem declarations (CRTEPTK)

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

1.3 Documentation

- *2 The documentation is available on the Internet at <https://bs2manuals.ts.fujitsu.com>.
- *2 There you will find both individual manuals and (under the "Softbooks" tab) the ISO
- *2 image of a DVD with the entire inventory.

2 Software extensions

2.1 New functions for support of 64 bit timestamps

In CRTE V21.0A there are new functions that support 64-bit timestamps:

```
fstatatx
fstatat64x
fstatx
fstat64x
ftwx
ftw64x
futimesat64
getrusage64
lstatx
lstat64x
msgctl64
nftwx
nftw64x
semctl64
shmctl64
statx
stat64x
utimensat64
utime64
utimes64
wait364
```

These functions need a POSIX-BC correction state from A47 to run. A description of these functions can be found in the manuals "C Library Functions for POSIX Applications" (Edition June 2021).

*1 2.2 Passing arguments to C programs in SDF environment

*1 The treatment of single and double quotation marks in arguments to call a C program
 *1 in SDF environment is adapted to the program call in POSIX. Especially strings are
 *1 recognized without preceding blank.

*1 2.3 Format check for printf and scanf functions

*1 The format check for the functions fprintf(), printf(), sprintf(), snprintf(), fscanf(), scanf()
 *1 and sscanf() as well as their ASCII- and IEEE-version is activated (for more infor-
 *1 mation see C/C++ user manual Pragmas __printf_args bzw. __scanf_args).
 *1 When the macro __SNI_PRINTF_CHECK is defined, the C/C++ compiler V4.0A40 de-
 *1 fines it implicitly.

*2 2.4 Improvements of the interface

*2 The interface to the POSIX-subsystem is improved.

*5 2.5 Support for the new library version

*5 With this CRTE release, library version 2 (MODIFY-LIBRARY-VERSION VERSION=2)
 *5 of C++ is supported for OS DX V1.0 for the first time.

*7 2.6 Support of %m in format strings of the printf-family

*7 Specifying printf("%m") is equivalent to specifying printf("%s", strerror(errno));

*8 **2.7 New Function _guid4**

*8 New function _guid4 added, to generate a version 4 Universal Unique Identifier (UUID).

3 Technical information

3.1 Resource requirements

Depending on the application concerned, CRTE V21.0A requires approx. 1 MB static virtual address space.

*5 The files supplied with the product occupy
approx. 195,700 PAM pages

*5 where
approx. 101,300 PAM pages
are occupied by files that are provided exclusively for producing X86 applications for X86 hardware.

Installation of CRTE V21.0A and POSIX-HEADER V21.0A in POSIX takes up around 9 MB in the root file system.

The later files can be deleted to save hard disk space, as long as the production of X86 applications is not intended.

The following space is required in class 4 memory for loading the subsystems:

*8	CRTEC	1800 KB
	CRTECOB	224 KB
*5	CRTESIK	2948 KB (only X86 systems)
*5	CRTESIS	948 KB
*8	CRTEPARK	5564 KB (only X86 systems)
*8	CRTEPART	2396 KB
	COBPART	176 KB
*8	CRTEBASK	5564 KB (only X86 systems)
*8	CRTEBASY	2396 KB
*8	CRTEPTH	2436 KB
*8	CRTEPTK	5636 KB (only X86 systems)

All subsystems are loaded by default into the class 4 memory above 16 MB.

3.2 Software configuration

CRTE V21.0A is included in BS2000 OS DX V1.0.

3.3 Product installation

Installation of the product CRTE 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 in this Release Notice.

The necessary inputs and the sequence of the installation are described in the IMON documentation. You will find all important information on product installation in the CRTE V21.0A User Guide.

The standard installation of CRTE in the POSIX file system is made either directly with IMON or with the POSIX installation tool after installation with IMON.

The following additional installation forms are also described in the manual for CRTE V21.0A:

- Installation to a non-standard ID
- Private installation
- Installation of header files and link switches in any desired POSIX directory

The CRTEBASY subsystem and possibly CRTEBASK as well as CRTEPTH and possibly CRTEPTK from the CRTE-BASYS component, are provided as the runtime environment for BS2000 internal programs. The subsystems should only be preloaded if this is recommended in the Release Notice of another installed product.

The subsystems are loaded into upper class 4 memory by default. As an alternative, the subsystems can also be loaded into class 4 memory below 16 MB using the supplied subsystem declaration files (with the extension LOW), if enough space is available there.

In addition, IMON copies the IC@RTSXS, IC@STLNK and IC@ULINK modules from the SYSLNK.CRTE-BASYS.210.CLIB library into the CLIB. If the \$.CLIB file does not exist in the original system, it is created by IMON. This \$.CLIB can be used for programs that were compiled with C V2.0 or earlier.

The compatibility library SYSLNK.ILCS is also installed with CRTE-BASYS.

3.3.1 Important information regarding future upgrades

CRTE V21.0 is the first version for BS2000 OS DX V1.0

Upgrading from previous CRTE versions:

The headers from an earlier CRTE version installed in POSIX must first be removed. For this, refer to the information in the CRTE V21.0A User Guide.

Subsequently, all files from previous CRTE versions can be deleted.

Any preloaded CRTEC, CRTECOB, CRTESIS, CRTEPART, CRTEPARK, COBPART subsystems from a previous version may not be accessed while or after installing CRTE V21.0A. These subsystems should be stopped before CRTE V21.0A is installed, and either replaced by the new version of the subsystem concerned (in the case of a standard installation, IMON automatically generates the appropriate entries in the subsystem catalog) or removed from the subsystem catalog.

Upgrading from previous CRTE-BASYS versions:

Any preloaded CRTEBASY or CRTEBASK subsystems from a previous version as well as CRTEPTH or CRTEPTK of a previous version or the product CRTE of a previous version may not be accessed while or after installing CRTE-BAS V21.0A.

They should be stopped before CRTE-BAS V21.0A is installed, and either replaced by the new version of the subsystem concerned (in the case of a standard installation, IMON automatically generates the appropriate entries in the subsystem catalog) or removed from the subsystem catalog.

Upgrading from previous POSIX-HEADER versions:

If the version of a product already installed in POSIX (POSIX-HEADER) changes (e.g. from 111 to 210), the old product version should be deinstalled ('Delete packages from POSIX' function of the POSIX installation program) before the new product version is installed in POSIX. This deinstallation can only be made using procedures from the old product files (e.g. SINLIB.<product>.<oldvers>). The old product files can then be deleted and the new product version installed in POSIX. See also the CRTE V21.0A User Guide for more information on this.

3.4 Product use

The CRTE V21.0A User Guide contains all the main information on using the product.

The libraries (SKULNK.CRTE.*) and subsystems (SKUSSC.CRTE.*), supplied exclusively for use on X86 systems are not released for use. If necessary, these files can be deleted (see section 3.1 "Resource requirements" for details).

Note on optional REP A0434953-295:

This optional REP ensures that page 0 is not allocated after ILCS initialization. This REP should only be used in debug operation to detect erroneous access to page 0.

3.5 Discontinued functions (and those to be discontinued)

The following functions are no longer supported as of this version:

none

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

none

3.6 Incompatibilities

The BS2000 macro ETPND is no longer transferred to the SYSLIB.CRTE library.

*1 By using C/C++ compiler version \geq V4.0A40 and CRTE-Header-libraries V21.0A10 it
*1 is possible to get new error messages because of the format check for printf and scanf
*1 functions.

*8 The libraries SYSDOC.CRTE.210.CXX01.OSS and SYSDOC.CRTE.210.CXX02.OSS
*8 are no longer provided. They have been replaced by the single library SYS-
*8 DOC.CRTE.210.OSS, which now contains all open-source documentation and will be
*8 extended in the future if needed

3.7 Restrictions

*4 none

3.8 Procedure in the event of errors

If an error occurs, the following error documents are needed for diagnostics:

- 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 and INCLUDE elements (LISTING option)
- execution log
- source including the COPY and INCLUDE elements and COSSD if required
- linker listing
- input/output files
- expected result
- brief description of execution
- product version number
- Rep files used
- CONSLOG (in special cases)
- DUMP, if available
- subsystems used

4 Hardware requirements

CRTE V21.0A will run on all business servers supported by BS2000 OS DX as of V1.0 that meet the software requirements.