



Norsk Data

# Product Information

Product name

COBOL-85 Runtime for ND-500/5000

Product number

211039

## Description of product

COBOL-85 Runtime System.

Implemented to ANSI-X3.23-1985, Highest level: Validated January 23. 1989 by National Computing Centre Ltd UK, with no errors.

Increased compatibility with leading PC COBOL systems.

Major ND extensions: Screen Handling, Multiuser File Access, Source Level Symbolic Debugging.

## Reason(s) for new product or version

- Accept full Level 2 ANSI-X3.23-1985 COBOL Syntax
- Accept leading PC COBOL Dialects
- Support earlier ND COBOL extensions
- Performance improvements
- Error corrections

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## 1 Prerequisites

The following are required in order to use this product.

### 1.1 Hardware prerequisites

The following hardware must be present for this product to be used:

CPU type (any of the following):

- 500
- 5000

### 1.2 Software prerequisites

The following software must be present for this product to be used:

Operating system:

<u>Name</u>	<u>Version/Revision</u>
SINTRAN-III VSX	<i>All</i>
SINTRAN-III VSX (if new DOMAIN format)	<i>L</i>

Other software:

<u>Product name</u>	<u>Product number</u>
Linkage loader for ND-500/5000	<i>210319D (or later)</i>
ND LINKER (if new DOMAIN format)	<i>211224A (or later)</i>
EXCEPT-LIB	<i>210511A (or later)</i>

### 1.3 Other prerequisites

The following are necessary for this product to be used.

Minimum Permanent Mass Storage:

User	Space (pages)	Number of files
LIBRARIES	<i>183</i>	<i>4</i>
PROGRAMS	<i>143</i>	<i>2</i>

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## 2 Dependencies

In addition to the above listed hardware and/or software prerequisites, the following dependencies exist between this and other products. The hardware and software listed here may, for example, be necessary to use the product's full functionality.

### 2.1 Hardware dependencies

The Screen Handling part of COBOL-85 requires a terminal supported by ND VTM (Virtual Terminal Manager).

### 2.2 Software dependencies

The Symbolic Debugger facility of COBOL-85 requires the following:

Debugging at listing level:

Symbolic Debugger, version  $\geq$  H00

Debugging at source level:

LED-DEBUGGER, version  $\geq$  B02

## 3 Documentation

Included (distributed free with product)

<u>Title</u>	<u>Number</u>
ND COBOL-85 Reference Manual	860231.1 EN

Hint:

A list of differences between ANSI-74 COBOL and ANSI-85 COBOL is found in Appendix 1 of the ND COBOL-85 Reference Manual.

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## 4 Installation procedure

### 4.1 Non-automatic installation

NOTE: The following SINTRAN users should exist (you may of course choose other user(s) in which to place the software):

LIBRARIES - for the COBOL-85 Runtime System.  
PROGRAMS - for the COBOL-85 Utilities.

#### 4.1.1 COBOL-85 Runtime System

- Log in as user LIBRARIES, and enter the diskette 211039K<rev>-XX-01D:

@ENTER-DIRECTORY,211039K,<Device name>,<Unit no> ↓

- Use the BACKUP-SYSTEM to copy the files:

COBOL-85-LIB-K<rev>:NRF	IS-MULTI-K<rev>:NRF
COBOL-85-LIB-K<rev>:NEW	IS-MULTI-K<rev>:NEW
COBOL-85-LIB-K<rev>:OLD	IS-MULTI-K<rev>:OLD

to user LIBRARIES.

#### NEW DOMAIN FORMAT:

- Run the mode file: @MODE IS-MULTI-K:NEW,,, ↓
- If you want to load the Runtime System to link segment 21 (dec), do the following:

@MODE COBOL-85-LIB-K<rev>:NEW,,, ↓  
(Ignore the redefinition warnings from the mode job)

#### OLD DOMAIN FORMAT:

- Run the mode file: @MODE IS-MULTI-K:OLD,,, ↓
- If you want to load the Runtime System to link segment 21 (dec), do the following:

@MODE COBOL-85-LIB-K<rev>:OLD,,, ↓  
(Ignore the redefinition warnings from the mode job)

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### 4.1.2 COBOL-85 Utilities

- Log in as user PROGRAMS, and use the BACKUP-SYSTEM to copy the files ISAM-SERVICE-K02:PROG and ISAM-INTER-K01:PROG to to user PROGRAMS.
- Release the diskette, and the installation procedure is finished:  
@RELEASE-DIRECTORY,211039K ↓

### 4.2 Use

We strongly recommend to use the new DOMAIN format, especially because of the more flexible linking facilities: The Multiuser Supervisor IS-MULTI-K:SEG will be the same, regardless of whether you choose to load or link the COBOL-85 Runtime System to your domain(s). See below.

#### 4.2.1 Linking/Loading, NEW domain format

##### Linking the COBOL Library:

```
@Linker
Open-Domain <Domain>
Load <Program>
Link COBOL-85-LIB-K:SEG
Close No,No
Exit
```

##### Loading the COBOL Library:

```
@Linker
Open-Domain <Domain>
Load <Program>
Link IS-MULTI-K:SEG
Load COBOL-85-LIB-K:NRF
Load EXCEPT-LIB:NRF
Close No,No
Exit
```

#### 4.2.2 Linking/Loading, OLD domain format

##### Linking the COBOL Library:

```
@Linkage-Loader
Clear-Domain <Domain>
Set-Domain <Domain>
Load-Segment <Program>
Link-Segment MULTI-IS-K
Link-Segment COBOL-85-LIB-K
End-Domain
Exit
```

##### Loading the COBOL Library:

```
@Linkage-Loader
Clear-Domain <Domain>
Set-Domain <Domain>
Load-Segment <Program>
Link-Segment IS-MULTI-K
Load-Segment COBOL-85-LIB:NRF
Load-Segment EXCEPT-LIB:NRF
End-Domain
Exit
```

Note the difference between MULTI-IS-K and IS-MULTI-K !!!

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## 5 Modifications

### General remarks:

Full ANSI-85 implementation of the following modules:

Nucleus,  
Sequential I-O,  
Relative I-O,  
Indexed I-O,  
Sort-Merge,  
Inter-Program Communication,  
Source Text Manipulation.

Increased compatibility with leading PC COBOL systems on:  
Screen Handling,  
Multiuser File Access.

Enhanced Symbolic Debugger facilities (Source Level Debugging).

### 5.1 Nucleus

- The SWITCH, CLASS and ALPHABET clauses are implemented.
- The USAGE IS BINARY clause is implemented.
- The RENAMES (level 66) clause is implemented.
- The VALUE clause is now valid for OCCURS items.
- New relational condition operators: >= and <=.
- New classes: ALPHABETIC-LOWER/UPPER, <User-defined class>.
- Reference Modification (ie. sub-string) is implemented.
- The maximum number of dimensions for tables are increased from 3 to 15.
- ACCEPT identifier FROM DAY-OF-WEEK is implemented.
- Format 4 ACCEPT and format 5 DISPLAY are implemented, to be compatible with leading PC COBOL systems on Screen Handling.
- The EVALUATE statement is implemented.
- The INITIALIZE statement is implemented.
- The INSPECT CONVERTING statement is implemented.

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- The PERFORM statement is enhanced: the WITH TEST BEFORE/AFTER clause is available, as well as in-line PERFORM. Up to 14 AFTER clauses.
- Two new formats of the SET statement:  
SET mnemonic-name TO ON/OFF (for switches).  
SET condition-name TO TRUE (for level 88).

### 5.2 Sequential I-O

- The set of FILE STATUSes is expanded, according to the standard.
- The SAME RECORD AREA clause is implemented.
- The MULTIPLE FILE TAPE clause is implemented.
- The ORGANIZATION IS LINE SEQUENTIAL is implemented. This will replace the RECORDING MODE IS T clause, which is declared an obsolete element.
- The RECORD DELIMITER clause is implemented.
- The LINAGE clause is implemented.
- CLOSE WITH LOCK, and CLOSE REEL are implemented.
- The AT END-OF-PAGE clause of the WRITE statement is implemented.

### 5.3 Relative and Indexed I-O

- The set of FILE STATUSes is expanded, according to the standard.
- The SAME RECORD AREA clause is implemented.
- The LOCK MODE clause in the SELECT phrase is implemented, to select singleuser or multiuser file access. The WITH MULTI-USER-MODE clauses of the OPEN statement are declared as obsolete elements. That is, they will still work, but will be removed in future versions of this product. Please refer to the Reference Manual, chapter 9.2: "Sharing Files on Multiuser Systems", chapter 9.3.4: "The LOCK MODE clause", and chapter 9.4: "The BLOCK CONTAINS clause".
- CLOSE WITH LOCK is implemented.
- SPLIT KEYS are implemented for Indexed files, allowing non-contiguous record items to be used as a key.

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### 5.4 Sort-Merge

- The WITH DUPLICATES IN ORDER clause of the SORT statement has been implemented.
- The GIVING clause of the SORT statement may now have more than one file.
- It is now possible to sort multi-reel tape files, and vice versa, multi-file tapes.
- Sort errors will now be captured by an appropriate USE statement in the DECLARATIVES.

### 5.5 Inter-Program Communication

- Nesting of source programs is permitted, using the END PROGRAM header.
- The IS COMMON/INITIAL PROGRAM clause is implemented in the PROGRAM-ID.
- The EXTERNAL and GLOBAL clauses for FILE SECTION and WORKING-STORAGE SECTION are implemented.
- The CANCEL statement is implemented.
- The parameters of the CALL statement may be preceded by the BY REFERENCE or BY CONTENT clauses.
- CALL identifier is implemented, allowing subroutine names to be changed at run-time.
- The CALL statement has been expanded with the ON OVERFLOW/EXCEPTION clauses.
- The GLOBAL clause of the USE statement is implemented.



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### 5.6 Source Text Manipulation

- COPY libraries are implemented, allowing many copy elements to be placed on one file. Note the new compiler command COPY-LIBRARY <name>, allowing you to specify a default copy library file.
- The COPY statement has been expanded with the REPLACING and BY clauses. Note that this implies that all COPY statements must be terminated by a period (.).
- The REPLACE statement is implemented.

### 5.7 Source Level Symbolic Debugging

Full source level debugging facilities are implemented in COBOL-85:

- Use the command DEBUG SOURCE-LEVEL before compiling your programs.
- The source programs will automatically be read into the source region of the screen, according to the execution. Program listings are not needed.
- COPY statements are allowed, both in the DATA and PROCEDURE parts.
- Debugging in mixed language environment is allowed.
- Use the DEBUGGER-LED, version B02 or later.

We strongly recommend using this facility, to see how fun (and indeed efficient) the modern way of application debugging is.

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## 6 Errors corrected

- The READ statement on text files could go AT END on the first record.
- On Indexed/Relative files opened in multiuser mode, the error flag was set erroneously.
- The SORT statement could fail when sorting big text files.
- Non-existing files following the GIVING clause of the SORT statement were not automatically created. This was also the case for the SD file itself.
- The condition F1 < F2 could produce wrong result if both F1 and F2 was alphanumeric fields of 8 character length.
- The condition F1 > numeric-literal could produce wrong result if the number of digits in numeric-literal was greater than the definition of F1.

Example: 02 num PIC 99 VALUE 47.

```
IF num > 100 DISPLAY "Compiler error!".
```

- The STRING statement failed if overflow on the destination field.
- The ON SIZE ERROR clause of the ADD/SUBTRACT CORRESPONDING was wrong.
- The ON SIZE ERROR clause of the ADD, SUBTRACT, MULTIPLY and DIVIDE statements was wrong if all operands were defined as COMP-1.
- The USE AFTER ERROR PROCEDURE ON file-name statement did not accept that file-name was defined with the IMPORT/EXPORT clauses.
- The SELECT file-name ASSIGN TO identifier clause did not accept that file-name was defined in the LINKAGE SECTION.
- PICTURE P was not fully implemented.
- The figurative constant ALL "xxx" was not accepted (length > 1).
- If the OPEN statement returned status "94" (error flag discovered), the following statements were rejected:  
READ, WRITE, START, REWRITE and DELETE.
- USE AFTER ERROR PROCEDURE ON <file-1> produced a PROTECT VIOLATION during compilation if <file-1> was defined with IMPORT.

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- The compiler required separate OPEN and CLOSE statements for files that were defined with IMPORT or EXPORT.
- The following UNSTRING construction was rejected by the compiler:  
UNSTRING <id> DELIMITED BY ALL <del> INTO ...  
where the size of <del> was greater than one character.
- The illegal combination NEXT SENTENCE / END-IF was not detected by the compiler.
- The compiler required that the last statement of a program was terminated by a period.
- The debug information for table elements was not correct.
- When using variable length records on continuous Index-Sequential or Relative files, status "24" (file is full), was not detected by the REWRITE statement.
- COBOL could not handle Index-Sequential and Relative files bigger than 2\*\*27 bytes, ie. 65536 SINTRAN pages. This limitation is now removed.
- The ISAM-SERVICE Utility was unable to:
  - Open files with a corrupted free list (list of deleted records).  
Error symptoms: NO SUCH PAGE, or the OPEN command would loop.
  - Open files with group key(s) and variable length records.
  - Unload/load files with odd byte record length and variable length records.
  - Create the index part from a flat SINTRAN file, using the OPEN and CREATE-KEY commands. Error symptom: The very last data records could be ignored, depending on the number of records.

## 7 Errors known but not corrected

None.