

FUJITSU Software

NetCOBOL V12.0

A decorative horizontal band with a red-to-dark-red gradient. It features abstract, glowing white and red lines that swirl and intersect, creating a sense of motion and energy.

LE Subroutines User's Guide

Windows(64)

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Preface

NetCOBOL LE subroutines provide the Language Environment of IBM compatibility. This guide explains the functions and specifications of the NetCOBOL LE subroutines.

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Abbreviations

The following abbreviations are used in this manual:

Product Name	Abbreviation
Microsoft(R) Windows Server(R) 2016 Datacenter Microsoft(R) Windows Server(R) 2016 Standard Microsoft(R) Windows Server(R) 2016 Essentials	Windows Server 2016
Microsoft(R) Windows Server(R) 2012 R2 Datacenter Microsoft(R) Windows Server(R) 2012 R2 Standard Microsoft(R) Windows Server(R) 2012 R2 Essentials Microsoft(R) Windows Server(R) 2012 R2 Foundation	Windows Server 2012 R2
Microsoft(R) Windows Server(R) 2012 Datacenter Microsoft(R) Windows Server(R) 2012 Standard Microsoft(R) Windows Server(R) 2012 Essentials Microsoft(R) Windows Server(R) 2012 Foundation	Windows Server 2012
Microsoft(R) Windows Server(R) 2008 R2 Datacenter Microsoft(R) Windows Server(R) 2008 R2 Enterprise Microsoft(R) Windows Server(R) 2008 R2 Standard Microsoft(R) Windows Server(R) 2008 R2 Foundation	Windows Server 2008 R2
Windows(R) 10 Education Windows(R) 10 Home Windows(R) 10 Pro Windows(R) 10 Enterprise	Windows 10 or Windows 10 (x64)
Windows(R) 8.1 Windows(R) 8.1 Pro Windows(R) 8.1 Enterprise	Windows 8.1 or Windows 8.1 (x64)
Windows(R) 7 Home Premium Windows(R) 7 Professional Windows(R) 7 Enterprise Windows(R) 7 Ultimate	Windows 7 or Windows 7(x64)

- In this manual, when all the following products are indicates, it is written as "Windows".
 - Windows Server 2016
 - Windows Server 2012 R2
 - Windows Server 2012
 - Windows Server 2008 R2
 - Windows 10
 - Windows 8.1
 - Windows 7

Organization of This Documentation

This documentation is organized as follows:

[Chapter 1 Introduction](#)

[Chapter 2 Bit Operation Subroutines](#)

[Chapter 3 Condition Processing Subroutines](#)

[Chapter 4 Date and Time Subroutines](#)

[Chapter 5 Dynamic Storage Area Subroutines](#)

[Chapter 6 General Subroutines](#)

[Chapter 7 Initialization and Termination Subroutines](#)

[Chapter 8 Math Subroutines](#)

[Chapter 9 Message Processing Subroutines](#)

[Chapter 10 Country wise language support Subroutines](#)

[Chapter 11 Other subroutines](#)

[Chapter 12 Using the runtime environment variable](#)

[Appendix A List of LE Subroutines](#)

System-specific Functions

indicator	Corresponding system	Corresponding product
[.NET]	Windows Server 2016 Windows Server 2012 R2 Windows 10 Windows 8.1 Windows 7	NetCOBOL for .NET V8
[Winx64]	Windows Server 2016 Windows Server 2012 R2 Windows Server 2012 Windows Server 2008 R2 Windows 10 (x64) Windows 8.1 (x64) Windows 7 (x64)	NetCOBOL (64bit) V12

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Contents

Chapter 1 Introduction.....	1
Chapter 2 Bit Operation Subroutines.....	2
2.1 CEESICLR.....	2
2.2 CEESISSET.....	2
2.3 CEESISHF.....	3
2.4 CEESITST.....	4
Chapter 3 Condition Processing Subroutines.....	6
3.1 CEEDCOD.....	6
3.2 CEENCOD.....	7
Chapter 4 Date and Time Subroutines.....	10
4.1 CEECLDY.....	10
4.2 CEEDATE.....	11
4.3 CEEDATM.....	12
4.4 CEEDAYS.....	13
4.5 CEEDYWK.....	14
4.6 CEEGMT.....	15
4.7 CEEGMTO.....	16
4.8 CEEISEC.....	17
4.9 CEEOCT.....	18
4.10 CEEQCEN.....	19
4.11 CEESCEN.....	20
4.12 CEESECI.....	21
4.13 CEESECS.....	22
4.14 CEEUTC.....	23
Chapter 5 Dynamic Storage Area Subroutines.....	25
5.1 CEECRHP.....	25
5.2 CEECZST.....	26
5.3 CEEDSHP.....	27
5.4 CEEFRST.....	27
5.5 CEEGTST.....	28
Chapter 6 General Subroutines.....	30
6.1 CEE3PRM.....	30
6.2 CEE3USR.....	30
6.3 CEEGPID.....	31
6.4 CEERANO.....	32
Chapter 7 Initialization and Termination Subroutines.....	34
7.1 CEE3ABD.....	34
Chapter 8 Math Subroutines.....	35
8.1 CEESxABS.....	35
8.2 CEESxACS.....	35
8.3 CEESxASN.....	36
8.4 CEESxATH.....	37
8.5 CEESxATN.....	38
8.6 CEESxAT2.....	39
8.7 CEESxCOS.....	40
8.8 CEESxCSH.....	41
8.9 CEESxCTN.....	42
8.10 CEESxDIM.....	42
8.11 CEESxEXP.....	43
8.12 CEESxINT.....	44

8.13 CEESxLG1	45
8.14 CEESxLG2	46
8.15 CEESxLOG	47
8.16 CEESxMOD	48
8.17 CEESxNIN	49
8.18 CEESxNWN	49
8.19 CEESxSGN	50
8.20 CEESxSIN	51
8.21 CEESxSNH	52
8.22 CEESxSQT	53
8.23 CEESxTAN	54
8.24 CEESxTNH	55
8.25 CEESxXPx	55
 Chapter 9 Message Processing Subroutines.....	 58
9.1 CEEMOUT.....	58
 Chapter 10 Country wise language support Subroutines	 59
10.1 CEE3CTY.....	59
10.2 CEE3LNG.....	60
10.3 CEE3MCS.....	61
10.4 CEE3MDS.....	62
10.5 CEE3MTS.....	63
10.6 CEEFMDA.....	64
10.7 CEEFMDT.....	64
10.8 CEEFMTM.....	65
 Chapter 11 Other subroutines.....	 67
11.1 Use of other subroutines.....	67
 Chapter 12 Using the runtime environment variable.....	 68
12.1 @CBR_LE_COUNTRY (Specify the default country code)	68
12.2 @CBR_LE_STORAGE (Specify the character used to initialize the heap area when allocating and freeing the heap)	68
12.3 @CBR_LE_HEAP (Specify the initial size and extended size for the heap allocation).....	68
12.4 @CBR_LE_MSGFILE (Specify message file name).....	69
 Appendix A List of LE Subroutines.....	 70

Chapter 1 Introduction

NetCOBOL LE subroutines provide the Language Environment of IBM compatibility. This guide explains the functions and specifications of the NetCOBOL LE subroutines.

This manual classifies the LE subroutines in the following categories:

- [Chapter 2 Bit Operation Subroutines](#)
- [Chapter 3 Condition Processing Subroutines](#)
- [Chapter 4 Date and Time Subroutines](#)
- [Chapter 5 Dynamic Storage Area Subroutines](#)
- [Chapter 6 General Subroutines](#)
- [Chapter 7 Initialization and Termination Subroutines](#)
- [Chapter 8 Math Subroutines](#)
- [Chapter 9 Message Processing Subroutines](#)
- [Chapter 10 Country wise language support Subroutines](#)

The appendix lists the LE subroutines

[Appendix A List of LE Subroutines](#)



- When calling LE subroutines with a dynamic link structure, link F4AGLER.LIB when linking the calling program. When calling LE subroutines with dynamic program structure, the following entry information is required.

```
:  
[ENTRY]  
LE_routine_name=F4AGLER.DLL
```

Refer to "Entry Information" in "NetCOBOL User's Guide" for details on specifying entry information.

- In an application that uses LE subroutines, Unicode and the internal floating-point format of the Fujitsu mainframe cannot be used.

Preparation for calling the LE subroutines

The following description is required to call the LE subroutines.

```
01 FC.  
 02 Condition-Token-Value.  
  COPY CEEIGZCT.  
 03 Case-1-Condition-ID.  
  :
```

In the library "CEEIGZCT.cbl", feedback codes used in the LE subroutines are defined.

This library is placed in the NetCOBOL installation folder.

Chapter 2 Bit Operation Subroutines

2.1 CEESICLR

Clears the bit.

It returns a copy of input integer (PARM1), and specified bit is set to 0.

Calling format

```
CALL "CEESICLR" USING
      BY REFERENCE PARM1,
      BY REFERENCE PARM2,
      BY REFERENCE FC,
      BY REFERENCE RESULT.
```

Parameter data definition

```
01 PARM1 PIC S9(9) BINARY.
01 PARM2 PIC S9(9) BINARY.
01 FC.
02 Condition-Token-Value.
COPY CEEIGZCT.
03 Case-1-Condition-ID.
04 Severity PIC S9(4) BINARY.
04 Msg-No PIC S9(4) BINARY.
03 Case-2-Condition-ID
REDEFINES Case-1-Condition-ID.
04 Class-Code PIC S9(4) BINARY.
04 Cause-Code PIC S9(4) BINARY.
03 Case-Sev-Ctl PIC X.
03 Facility-ID PIC XXX.
02 I-S-Info PIC S9(9) BINARY.
01 RESULT PIC S9(9) BINARY.
```

PARM1 (Input)

Specify the operation target that clears bit.

PARM2 (Input)

Specify the bit position that clears bit.

The PARM2 value is a 32-bit integer in the range between 0 and 31.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1VC	2	2028	The value of second argument was outside the valid range.

RESULT (Output)

Specify the area to store the result of this subroutine.

It returns a copy of PARM1 and the bit numbered PARM2 (counting from the right) is set to 0.

2.2 CEESISSET

Sets the bit.

It returns a copy of input integer (PARM1), and specified bit is set to 1.

Calling format

```
CALL "CEESISSET" USING
      BY REFERENCE PARM1,
      BY REFERENCE PARM2,
      BY REFERENCE FC,
      BY REFERENCE RESULT.
```

Parameter data definition

```
01 PARM1 PIC S9(9) BINARY.
01 PARM2 PIC S9(9) BINARY.
01 FC.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
  03 Case-1-Condition-ID.
  04 Severity PIC S9(4) BINARY.
  04 Msg-No PIC S9(4) BINARY.
  03 Case-2-Condition-ID
  REDEFINES Case-1-Condition-ID.
  04 Class-Code PIC S9(4) BINARY.
  04 Cause-Code PIC S9(4) BINARY.
  03 Case-Sev-Ctl PIC X.
  03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
01 RESULT PIC S9(9) BINARY.
```

PARM1 (Input)

Specify the operation target that set bit.

PARM2 (Input)

Specify the bit position that set bit.

The PARM2 value is a 32-bit integer in the range between 0 and 31.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1VC	2	2028	The value of second argument was outside the valid range.

RESULT (Output)

Specify the area to store the result of this subroutine.

It returns a copy of PARM1 and the bit numbered PARM2 (counting from the right) is set to 1.

2.3 CEESISHF

Shifts the bit.

It returns a copy of input integer (PARM1), and only the specified number bits shifts to the right or the left.

Calling format

```
CALL "CEESISHF" USING
      BY REFERENCE PARM1,
      BY REFERENCE PARM2,
```

```
BY REFERENCE FC ,
BY REFERENCE RESULT .
```

Parameter data definition

```
01 PARM1 PIC S9(9) BINARY.
01 PARM2 PIC S9(9) BINARY.
01 FC.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
  03 Case-1-Condition-ID.
  04 Severity PIC S9(4) BINARY.
  04 Msg-No PIC S9(4) BINARY.
  03 Case-2-Condition-ID
  REDEFINES Case-1-Condition-ID.
  04 Class-Code PIC S9(4) BINARY.
  04 Cause-Code PIC S9(4) BINARY.
  03 Case-Sev-Ctl PIC X.
  03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
01 RESULT PIC S9(9) BINARY.
```

PARM1 (Input)

Specify the operation target that shifts bit.

PARM2 (Input)

Specify the bit count to shift.

The PARM2 value is a 32-bit integer in the range between -32 and 32.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1VC	2	2028	The value of second argument was outside the valid range.

RESULT (Output)

Specify the area to store the result of this subroutine.

Output is a 32 bit integer whose value depends on the value of PARM2. In either case, the blank bits are set to 0.

- If PARM2 is 0 or more, then result is a copy of PARM1 shifted to left by PARM2 bits.
- If PARM2 is less than 0, then the result is a copy of PARM1 shifted to right by |PARM2| bits.

2.4 CEESITST

Tests the bit.

It tests if the selected bit is ON or OFF.

Calling format

```
CALL "CEESITST" USING
      BY REFERENCE PARM1 ,
      BY REFERENCE PARM2 ,
      BY REFERENCE FC ,
      BY REFERENCE RESULT .
```

Parameter data definition

```
01 PARM1 PIC S9(9) BINARY.
01 PARM2 PIC S9(9) BINARY.
01 FC.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
01 RESULT PIC S9(9) BINARY.
```

PARM1 (Input)

Specify the operation target that tests bit.

PARM2 (INPUT)

Specify the bit position that tests bit. (Counting from the right)

The PARM2 value is a 32-bit integer in the range between 0 and 31.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1VC	2	2028	The value of second argument was outside the valid range.

RESULT (Output)

Specify the area to store the result of this subroutine.

The output is a 32-bit integer with one of the following values. Bits are counted from the right.

- 1 : The tested bit is ON.
- 0 : The tested bit is OFF.

Chapter 3 Condition Processing Subroutines

3.1 CEEDCOD

Decomposes an existing condition token.

Calling format

```
CALL "CEEDCOD" USING
    BY REFERENCE FC,
    BY REFERENCE SEV,
    BY REFERENCE MSGNO,
    BY REFERENCE CASE,
    BY REFERENCE SEV2,
    BY REFERENCE CNTRL,
    BY REFERENCE FACID,
    BY REFERENCE ISINFO,
    BY REFERENCE FC2.
```

Parameter data definition

```
01 SEV    PIC S9(4) BINARY.
01 MSGNO  PIC S9(4) BINARY.
01 CASE   PIC S9(4) BINARY.
01 SEV2   PIC S9(4) BINARY.
01 CNTRL  PIC S9(4) BINARY.
01 FACID  PIC X(3).
01 ISINFO PIC S9(9) BINARY.
01 FC.
    02 Condition-Token-Value.
    COPY CEEIGZCT.
        03 Case-1-Condition-ID.
            04 Severity PIC S9(4) BINARY.
            04 Msg-No PIC S9(4) BINARY.
        03 Case-2-Condition-ID
            REDEFINES Case-1-Condition-ID.
            04 Class-Code PIC S9(4) BINARY.
            04 Cause-Code PIC S9(4) BINARY.
        03 Case-Sev-Ctl PIC X.
        03 Facility-ID PIC XXX.
    02 I-S-Info PIC S9(9) BINARY.
01 FC2.
    02 Condition-Token-Value.
    COPY CEEIGZCT.
        03 Case-1-Condition-ID.
            04 Severity PIC S9(4) BINARY.
            04 Msg-No PIC S9(4) BINARY.
        03 Case-2-Condition-ID
            REDEFINES Case-1-Condition-ID.
            04 Class-Code PIC S9(4) BINARY.
            04 Cause-Code PIC S9(4) BINARY.
        03 Case-Sev-Ctl PIC X.
        03 Facility-ID PIC XXX.
    02 I-S-Info PIC S9(9) BINARY.
```

FC (Input)

Specify the decomposed condition token.

SEV (Output)

Specify the area where the first two bytes of the condition_ID are stored.

MSGNO (Output)

Specify the area where the second two bytes of the condition_ID are stored.

CASE (Output)

Specify the area where the condition_ID format is stored.

- 1: Format of case 1 condition (Case-1-Condition-ID)
- 2: Format of case 2 condition (Case-2-Condition-ID)

0 or 3: It is reserved.

SEV2 (Output)

Specify the area where the severity of condition is stored. The following values are set.

- 0 (Information only): (However, when the entire token is zero, there is no information.)
- 1 (Warning): The subroutine was completed probably correctly.
- 2 (Error): correction attempted. The subroutine was completed perhaps incorrectly.
- 3 (Severe error): The subroutine is not completed.
- 4 (Critical error): The subroutine is not completed. Condition is informed by the signal.
Critical error is a condition that jeopardizes the environment.

CNTRL (Output)

Specify the area where the controlling condition state is stored. The following values are set.

- 1: The facility_ID is assigned by this system.
- 0: The facility_ID is assigned by the user.

FACID (output)

Specify the area where the alphanumeric character of three characters is stored.

The alphanumeric character of three characters (A to Z, a to z and 0 to 9) identify the product generating the condition or feedback information. (e.g. CEE)

ISINFO (output)

This parameter has no meaning in this system.

FC2 (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE036	3	0102	Unrecognized condition token was passed to routine and could not be used.

3.2 CEENCOD

Dynamically constructs a condition token.

Calling format

```
CALL "CEENCOD" USING
    BY REFERENCE SEV,
    BY REFERENCE MSGNO,
    BY REFERENCE CASE,
    BY REFERENCE SEV2,
```

```

BY REFERENCE CNTRL,
BY REFERENCE FACID,
BY REFERENCE ISINFO,
BY REFERENCE NEWTOK,
BY REFERENCE FC.

```

Parameter data definition

```

01 SEV    PIC S9(4) BINARY.
01 MSGNO  PIC S9(4) BINARY.
01 CASE   PIC S9(4) BINARY.
01 SEV2   PIC S9(4) BINARY.
01 CNTRL  PIC S9(4) BINARY.
01 FACID  PIC X(3).
01 ISINFO PIC S9(9) BINARY.
01 NEWTOK.
    02 Condition-Token-Value.
    COPY CEEIGZCT.
        03 Case-1-Condition-ID.
            04 Severity PIC S9(4) BINARY.
            04 Msg-No PIC S9(4) BINARY.
        03 Case-2-Condition-ID
            REDEFINES Case-1-Condition-ID.
            04 Class-Code PIC S9(4) BINARY.
            04 Cause-Code PIC S9(4) BINARY.
        03 Case-Sev-Ctl PIC X.
        03 Facility-ID PIC XXX.
    02 I-S-Info PIC S9(9) BINARY.
01 FC.
    02 Condition-Token-Value.
    COPY CEEIGZCT.
        03 Case-1-Condition-ID.
            04 Severity PIC S9(4) BINARY.
            04 Msg-No PIC S9(4) BINARY.
        03 Case-2-Condition-ID
            REDEFINES Case-1-Condition-ID.
            04 Class-Code PIC S9(4) BINARY.
            04 Cause-Code PIC S9(4) BINARY.
        03 Case-Sev-Ctl PIC X.
        03 Facility-ID PIC XXX.
    02 I-S-Info PIC S9(9) BINARY.

```

SEV (Input)

SEV and MSGNO compose the condition_ID part of condition token.

Specify the first two bytes of the condition_ID.

- When it is case 1, it represents the severity.
- When it is case 2, it represents the class_code.

MSGNO (Input)

Specify the second two bytes of the condition_ID.

- When it is case 1, it represents the Msg_No.
- When it is case 2, it represents the class_code.

CASE (Input)

Specify the condition_ID format.

SEV2 (Input)

Specify the severity of condition. The following values are set.

When it is case 1 condition, the value of this field is same as severity value of the condition_ID.

In the condition of case 1 and case 2, this field can be used to inspect the severity of the condition.

The following values can be set.

- 0 (Information only): (However, when the entire token is zero, there is no information.)
- 1 (Warning): The subroutine was completed probably correctly.
- 2 (Error): correction attempted. The subroutine was completed perhaps incorrectly.
- 3 (Severe error): The subroutine is not completed.
- 4 (Critical error): The subroutine is not completed. Condition is informed by the signal.
Critical error is a condition that jeopardizes the environment.

CNTRL (Input)

Specify the controlling condition state. The following values can be set.

- 1: The facility_ID is assigned by this system.
- 0: The facility_ID is assigned by 1 the user.

FACID (Input)

Specify the alphanumeric character of three characters.

The alphanumeric character of three characters (A to Z, a to z and 0 to 9) identify the product generating the condition or feedback information.

When it is the facility_ID is assigned by this system, FACID must be either CEE or FJX.

When it is the facility_ID is assigned by the user, FACID must be in the range between J and Z.

ISINFO (Input)

This parameter has no meaning in this system.

NEWTOK (Output)

Specify the area where the constructed condition token is stored.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE0CH	3	0401	Invalid case code <i>case-code</i> was passed.
CEE0CI	3	0402	Invalid control code <i>control-code</i> was passed.
CEE0CJ	3	0403	Invalid severity code <i>severity-code</i> was passed.
CEE0CK	1	0404	Facility ID <i>facility-id</i> with non-alphanumeric characters was passed.
CEE0E4	3	0452	Invalid facility ID <i>facility-id</i> was passed.

Chapter 4 Date and Time Subroutines

4.1 CEECBLDY

Converts a date string to the COBOL integer format.

The value of COBOL integer is an integer indicating a serial day starting from January 1, 1601.

Calling format

```
CALL "CEECBLDY" USING
        BY REFERENCE CHRDATE,
        BY REFERENCE PICSTR,
        BY REFERENCE INTEGER,
        BY REFERENCE FC.
```

Parameter data definition

```
01 CHRDATE.
    02 Vstring-length PIC S9(4) BINARY.
    02 Vstring-text.
        03 Vstring-char PIC X
            OCCURS 0 TO 256 TIMES
            DEPENDING ON Vstring-length of CHRDATE.
01 PICSTR.
    02 Vstring-length PIC S9(4) BINARY.
    02 Vstring-text.
        03 Vstring-char PIC X
            OCCURS 0 TO 256 TIMES
            DEPENDING ON Vstring-length of PICSTR.
01 INTEGER PIC S9(9) BINARY.
01 FC.
    02 Condition-Token-Value.
        COPY CEEIGZCT.
            03 Case-1-Condition-ID.
                04 Severity PIC S9(4) BINARY.
                04 Msg-No PIC S9(4) BINARY.
            03 Case-2-Condition-ID
                REDEFINES Case-1-Condition-ID.
                04 Class-Code PIC S9(4) BINARY.
                04 Cause-Code PIC S9(4) BINARY.
            03 Case-Sev-Ctl PIC X.
            03 Facility-ID PIC XXX.
    02 I-S-Info PIC S9(9) BINARY.
```

CHRDATE (Input)

Specify the character string (length is contained) that represents the date or timestamp.

The number of characters is from 5 to 255.

PICSTR (Input)

Specify the date format specified for CHRDATE.

The character in PICSTR corresponds to the character in CHRDATE.

For the list of valid picture character terms and valid picture string, refer to the manual of IBM.

INTEGER (Output)

Specify the area where the COBOL integer (number of days since 31 December 1600) is stored.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE2EB	3	2507	The insufficient data was specified.
CEE2EC	3	2508	The date value was invalid.
CEE2ED	3	2509	The era was not correct.
CEE2EH	3	2513	The input date was not within the supported range.
CEE2EL	3	2517	The month value was not correct.
CEE2EM	3	2518	An invalid picture string was specified in a call to a date and time subroutine.
CEE2EO	3	2520	The date string did not match the picture string.
CEE2EP	3	2521	The (<JJJJ>) or (<CCCC>) year-within-era value was zero.

4.2 CEEDATE

Converts a Lilian date to the character format.

Calling format

```
CALL "CEEDATE" USING
    BY REFERENCE LILIAN,
    BY REFERENCE PICSTR,
    BY REFERENCE CHRDATE,
    BY REFERENCE FC.
```

Parameter data definition

```
01 LILIAN PIC S9(9) BINARY.
01 PICSTR.
    02 Vstring-length PIC S9(4) BINARY.
    02 Vstring-text.
        03 Vstring-char PIC X
            OCCURS 0 TO 256 TIMES
            DEPENDING ON Vstring-length of PICSTR.
01 CHRDATE PIC X(80).
01 FC.
    02 Condition-Token-Value.
    COPY CEEIGZCT.
        03 Case-1-Condition-ID.
            04 Severity PIC S9(4) BINARY.
            04 Msg-No PIC S9(4) BINARY.
        03 Case-2-Condition-ID
            REDEFINES Case-1-Condition-ID.
            04 Class-Code PIC S9(4) BINARY.
            04 Cause-Code PIC S9(4) BINARY.
        03 Case-Sev-Ctl PIC X.
        03 Facility-ID PIC XXX.
    02 I-S-Info PIC S9(9) BINARY.
```

LILIAN (Input)

Specify the Lilian date.

The Lilian date is an integer indicating a serial day starting from October 14, 1582.

PICSTR (Input)

Specify the desired format of CHRDATE(length is contained).

For the list of valid picture character terms and valid picture string, refer to the manual of IBM.

CHRDATE (Output)

Specify the area where the Lillian date converted into character format is stored. Character format is a form specified by PICSTR.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE2EG	3	2512	The Lillian date value was not within supported range.
CEE2EM	3	2518	An incorrect picture string was specified.
CEE2EQ	3	2522	<JJJ>, <CCCC> or <CCCCCCCC> was used in a picture string passed to CEEDATE, but the Lillian date value was not within the supported range. The era could not be determined.
CEE2EU	3	2526	The date string returned by CEEDATE was truncated.

4.3 CEEDATM

Converts the number of seconds since 00:00:00, October 14, 1582 to a character string format.

The format of the output is a character string timestamp.

For example it is output as, 1988/07/26 20:37:00.

Calling format

```
CALL "CEEDATM" USING
      BY REFERENCE SECONDS,
      BY REFERENCE PICSTR,
      BY REFERENCE TIMESTP,
      BY REFERENCE FC.
```

Parameter data definition

```
01 SECONDS COMP-2.
01 PICSTR.
  02 Vstring-length PIC S9(4) BINARY.
  02 Vstring-text.
    03 Vstring-char PIC X
      OCCURS 0 TO 256 TIMES
      DEPENDING ON Vstring-length of PICSTR.
01 TIMESTP PIC X(80).
01 FC.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
```

SECONDS (Input)

Specify the number of seconds since 00:00:00 on 14 October 1582.

PICSTR (Input)

Specify the desired format of TIMESTP(length is contained).

For the list of valid picture character terms and valid picture string, refer to the manual of IBM.

TIMESTP (Output)

Specify the area where the SECONDS converted into the format specified by PICSTR is stored.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE2E9	3	2505	The number-of-seconds value was not within supported range.
CEE2EA	3	2506	<JJJJ>, <CCCC> or <CCCCCCCC> was used in a picture string passed to CEEDATM, but the input number-of-seconds value was not within the supported range.
CEE2EM	3	2518	An invalid picture string was specified.
CEE2EV	2	2527	The timestamp string returned by CEEDATM was truncated.
CEE3CF	2	3471	The country code country-code was not valid for CEEFMDT.

4.4 CEEDAYS

Converts a date string to a Lilian format.

Calling format

```
CALL "CEEDAYS" USING
      BY REFERENCE CHRDATE,
      BY REFERENCE PICSTR,
      BY REFERENCE LILIAN,
      BY REFERENCE FC.
```

Parameter data definition

```
01 CHRDATE.
  02 Vstring-length PIC S9(4) BINARY.
  02 Vstring-text.
    03 Vstring-char PIC X
      OCCURS 0 TO 256 TIMES
      DEPENDING ON Vstring-length of CHRDATE.
01 PICSTR.
  02 Vstring-length PIC S9(4) BINARY.
  02 Vstring-text.
    03 Vstring-char PIC X
      OCCURS 0 TO 256 TIMES
      DEPENDING ON Vstring-length of PICSTR.
01 LILIAN PIC S9(9) BINARY.
01 FC.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
```

```

03 Case-2-Condition-ID
   REDEFINES Case-1-Condition-ID.
04 Class-Code PIC S9(4) BINARY.
04 Cause-Code PIC S9(4) BINARY.
03 Case-Sev-Ctl PIC X.
03 Facility-ID PIC XXX.
02 I-S-Info PIC S9(9) BINARY.

```

CHRRATE (Input)

Specify the date or timestamp(length is contained) according to the format specified by PICSTR

PICSTR (Input)

Specify the date format specified for CHRRATE.

LIAN (Output)

Specify the area where the Lillian date (number of days since 14 October 1582) is stored.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE2EB	3	2507	The insufficient data was specified. The value of Lillian date was not calculated.
CEE2EC	3	2508	The date value was not valid.
CEE2ED	3	2509	The era was not correct.
CEE2EH	3	2513	The input date was not within the supported range.
CEE2EL	3	2517	The month value was not correct.
CEE2EM	3	2518	An incorrect picture string was specified.
CEE2EO	3	2520	CEEDAYS detected non-numeric data in a numeric field, or date string did not match the picture string.
CEE2EP	3	2521	The year-within-era value was zero.

4.5 CEEDYWK

Calculates a day of the week from a Lillian date.

The day of the week is returned as a number between 1 and 7.

Calling format

```

CALL "CEEDYWK" USING
   BY REFERENCE LILIAN,
   BY REFERENCE DAYNUM,
   BY REFERENCE FC.

```

Parameter data definition

```

01 LILIAN PIC S9(9) BINARY.
01 DAYNUM PIC S9(9) BINARY.
01 FC.
02 Condition-Token-Value.
COPY CEEIGZCT.
03 Case-1-Condition-ID.
04 Severity PIC S9(4) BINARY.

```

```

    04 Msg-No    PIC S9(4) BINARY.
03 Case-2-Condition-ID
    REDEFINES Case-1-Condition-ID.
    04 Class-Code PIC S9(4) BINARY.
    04 Cause-Code PIC S9(4) BINARY.
03 Case-Sev-Ctl PIC X.
03 Facility-ID  PIC XXX.
02 I-S-Info    PIC S9(9) BINARY.

```

LILIAN (Input)

Specify the Lilian date.

The Lilian date is an integer indicating a serial day starting from October 14, 1582.

DAYNUM (Output)

Specify the area where the day-of-week of LILIAN is stored.

1: Sunday

2: Monday

:

7: Saturday.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE2EG	3	2512	The Lilian date value was not within the supported range.

4.6 CEEGMT

Gets the current Greenwich Mean Time (GMT) converted into following information.

- The Lilian date
- The number of seconds since 00:00:00 14 October 1582.

Calling format

```

CALL "CEEGMT" USING
    BY REFERENCE LILIAN,
    BY REFERENCE SECS,
    BY REFERENCE FC.

```

Parameter data definition

```

01 LILIAN PIC S9(9) BINARY.
01 SECS  COMP-2.
01 FC.
02 Condition-Token-Value.
COPY CEEIGZCT.
    03 Case-1-Condition-ID.
        04 Severity PIC S9(4) BINARY.
        04 Msg-No    PIC S9(4) BINARY.
03 Case-2-Condition-ID
    REDEFINES Case-1-Condition-ID.
        04 Class-Code PIC S9(4) BINARY.
        04 Cause-Code PIC S9(4) BINARY.
03 Case-Sev-Ctl PIC X.

```

```

03 Facility-ID PIC XXX.
02 I-S-Info PIC S9(9) BINARY.

```

LILIAN (Output)

Specify the area where the Lillian date (number of days since 14 October 1582) is stored.

SECS (Output)

Specify the area where the number of seconds since 00:00:00 14 October 1582 is stored.

(However, the leap second is not counted.)

FC (Output)

Specify the feedback code, which indicates the result of this subroutine.

The values and the meanings of the feedback codes are given below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE2E6	3	2502	The UTC/GMT was not available from the system.

4.7 CEEGMTO

Gets the difference between the local system time and Greenwich Mean Time (GMT).

Calling format

```

CALL "CEEGMTO" USING
    BY REFERENCE HOURS,
    BY REFERENCE MINUTES,
    BY REFERENCE SECONDS,
    BY REFERENCE FC.

```

Parameter data definition

```

01 HOURS PIC S9(9) BINARY.
01 MINUTES PIC S9(9) BINARY.
01 SECONDS COMP-2.
01 FC.
    02 Condition-Token-Value.
    COPY CEEIGZCT.
        03 Case-1-Condition-ID.
            04 Severity PIC S9(4) BINARY.
            04 Msg-No PIC S9(4) BINARY.
        03 Case-2-Condition-ID
            REDEFINES Case-1-Condition-ID.
            04 Class-Code PIC S9(4) BINARY.
            04 Cause-Code PIC S9(4) BINARY.
        03 Case-Sev-Ctl PIC X.
        03 Facility-ID PIC XXX.
    02 I-S-Info PIC S9(9) BINARY.

```

HOURS (Output)

Specify the area where the offset (in hours) from GMT to local time is stored.

MINUTES (Output)

When the local time is ahead of or behind GMT, specifies the area where the number of additional minutes is stored.

The range of MINUTES is 0 to 59.

SECONDS (Output)

Specify the area where the offset (in seconds) from GMT to local time is stored.

FC (Output)

Specify the feedback code, which indicates the result of this subroutine.

The values and the meanings of the feedback codes are given below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE2E7	3	2503	The offset from UTC/GMT to local time was not available from the system.

4.8 CEEISEC

Converts binary integers (year, month, day, hour, minute, second, and millisecond) to the number of seconds since 00:00:00 14 October 1582.

Calling format

```
CALL "CEEISEC" USING
    BY REFERENCE YEAR,
    BY REFERENCE MONTH,
    BY REFERENCE DAYS,
    BY REFERENCE HOURS,
    BY REFERENCE MINUTES,
    BY REFERENCE SECONDS,
    BY REFERENCE MILLSEC,
    BY REFERENCE OUTSECS,
    BY REFERENCE FC.
```

Parameter data definition

```
01 YEAR    PIC S9(9) BINARY.
01 MONTH   PIC S9(9) BINARY.
01 DAYS    PIC S9(9) BINARY.
01 HOURS   PIC S9(9) BINARY.
01 MINUTES PIC S9(9) BINARY.
01 SECONDS PIC S9(9) BINARY.
01 MILLSEC PIC S9(9) BINARY.
01 OUTSECS COMP-2.
01 FC.
02 Condition-Token-Value.
COPY CEEIGZCT.
03 Case-1-Condition-ID.
04 Severity PIC S9(4) BINARY.
04 Msg-No   PIC S9(4) BINARY.
03 Case-2-Condition-ID
REDEFINES Case-1-Condition-ID.
04 Class-Code PIC S9(4) BINARY.
04 Cause-Code PIC S9(4) BINARY.
03 Case-Sev-Ctl PIC X.
03 Facility-ID PIC XXX.
02 I-S-Info PIC S9(9) BINARY.
```

YEAR (Input)

Specify the year. The valid range for YEAR is 1582 to 9999.

MONTH (Input)

Specify the month. The valid range for MONTH is 1 to 12.

DAYS (Input)

Specify the day. The valid range for DAYS is 1 to 31.

HOURS (Input)

Specify the hours. The range of valid HOURS is 0 to 23.

MINUTES (Input)

Specify the minutes. The range of valid MINUTES is 0 to 59.

SECONDS (Input)

Specify the seconds. The range of valid SECONDS is 0 to 59.

MILLSEC (Input)

Specify the milliseconds. The range of valid MILLSEC is 0 to 999.

OUTSECS (Output)

Specify the area where the number of seconds since 00:00:00 on 14 October 1582 is stored.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE2EE	3	2510	The hour value was not recognized.
CEE2EF	3	2511	The day parameter was invalid for year and month specified.
CEE2EH	3	2513	The input date was not within the supported range.
CEE2EI	3	2514	The year value was not within the supported range.
CEE2EJ	3	2515	The milliseconds value was not recognized.
CEE2EK	3	2516	The minute value was not recognized.
CEE2EL	3	2517	The month value was not recognized.
CEE2EN	3	2519	The second value was no recognized.

4.9 CEELCCT

Gets a current local date and time in the following formats.

- Lillian date (the number of days since 14 October 1582)
- Lillian seconds (the number of seconds since 00:00:00 14 October 1582)
- Gregorian character string (in the form YYYYMMDDHHMISS999)

Calling format

```
CALL "CEELCCT" USING
      BY REFERENCE LILIAN,
      BY REFERENCE SECONDS,
      BY REFERENCE GREGORN,
      BY REFERENCE FC.
```

Parameter data definition

```
01 LILIAN PIC S9(9) BINARY.
01 SECONDS COMP-2.
01 GREGORN PIC X(17).
01 FC.
   02 Condition-Token-Value.
   COPY CEEIGZCT.
   03 Case-1-Condition-ID.
```



```

    04 Severity PIC S9(4) BINARY.
    04 Msg-No   PIC S9(4) BINARY.
03 Case-2-Condition-ID
    REDEFINES Case-1-Condition-ID.
    04 Class-Code PIC S9(4) BINARY.
    04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
02 I-S-Info PIC S9(9) BINARY.

```

LILIAN (Output)

Specify the area where the current local date in the Lilian format is stored.

SECONDS (Output)

Specify the area where the current local date and time as the number of seconds since 00:00:00 on 14 October 1582 is stored.

GREGORN (Output)

Specify the area where the format of YYYYMMDDHHMISS999 is stored.

The local year, month, day, hour, minute, second, and millisecond are set.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE2F3	3	2531	The local time was not available from the system.

4.10 CEEQCEN

Queries the century window.

A century window is a 100-year interval within which any two-digit year is unique.

When you want to change the setting, use CEEQCEN to get the setting and then use CEESCEN to save and restore the current setting.

Calling format

```

CALL "CEEQCEN" USING
        BY REFERENCE STARTCW,
        BY REFERENCE FC.

```

Parameter data definition

```

01 STARTCW PIC S9(9) BINARY.
01 FC.
    02 Condition-Token-Value.
    COPY CEEIGZCT.
        03 Case-1-Condition-ID.
            04 Severity PIC S9(4) BINARY.
            04 Msg-No   PIC S9(4) BINARY.
        03 Case-2-Condition-ID
            REDEFINES Case-1-Condition-ID.
            04 Class-Code PIC S9(4) BINARY.
            04 Cause-Code PIC S9(4) BINARY.
        03 Case-Sev-Ctl PIC X.
        03 Facility-ID PIC XXX.
02 I-S-Info PIC S9(9) BINARY.

```

STARTCW (Output)

Specify the area where the integer between 0 and 100 is stored. This value indicates how many years earlier the current century window began.

For example (in 2016):

When the STARTCW value is 50, the century window is from 1966 to 2066.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.

4.11 CEESCEN

Sets the century window.

For the century window, refer to CEEQCEN.

Calling format

```
CALL "CEESCEN" USING
      BY REFERENCE STARTCW,
      BY REFERENCE FC.
```

Parameter data definition

```
01 STARTCW PIC S9(9) BINARY.
01 FC.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
```

STARTCW (Input)

Specify the integer between 0 and 100. This value indicates how many years earlier the current century window began.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE2E6	3	2502	The UTC/GMT was not available from the system.

4.12 CEESECI

Converts the number of seconds since 00:00:00 14 October 1582 to binary integers (year, month, day, hour, minute, second, and millisecond).

Calling format

```
CALL "CEESECI" USING
      BY REFERENCE INSECS,
      BY REFERENCE YEAR,
      BY REFERENCE MONTH,
      BY REFERENCE DAYS,
      BY REFERENCE HOURS,
      BY REFERENCE MINUTES,
      BY REFERENCE SECONDS,
      BY REFERENCE MILLSEC,
      BY REFERENCE FC.
```

Parameter data definition

```
01 INSECS  COMP-2.
01 YEAR    PIC S9(9) BINARY.
01 MONTH   PIC S9(9) BINARY.
01 DAYS    PIC S9(9) BINARY.
01 HOURS   PIC S9(9) BINARY.
01 MINUTES PIC S9(9) BINARY.
01 SECONDS PIC S9(9) BINARY.
01 MILLSEC PIC S9(9) BINARY.
01 FC.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No   PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID  PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
```

INSECS(Input)

Specify the number of seconds since 00:00:00 on 14 October 1582.

YEAR (Output)

Specify the area where the year is stored. The range of valid YEAR is 1582 to 9999.

MONTH (Output)

Specify the area where the month is stored. The range of valid MONTH is 1 to 12.

DAYS (Output)

Specify the area where the day is stored. The range of valid DAYS is 1 to 31.

HOURS (Output)

Specify the area where the hour is stored. The range of valid HOURS is 0 to 23.

MINUTES (Output)

Specify the area where the minute is stored. The range of valid MINUTES is 0 to 59.

SECONDS (Output)

Specify the area where the second is stored. The range of valid SECONDS is 0 to 59.

MILLSEC (Output)

Specify the area where the millisecond is stored. The range of valid MILLSEC is 0 to 999.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE2E9	3	2505	The INSECS value was not within the supported range.

4.13 CEESECS

Converts the timestamp to the number of Lillian seconds (number of seconds since 00:00:00 14 October 1582).

Calling format

```
CALL "CEESECS" USING
  BY REFERENCE TIMESTP,
  BY REFERENCE PICSTR,
  BY REFERENCE SECOND,
  BY REFERENCE FC.
```

Parameter data definition

```
01 TIMESTP.
  02 Vstring-length PIC S9(4) BINARY.
  02 Vstring-text.
    03 Vstring-char PIC X,
      OCCURS 0 TO 256 TIMES
      DEPENDING ON Vstring-length of TIMESTP2.
01 PICSTR.
  02 Vstring-length PIC S9(4) BINARY.
  02 Vstring-text.
    03 Vstring-char PIC X,
      OCCURS 0 TO 256 TIMES
      DEPENDING ON Vstring-length of PICSTR.
01 SECOND COMP-2.
01 FC.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
```

TIMESTP (Input)

Specify the character string representing a date or timestamp (length is contained).

PICSTR (Input)

Specify the date or timestamp value format specified for TIMESTP (length is contained).

For the list of valid picture character terms and valid picture string, refer to the manual of IBM.

SECOND (Output)

Specify the area where the number of seconds since 00:00:00 on 14 October 1582 is stored.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE2EB	3	2507	The insufficient data was specified.
CEE2EC	3	2508	The date value was invalid.
CEE2ED	3	2509	The era was not recognized.
CEE2EE	3	2510	The hour value was not recognized.
CEE2EH	3	2513	The input date was not within the supported range.
CEE2EK	3	2516	The minute value was not recognized.
CEE2EL	3	2517	The month value was not recognized.
CEE2EM	3	2518	An invalid picture string was specified in a call to a date/time subroutine.
CEE2EN	3	2519	The second value was not recognized.
CEE2EP	3	2521	The year-within-era value was zero.
CEE2ET	3	2525	CEESECS detected non-numeric data in a numeric field, or the timestamp string did not match the picture string.

4.14 CEEUTC

Gets the coordinated universal time (it is an alias of CEEGMT).

Calling format

```
CALL "CEEUTC" USING
  BY REFERENCE LILIAN,
  BY REFERENCE SECS,
  BY REFERENCE FC.
```

Parameter data definition

```
01 LILIAN PIC S9(9) BINARY.
01 SECS   COMP-2.
01 FC.
  02 Condition-Token-Value.
    COPY CEEIGZCT.
      03 Case-1-Condition-ID.
        04 Severity PIC S9(4) BINARY.
        04 Msg-No   PIC S9(4) BINARY.
      03 Case-2-Condition-ID
        REDEFINES Case-1-Condition-ID.
        04 Class-Code PIC S9(4) BINARY.
        04 Cause-Code PIC S9(4) BINARY.
      03 Case-Sev-Ctl PIC X.
      03 Facility-ID PIC XXX.
    02 I-S-Info PIC S9(9) BINARY.
```

LILIAN (Output)

Specify the area where the current time in Greenwich, England, in the Lilian format (the number of days since 14 October 1582) is stored.

SECS (Output)

Specify the area where the current date and time in Greenwich, England, as the number of seconds since 00:00:00 on 14 October 1582 is stored.

(However, the leap second is not counted.)

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE2E6	3	2502	The UTC/GMT was not available from the system.

Chapter 5 Dynamic Storage Area Subroutines

5.1 CEECRHP

Allocates heaps.

Calling format

```
CALL "CEECRHP" USING
  BY REFERENCE HEAPID,
  BY REFERENCE HPSIZE,
  BY REFERENCE INCR,
  BY REFERENCE OPTS,
  BY REFERENCE FC.
```

Parameter data definition

```
01 HEAPID PIC S9(9) BINARY.
01 HPSIZE PIC S9(9) BINARY.
01 INCR   PIC S9(9) BINARY.
01 OPTS   PIC S9(9) BINARY.
01 FC.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No   PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID  PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
```

HEAPID (Output)

Specify the area where heap ID for allocated heap is stored.

In the storage obtained from HEAPID 79 and 80, independent of any initialization value specified by the environment variable [@CBR_LE_STORAGE](#), zero is set.

HPSIZE (Input)

Specify the size of heap area to be allocated.

HPSIZE is rounded up in multiples of 4096 bytes.

If you specify 0 for HPSIZE, then the HPSIZE specified in the environment variable [@CBR_LE_HEAP](#) is used. If the environment variable [@CBR_LE_HEAP](#) was not specified, the heap area of 32 Kbytes is allocated.

INCR (Input)

When you expand the heap area to satisfy an allocation request, specify the number of bytes of the heap area to be expanded.

INCR is rounded up in multiples of 4096 bytes.

If you specify 0 for INCR, then the `incr_size` specified in the environment variable [@CBR_LE_HEAP](#) is used. If the environment variable [@CBR_LE_HEAP](#) was not specified, the heap area of 32 Kbytes is allocated.

OPTS (Input)

Specify HEAP attributes.

For value of specified option and HEAP attribute, refer to the manual of IBM.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE0P2	4	0802	Heap storage control information was damaged.
CEE0P4	3	0804	The initial size value specified by the heap allocation request is not supported.
CEE0P5	3	0805	The increment size value specified by the heap allocation request is not supported.
CEE0P6	3	0806	The options value specified by the heap allocation request was unrecognized.
CEE0PD	3	0813	Insufficient storage was available to satisfy a get storage request.

5.2 CEECZST

Changes the size of the heap element.

When new sizes are longer than old heap sizes, the content of the heap element is preserved as it is. When a new size is short, the heap element of only new size remains.

Calling format

```
CALL "CEECZST" USING  
  BY REFERENCE ADDRSS,  
  BY REFERENCE NEWSIZE,  
  BY REFERENCE FC.
```

Parameter data definition

```
01 ADDRSS  USAGE POINTER.  
01 NEWSIZE PIC S9(9) BINARY.  
01 FC.  
  02 Condition-Token-Value.  
    COPY CEEIGZCT.  
      03 Case-1-Condition-ID.  
        04 Severity PIC S9(4) BINARY.  
        04 Msg-No   PIC S9(4) BINARY.  
      03 Case-2-Condition-ID  
        REDEFINES Case-1-Condition-ID.  
        04 Class-Code PIC S9(4) BINARY.  
        04 Cause-Code PIC S9(4) BINARY.  
      03 Case-Sev-Ctl PIC X.  
      03 Facility-ID  PIC XXX.  
  02 I-S-Info PIC S9(9) BINARY.
```

ADDRSS (input/output)

On input, specify the address returned by the CEEGTST call.

On output, specify the area where an address area is stored. The address of the first byte of the newly allocated storage is set.

NEWSIZE (Input)

Specify the number of bytes of storage to be allocated for the new heap element.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE0P2	4	0802	Heap storage control information was damaged.
CEE0P8	3	0808	Storage size in a get storage request (CEEGTST) or a reallocate request (CEECZST) was not a positive number.
CEE0PA	3	0810	The storage address in a free storage request was not recognized, or heap storage control information was damaged.
CEE0PD	3	0813	Insufficient storage was available to satisfy a get storage (CEECZST) request.

5.3 CEEDSHP

Frees the entire heap allocated by CEECRHP or CEEGTST

Calling format

```
CALL "CEEDSHP" USING
    BY REFERENCE HEAPID,
    BY REFERENCE FC.
```

Parameter data definition

```
01 HEAPID PIC S9(9) BINARY.
01 FC.
    02 Condition-Token-Value.
    COPY CEEIGZCT.
        03 Case-1-Condition-ID.
            04 Severity PIC S9(4) BINARY.
            04 Msg-No PIC S9(4) BINARY.
        03 Case-2-Condition-ID
            REDEFINES Case-1-Condition-ID.
            04 Class-Code PIC S9(4) BINARY.
            04 Cause-Code PIC S9(4) BINARY.
        03 Case-Sev-Ctl PIC X.
        03 Facility-ID PIC XXX.
    02 I-S-Info PIC S9(9) BINARY.
```

HEAPID (Input)

Specify the heap ID.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE0P2	4	0802	Heap storage control information was damaged.
CEE0P3	3	0803	The heap ID was unrecognized.
CEE0PC	3	0812	An invalid attempt to discard the Initial Heap was made.

5.4 CEEFRST

Frees the storage allocated by CEEGTST.

Calling format

```
CALL "CEEFRST" USING
    BY REFERENCE ADDRSS,
    BY REFERENCE FC.
```

Parameter data definition

```
01 ADDRSS USAGE POINTER.
01 FC.
    02 Condition-Token-Value.
    COPY CEEIGZCT.
        03 Case-1-Condition-ID.
            04 Severity PIC S9(4) BINARY.
            04 Msg-No PIC S9(4) BINARY.
        03 Case-2-Condition-ID
            REDEFINES Case-1-Condition-ID.
            04 Class-Code PIC S9(4) BINARY.
            04 Cause-Code PIC S9(4) BINARY.
        03 Case-Sev-Ctl PIC X.
        03 Facility-ID PIC XXX.
    02 I-S-Info PIC S9(9) BINARY.
```

ADDRSS (Input)

Specify the address returned by the CEEGTST call.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE0P2	4	0802	Heap storage control information was damaged.
CEE0PA	3	0810	The storage address in a free storage (CEEFRST) request was not recognized. Or, heap storage (CEECZST) control information was damaged.

5.5 CEEGTST

Gets the storage from the specified heap ID.

Calling format

```
CALL "CEEGTST" USING
    BY REFERENCE HEAPID,
    BY REFERENCE STGSIZE,
    BY REFERENCE ADDRSS,
    BY REFERENCE FC.
```

Parameter data definition

```
01 HEAPID PIC S9(9) BINARY.
01 STGSIZE PIC S9(9) BINARY.
01 ADDRSS USAGE POINTER.
01 FC.
    02 Condition-Token-Value.
    COPY CEEIGZCT.
        03 Case-1-Condition-ID.
            04 Severity PIC S9(4) BINARY.
            04 Msg-No PIC S9(4) BINARY.
```

```

03 Case-2-Condition-ID
   REDEFINES Case-1-Condition-ID.
04 Class-Code PIC S9(4) BINARY.
04 Cause-Code PIC S9(4) BINARY.
03 Case-Sev-Ctl PIC X.
03 Facility-ID PIC XXX.
02 I-S-Info PIC S9(9) BINARY.

```

HEAPID (Input)

Specify heap ID to which storage is allotted.

The heap ID must be a value obtained from the CEECRHP subroutine.

If you specify 0 for HEADID, storage is newly allocated.

STGSIZE (Input)

Specify the size of the allocated storage in bytes.

ADDRSS (Output)

Specify the area where the top address of allocated storage is stored.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE0P2	4	0802	Heap storage control information was damaged.
CEE0P3	3	0803	The heap ID was unrecognized.
CEE0P8	3	0808	Storage size in a get storage request (CEEGTST) or a reallocate request (CEECZST) was not a positive number.
CEE0PD	3	0813	Insufficient storage was available to satisfy a get storage (CEECZST) request.

Chapter 6 General Subroutines

6.1 CEE3PRM

Returns the runtime parameter specified at the call of the program.

When there is no runtime parameter, a space is returned.

Calling format

```
CALL "CEE3PRM" USING  
  BY REFERENCE PARMSTR,  
  BY REFERENCE FC.
```

Parameter data definition

```
01 PARMSTR PIC X(80).  
01 FC.  
  02 Condition-Token-Value.  
  COPY CEEIGZCT.  
    03 Case-1-Condition-ID.  
      04 Severity PIC S9(4) BINARY.  
      04 Msg-No PIC S9(4) BINARY.  
    03 Case-2-Condition-ID  
      REDEFINES Case-1-Condition-ID.  
      04 Class-Code PIC S9(4) BINARY.  
      04 Cause-Code PIC S9(4) BINARY.  
    03 Case-Sev-Ctl PIC X.  
    03 Facility-ID PIC XXX.  
  02 I-S-Info PIC S9(9) BINARY.
```

PARMSTR (Output)

Specify the area where the runtime parameter specified at the call of the program is stored.

If the runtime parameter string is longer than 80 characters, then extra length string is truncated.

If the runtime parameter string is shorter than 80 characters, remaining string is padded with space. If the runtime parameter is not specified, or is not a character string, the space is set.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE311	1	3649	The parameter string returned from CEE3PRM exceeded the maximum length of 80 bytes and was truncated.

6.2 CEE3USR

Sets or refers to the user area field.

The user area field is 4-byte field. There are two user area fields.

Calling format

```
CALL "CEE3USR" USING  
  BY REFERENCE FUNCODE,  
  BY REFERENCE FIELDNO,
```

```

BY REFERENCE INVALUE,
BY REFERENCE FC.

```

Parameter data definition

```

01 FUNCODE PIC S9(9) BINARY.
01 FIELDNO PIC S9(9) BINARY.
01 INVALUE PIC S9(9) BINARY.
01 FC.
    02 Condition-Token-Value.
    COPY CEEIGZCT.
        03 Case-1-Condition-ID.
            04 Severity PIC S9(4) BINARY.
            04 Msg-No PIC S9(4) BINARY.
        03 Case-2-Condition-ID
            REDEFINES Case-1-Condition-ID.
            04 Class-Code PIC S9(4) BINARY.
            04 Cause-Code PIC S9(4) BINARY.
        03 Case-Sev-Ctl PIC X.
        03 Facility-ID PIC XXX.
    02 I-S-Info PIC S9(9) BINARY.

```

FUNCODE (Input)

Specify the function code to execute.

1-SET User area field is set to the value specified in INVALUE.

2-REFER User area field; return current value in INVALUE.

FIELDNO (Input)

Specify the field number.

1 or 2 can be specified.

INVALUE (Input/Output)

When 1 (set) is specified in FUNCODE, specify the value set to the user area field specified by FIELDNO.

When 2 (refer) is specified in FUNCODE, the value set in the user area field specified by FIELDNO is output.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE3PS	3	3900	The function code passed to CEE3USR was not 1 or 2.
CEE3PT	3	3901	The field number passed to CEE3USR was not 1 or 2.

6.3 CEEGPID

Retrieves the version ID and platform ID of version.

This subroutine is no functional meaning for this system.

Calling format

```

CALL "CEEGPID" USING
    BY REFERENCE VERSION,
    BY REFERENCE PLATID,
    BY REFERENCE FC.

```

Parameter data definition

```
01 VERSION PIC S9(9) BINARY.
01 PLATID PIC S9(9) BINARY.
01 FC.
    02 Condition-Token-Value.
    COPY CEEIGZCT.
        03 Case-1-Condition-ID.
            04 Severity PIC S9(4) BINARY.
            04 Msg-No PIC S9(4) BINARY.
        03 Case-2-Condition-ID
            REDEFINES Case-1-Condition-ID.
            04 Class-Code PIC S9(4) BINARY.
            04 Cause-Code PIC S9(4) BINARY.
        03 Case-Sev-Ctl PIC X.
        03 Facility-ID PIC XXX.
    02 I-S-Info PIC S9(9) BINARY.
```

VERSION (Output)

In this system, the value of this parameter is 0.

PLATID (Output)

In this system, the value of this parameter is 0.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained b

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.

6.4 CEERAN0

Generates a sequence of uniform pseudo-random numbers between 0.0 and 1.0.

Calling format

```
CALL "CEERAN0" USING
    BY REFERENCE SEED,
    BY REFERENCE RANDNUM,
    BY REFERENCE FC.
```

Parameter data definition

```
01 SEED PIC S9(9) BINARY.
01 RANDNUM COMP-2.
01 FC.
    02 Condition-Token-Value.
    COPY CEEIGZCT.
        03 Case-1-Condition-ID.
            04 Severity PIC S9(4) BINARY.
            04 Msg-No PIC S9(4) BINARY.
        03 Case-2-Condition-ID
            REDEFINES Case-1-Condition-ID.
            04 Class-Code PIC S9(4) BINARY.
            04 Cause-Code PIC S9(4) BINARY.
        03 Case-Sev-Ctl PIC X.
        03 Facility-ID PIC XXX.
    02 I-S-Info PIC S9(9) BINARY.
```

SEED (Input/Output)

Specify the initial value used to generate random numbers.

The valid range is 0 to +2,147,483,646.

If you specify 0 for SEED, the seed is generated from the current Greenwich Mean Time.

When it is a return to calling routine, the value of SEED is updated, it can be used as the new seed in the next call.

RANDNUM (Output)

Specify the area where the random number is stored.

Return a value between 0 and 1, exclusive.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE2ER	1	2523	The system time was not available. A seed value of 1 was used to generate a random number and a new seed value.
CEE2ES	3	2524	An invalid seed value was passed . The random number was set to -1.

Chapter 7 Initialization and Termination Subroutines

7.1 CEE3ABD

The program is terminated abnormally.

Calling format

```
CALL "CEE3ABD" USING  
    BY REFERENCE ABDCODE,  
    BY REFERENCE TIMING.
```

Parameter data definition

```
01 ABDCODE PIC S9(9) BINARY.  
01 TIMING PIC S9(9) BINARY.
```

ABDCODE (Input)

Specify the abend code that is issued.

TIMING (Input)

In this system, this parameter does not have the meaning.

Chapter 8 Math Subroutines

8.1 CEESxABS

Returns the absolute value of argument.

The following routines are provided for the various data types supported:

- CEESIABS 32-bit binary integer
- CEESABS 32-bit single-precision floating-point number
- CEESDABS 64-bit double-precision floating-point number

Calling format

```
CALL "CEESxABS" USING  
  BY REFERENCE ARG1RS,  
  BY REFERENCE FBCODE,  
  BY REFERENCE RESLTRS.
```

Parameter data definition

```
01 ARG1RS COMP-1.  
01 FBCODE.  
  02 Condition-Token-Value.  
  COPY CEEIGZCT.  
    03 Case-1-Condition-ID.  
      04 Severity PIC S9(4) BINARY.  
      04 Msg-No PIC S9(4) BINARY.  
    03 Case-2-Condition-ID  
      REDEFINES Case-1-Condition-ID.  
      04 Class-Code PIC S9(4) BINARY.  
      04 Cause-Code PIC S9(4) BINARY.  
    03 Case-Sev-Ctl PIC X.  
    03 Facility-ID PIC XXX.  
  02 I-S-Info PIC S9(9) BINARY.  
01 RESLTRS COMP-1.
```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1V9	1	2025	An underflow has occurred.

RESLTRS (Output)

Specify the area where the absolute value is stored.

8.2 CEESxACS

Return the arc cosine of argument.

The following routines are provided for the various data types supported:

- CEESACS 32-bit single-precision floating-point number

- CEESDACS 64-bit double-precision floating-point number

Calling format

```
CALL "CEESxACS" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.
```

Parameter data definition

```
01 ARG1RS COMP-1.
01 FBCODE.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl1 PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.
```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

The input range is as follows.

|ARG1RS| 1

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1V0	2	2016	The absolute value of the argument was greater than or equal to limit.

RESLTRS (Output)

Specify the area where the arccosine is stored.

8.3 CEESxASN

Returns the arcsine of argument.

The following routines are provided for the various data types supported:

- CEESASN 32-bit single-precision floating-point number
- CEESDASN 64-bit double-precision floating-point number

Calling format

```
CALL "CEESxASN" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.
```

Parameter data definition

```

01 ARG1RS COMP-1.
01 FBCODE.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.
    
```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1V0	2	2016	The absolute value of the argument was greater than or equal to limit.

RESLTRS (Output)

Specify the area where the arcsine is stored.

8.4 CEESxATH

Returns the hyperbolic arctangent of argument.

The following routines are provided for the various data types supported:

- CEESATH 32-bit single-precision floating-point number
- CEESDATH 64-bit double-precision floating-point number

Calling format

```

CALL "CEESxATH" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.
    
```

Parameter data definition

```

01 ARG1RS COMP-1.
01 FBCODE.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
    
```

```

04 Class-Code PIC S9(4) BINARY.
04 Cause-Code PIC S9(4) BINARY.
03 Case-Sev-Ctl PIC X.
03 Facility-ID PIC XXX.
02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.

```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1V1	2	2017	The absolute value of the argument was greater than or equal to limit.
CEE1V6	2	2022	The value of the argument was plus or minus limit.

RESLTRS (Output)

Specify the area where the hyperbolic arctangent is stored.

8.5 CEESxATN

Returns the arctangent of argument.

The following routines are provided for the various data types supported:

- CEESATN 32-bit single-precision floating-point number
- CEESDATN 64-bit double-precision floating-point number

Calling format

```

CALL "CEESxATN" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.

```

Parameter data definition

```

01 ARG1RS COMP-1.
01 FBCODE.
02 Condition-Token-Value.
  COPY CEEIGZCT.
03 Case-1-Condition-ID.
  04 Severity PIC S9(4) BINARY.
  04 Msg-No PIC S9(4) BINARY.
03 Case-2-Condition-ID
  REDEFINES Case-1-Condition-ID.
  04 Class-Code PIC S9(4) BINARY.
  04 Cause-Code PIC S9(4) BINARY.
03 Case-Sev-Ctl PIC X.
03 Facility-ID PIC XXX.
02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.

```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1V6	2	2022	The value of the argument was plus or minus limit.
CEE1V9	1	2025	An underflow has occurred.

RESLTRS (Output)

Specify the area where the arctangent is stored.

8.6 CEESxAT2

Calculates a result by using the equation: $RESLTRS = \text{the angle (in radians) between the positive X axis and a vector defined by (ARG2RS, ARG1RS)}$.

The following routines are provided for the various data types supported:

- CEESAT2 32-bit single-precision floating-point number
- CEESDAT2 64-bit double-precision floating-point number

Calling format

```
CALL "CEESxAT2" USING  
  BY REFERENCE ARG1RS,  
  BY REFERENCE ARG2RS,  
  BY REFERENCE FBCODE,  
  BY REFERENCE RESLTRS.
```

Parameter data definition

```
01 ARG1RS COMP-1.  
01 ARG2RS COMP-1.  
01 FBCODE.  
  02 Condition-Token-Value.  
  COPY CEEIGZCT.  
    03 Case-1-Condition-ID.  
      04 Severity PIC S9(4) BINARY.  
      04 Msg-No PIC S9(4) BINARY.  
    03 Case-2-Condition-ID  
      REDEFINES Case-1-Condition-ID.  
      04 Class-Code PIC S9(4) BINARY.  
      04 Cause-Code PIC S9(4) BINARY.  
    03 Case-Sev-Ctl PIC X.  
    03 Facility-ID PIC XXX.  
  02 I-S-Info PIC S9(9) BINARY.  
01 RESLTRS COMP-1.
```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

The input range of ARG1RS cannot equal 0 if ARG2RS equals 0.

ARG2RS (Input)

Specify the numeric.

The input range of ARG2RS cannot equal 0 if ARG1RS equals 0.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1UU	2	2014	Both arguments were equal to limit.
CEE1V9	1	2025	An underflow has occurred.

RESLTRS (Output)

Specify the area where the result (radians) of this subroutine is stored..

8.7 CEESxCOS

Returns the cosine of argument.

The following routines are provided for the various data types supported:

- CEESXCOS 32-bit single-precision floating-point number
- CEESDCOS 64-bit double-precision floating-point number

Calling format

```
CALL "CEESxCOS" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.
```

Parameter data definition

```
01 ARG1RS COMP-1.
01 FBCODE.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.
```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1UT	2	2013	The absolute value of the imaginary part of the argument was greater than limit.

Code	Severity	Msg-No	Meaning
CEE1V1	2	2017	The absolute value of the argument was greater than or equal to limit.
CEE1V3	2	2019	The absolute value of the real part of the argument was greater than equal to limit.

RESLTRS (Output)

Specify the area where the cosine is stored.

8.8 CEESxCSH

Returns the hyperbolic cosine of argument.

The following routines are provided for the various data types supported:

- CEESCSH 32-bit single-precision floating-point number
- CEESDCSH 64-bit double-precision floating-point number

Calling format

```
CALL "CEESxCSH" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.
```

Parameter data definition

```
01 ARG1RS COMP-1.
01 FBCODE.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.
```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1V0	2	2016	The absolute value of the argument was greater than or equal to limit.

RESLTRS (Output)

Specify the area where the hyperbolic cosine is stored.

8.9 CEESxCTN

Returns the cotangent of argument.

The following routines are provided for the various data types supported:

- CEESCTN 32-bit single-precision floating-point number
- CEESDCTN 64-bit double-precision floating-point number

Calling format

```
CALL "CEESxCTN" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.
```

Parameter data definition

```
01 ARG1RS COMP-1.
01 FBCODE.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.
```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1UI	2	2002	The argument value was too close to one of the singularities (plus or minus $\pi/2$, plus or minus $3\pi/2$, for the tangent; or plus or minus π , plus or minus 2π , for the cotangent) in this routine.
CEE1V1	2	2017	The absolute value of the argument was greater than or equal to limit.

RESLTRS (Output)

Specify the area where the cotangent is stored.

8.10 CEESxDIM

Returns the positive difference between two numbers.

The following routines are provided for the various data types supported:

- CEESIDIM 32-bit binary integer
- CEESDIM 32-bit single-precision floating-point number
- CEESDDIM 64-bit double-precision floating-point number

Calling format

```
CALL "CEESxDIM" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE ARG2RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.
```

Parameter data definition

```
01 ARG1RS COMP-1.
01 ARG2RS COMP-1.
01 FBCODE.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
    04 Severity PIC S9(4) BINARY.
    04 Msg-No PIC S9(4) BINARY.
  03 Case-2-Condition-ID
  REDEFINES Case-1-Condition-ID.
    04 Class-Code PIC S9(4) BINARY.
    04 Cause-Code PIC S9(4) BINARY.
  03 Case-Sev-Ctl PIC X.
  03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.
```

ARG1RS (Input)

Specify the numeric as the first argument of this subroutine.

ARG2RS (Input)

Specify the numeric as the second argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
FJX999	4	9999	An overflow has occurred.

RESLTRS (Output)

Specify the area where the positive difference is stored.

8.11 CEESxEXP

Calculates of raised to a power.

The following routines are provided for the various data types supported:

- CEESSEXP 32-bit single-precision floating-point number
- CEESDEXP 64-bit double-precision floating-point number

Calling format

```
CALL "CEESxEXP" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.
```

Parameter data definition

```
01 ARG1RS COMP-1.
01 FBCODE.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.
```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1UP	2	2009	The value of the real part of the argument was greater than limit.
CEE1UR	2	2011	The argument was greater than limit.
CEE1UT	2	2013	The absolute value of imaginary part of argument was greater than limit.
CEE1UV	2	2015	The absolute value of the imaginary part of the argument was greater than or equal to limit.
CEE1V9	1	2025	An underflow has occurred.

RESLTRS (Output)

Specify the area where the result of the exponential base e routine is stored.

8.12 CEESxINT

Returns the truncated value of argument using the following expression.

The following routines are provided for the various data types supported:

- CEESINT 32-bit single-precision floating-point number
- CEESDINT 64-bit double-precision floating-point number

Calling format

```
CALL "CEESxINT" USING
    BY REFERENCE ARG1RS,
    BY REFERENCE FBCODE,
    BY REFERENCE RESLTRS.
```

Parameter data definition

```
01 ARG1RS COMP-1.
01 FBCODE.
    02 Condition-Token-Value.
        COPY CEEIGZCT.
            03 Case-1-Condition-ID.
                04 Severity PIC S9(4) BINARY.
                04 Msg-No PIC S9(4) BINARY.
            03 Case-2-Condition-ID
                REDEFINES Case-1-Condition-ID.
                04 Class-Code PIC S9(4) BINARY.
                04 Cause-Code PIC S9(4) BINARY.
            03 Case-Sev-Ctl PIC X.
            03 Facility-ID PIC XXX.
    02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.
```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.

RESLTRS (Output)

Specify the area where the result of the truncation is stored.

8.13 CEESxLG1

Returns the logarithm base 10.

The following routines are provided for the various data types supported:

- CEESLG1 32-bit single-precision floating-point number
- CEESDLG1 64-bit double-precision floating-point number

Calling format

```
CALL "CEESxLG1" USING
    BY REFERENCE ARG1RS,
    BY REFERENCE FBCODE,
    BY REFERENCE RESLTRS.
```

Parameter data definition

```
01 ARG1RS COMP-1.
01 FBCODE.
    02 Condition-Token-Value.
        COPY CEEIGZCT.
            03 Case-1-Condition-ID.
```

```

    04 Severity PIC S9(4) BINARY.
    04 Msg-No   PIC S9(4) BINARY.
  03 Case-2-Condition-ID
    REDEFINES Case-1-Condition-ID.
    04 Class-Code PIC S9(4) BINARY.
    04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.

```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1US	2	2012	The argument parameter was less than or equal to limit.

RESLTRS (Output)

Specify the area where the result of the log base 10 is stored.

8.14 CEESxLG2

Returns the logarithm base 2.

The following routines are provided for the various data types supported:

- CEESLG2 32-bit single-precision floating-point number
- CEESDLG2 64-bit double-precision floating-point number

Calling format

```

CALL "CEESxLG2" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.

```

Parameter data definition

```

01 ARG1RS COMP-1.
01 FBCODE.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No   PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.

```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1US	2	2012	The argument was less than or equal to limit.

RESLTRS (Output)

Specify the area where the result of the log base 2 is stored.

8.15 CEESxLOG

Returns the logarithm base e.

The following routines are provided for the various data types supported:

- CEESLOG 32-bit single-precision floating-point number
- CEESDLOG 64-bit double-precision floating-point number

Calling format

```
CALL "CEESxLOG" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.
```

Parameter data definition

```
01 ARG1RS COMP-1.
01 FBCODE.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.
```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.

Code	Severity	Msg-No	Meaning
CEE1US	2	2012	The parameter was less than or equal to limit.
CEE1V2	2	2018	The real and imaginary parts of the parameter were equal to limit.

RESLTRS (Output)

Specify the area where the result of the log base e is stored.

8.16 CEESxMOD

Performs the modular arithmetic.

The following routines are provided for the various data types supported:

- CEESIMOD 32-bit binary integer
- CEESMOD 32-bit single-precision floating-point number
- CEESDMOD 64-bit double-precision floating-point number

Calling format

```
CALL "CEESxMOD" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE ARG2RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.
```

Parameter data definition

```
01 ARG1RS COMP-1.
01 ARG2RS COMP-1.
01 FBCODE.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.
```

ARG1RS (Input)

Specify the numeric as the first argument of this subroutine.

ARG2RS (Input)

Specify the numeric as the second argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.

Code	Severity	Msg-No	Meaning
FJX999	4	9999	ARG2RS was zero.

RESLTRS (Output)

Specify the area where the result of the modular arithmetic is stored.

8.17 CEESxNIN

Calculates the nearest integer.

The following routines are provided for the various data types supported:

- CEESNIN 32-bit single-precision floating-point number
- CEESDNIN 64-bit double-precision floating-point number

Calling format

```
CALL "CEESxNIN" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.
```

Parameter data definition

```
01 ARG1RS COMP-1.
01 FBCODE.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS S9(9) BINARY.
```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code, which indicates the result of this subroutine.

The values and the meanings of the feedback codes are given below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
FJX999	4	9999	An overflow has occurred.

RESLTRS (Output)

Specify the area where the nearest integer is stored.

8.18 CEESxNWN

Calculates the nearest whole number.

The following routines are provided for the various data types supported:

- CEESNWN 32-bit single-precision floating-point number
- CEESDWN 64-bit double-precision floating-point number

Calling format

```
CALL "CEESxNWN" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.
```

Parameter data definition

```
01 ARG1RS COMP-1.
01 FBCODE.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.
```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.

RESLTRS (Output)

Specify the area where the nearest whole number is stored.

8.19 CEESxSGN

Performs the function transfer of sign.

The following routines are provided for the various data types supported:

- CEESISGN 32-bit binary integer
- CEESSSGN 32-bit single-precision floating-point number
- CEESDSGN 64-bit double-precision floating-point number

Calling format

```
CALL "CEESxSGN" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE ARG2RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.
```


Parameter data definition

```
01 ARG1RS COMP-1.
01 ARG2RS COMP-1.
01 FBCODE.
    02 Condition-Token-Value.
    COPY CEEIGZCT.
        03 Case-1-Condition-ID.
            04 Severity PIC S9(4) BINARY.
            04 Msg-No PIC S9(4) BINARY.
        03 Case-2-Condition-ID
            REDEFINES Case-1-Condition-ID.
            04 Class-Code PIC S9(4) BINARY.
            04 Cause-Code PIC S9(4) BINARY.
        03 Case-Sev-Ctl PIC X.
        03 Facility-ID PIC XXX.
    02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.
```

ARG1RS (Input)

Specify the numeric as the first argument of this subroutine.

ARG2RS (Input)

Specify the numeric as the second argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
FJX999	4	9999	An overflow has occurred.

RESLTRS (Output)

Specify the area where the result of the transfer of sign is stored.

8.20 CEESxSIN

Returns the sine of argument.

The following routines are provided for the various data types supported:

- CEESSSIN 32-bit single-precision floating-point number
- CEESDSIN 64-bit double-precision floating-point number

Calling Format

```
CALL "CEESxSIN" USING
    BY REFERENCE ARG1RS,
    BY REFERENCE FBCODE,
    BY REFERENCE RESLTRS.
```

Parameter data definition

```
01 ARG1RS COMP-1.
01 FBCODE.
    02 Condition-Token-Value.
    COPY CEEIGZCT.
        03 Case-1-Condition-ID.
            04 Severity PIC S9(4) BINARY.
```

```

04 Msg-No PIC S9(4) BINARY.
03 Case-2-Condition-ID
  REDEFINES Case-1-Condition-ID.
04 Class-Code PIC S9(4) BINARY.
04 Cause-Code PIC S9(4) BINARY.
03 Case-Sev-Ctl PIC X.
03 Facility-ID PIC XXX.
02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.

```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1UT	2	2013	The absolute value of the imaginary part of the argument was greater than limit.
CEE1V1	2	2017	The absolute value of the argument was greater than or equal to limit
CEE1V3	2	2019	The absolute value of the real part of the argument was greater than or equal to limit.

RESLTRS (Output)

Specify the area where the result of the sine routine is stored.

8.21 CEESxSNH

Calculates of the hyperbolic sine.

The following routines are provided for the various data types supported:

- CEESxSNH 32-bit single-precision floating-point number
- CEESDSNH 64-bit double-precision floating-point number

Calling format

```

CALL "CEESxSNH" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.

```

Parameter data definition

```

01 ARG1RS COMP-1.
01 FBCODE.
02 Condition-Token-Value.
  COPY CEEIGZCT.
03 Case-1-Condition-ID.
  04 Severity PIC S9(4) BINARY.
  04 Msg-No PIC S9(4) BINARY.
03 Case-2-Condition-ID
  REDEFINES Case-1-Condition-ID.
  04 Class-Code PIC S9(4) BINARY.
  04 Cause-Code PIC S9(4) BINARY.
03 Case-Sev-Ctl PIC X.

```

```

03 Facility-ID PIC XXX.
02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.

```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1V0	2	2016	The absolute value of the argument was greater than or equal to limit.

RESLTRS (Output)

Specify the area where the result of the hyperbolic sine is stored.

8.22 CEESxSQT

Returns the square root.

The following routines are provided for the various data types supported:

- CEESSTQT 32-bit single-precision floating-point number
- CEESDSQT 64-bit double-precision floating-point number

Calling format

```

CALL "CEESxSQT" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.

```

Parameter data definition

```

01 ARG1RS COMP-1.
01 FBCODE.
02 Condition-Token-Value.
  COPY CEEIGZCT.
03 Case-1-Condition-ID.
  04 Severity PIC S9(4) BINARY.
  04 Msg-No PIC S9(4) BINARY.
03 Case-2-Condition-ID
  REDEFINES Case-1-Condition-ID.
  04 Class-Code PIC S9(4) BINARY.
  04 Cause-Code PIC S9(4) BINARY.
03 Case-Sev-Ctl PIC X.
03 Facility-ID PIC XXX.
02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.

```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1UQ	2	2010	The parameter was less than limit.

RESLTRS (Output)

Specify the area where the square root is stored..

8.23 CEESxTAN

Returns the tangent of argument.

The following routines are provided for the various data types supported:

- CEESSTAN 32-bit single-precision floating-point number
- CEESDTAN 64-bit double-precision floating-point number

Calling format

```
CALL "CEESxTAN" USING
    BY REFERENCE ARG1RS,
    BY REFERENCE FBCODE,
    BY REFERENCE RESLTRS.
```

Parameter data definition

```
01 ARG1RS COMP-1.
01 FBCODE.
    02 Condition-Token-Value.
        COPY CEEIGZCT.
            03 Case-1-Condition-ID.
                04 Severity PIC S9(4) BINARY.
                04 Msg-No PIC S9(4) BINARY.
            03 Case-2-Condition-ID
                REDEFINES Case-1-Condition-ID.
                04 Class-Code PIC S9(4) BINARY.
                04 Cause-Code PIC S9(4) BINARY.
            03 Case-Sev-Ctl PIC X.
            03 Facility-ID PIC XXX.
    02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.
```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1UI	2	2002	The argument value was too close to one of the singularities (plus or minus pi/2, plus or minus 3pi/2, for the tangent; or plus or minus pi, plus or minus 2pi, for the cotangent.
CEE1V1	2	2017	The absolute value of the argument was greater than or equal to limit.
CEE1V9	1	2025	An underflow has occurred.

RESLTRS (Output)

Specify the area where the tangent is stored.

8.24 CEESxTNH

Calculates the hyperbolic tangent.

The following routines are provided for the various data types supported:

- CEESSTNH 32-bit single-precision floating-point number
- CEESDTNH 64-bit double-precision floating-point number

Calling format

```
CALL "CEESxTNH" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.
```

Parameter data definition

```
01 ARG1RS COMP-1.
01 FBCODE.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.
```

ARG1RS (Input)

Specify the numeric as an argument of this subroutine.

FBCODE (Output)

Specify the feedback code, which indicates the result of this subroutine.

The values and the meanings of the feedback codes are given below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.

RESLTRS (Output)

Specify the area where the hyperbolic tangent is stored.

8.25 CEESxXPx

Calculates the exponentiation.

The following routines are provided for the various data types supported:

- CEESDXPD 64-bit double-precision floating-point raised to a 64-bit double floating-point
- CEESDXPI 64-bit double-precision floating-point number raised to a 32-bit binary integer

- CEESIXPI 32-bit binary integer raised to a 32-bit binary integer
- CEESXPI 32-bit single-precision floating-point number raised to a 32-bit binary integer
- CEESXPS 32-bit single-precision floating-point raised to a 32-bit single floating-point

Calling format

```
CALL "CEESxXPx" USING
  BY REFERENCE ARG1RS,
  BY REFERENCE ARG2RS,
  BY REFERENCE FBCODE,
  BY REFERENCE RESLTRS.
```

Parameter data definition

```
01 ARG1RS COMP-1.
01 ARG2RS COMP-1.
01 FBCODE.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
    04 Severity PIC S9(4) BINARY.
    04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
    REDEFINES Case-1-Condition-ID.
    04 Class-Code PIC S9(4) BINARY.
    04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
01 RESLTRS COMP-1.
```

ARG1RS (Input)

Specify the base as an argument of the exponentiation subroutine.

ARG2RS (Input)

Specify the power as an argument of the exponentiation subroutine.

FBCODE (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE1UJ	2	2003	For an exponentiation operation (I**J) where I and J are integers, I was equal to zero and J was less than or equal to zero.
CEE1UK	2	2004	For an exponentiation operation (R**I) where R is real and I is an integer, R was equal to zero and I was less than or equal to zero.
CEE1UL	2	2005	The value of the parameter was outside the valid range.
CEE1UM	2	2006	For an exponentiation operation (R**S) where R and S are real values, R was equal to zero and S was less than or equal to zero.
CEE1UN	2	2007	The exponent exceeded limit.

Code	Severity	Msg-No	Meaning
CEE1UO	2	2008	For an exponentiation operation ($Z^{**}P$) where the complex base Z equals zero, the real part of the complex exponent P , or the integer exponent P was less than or equal to zero.
CEE1V4	2	2020	For an exponentiation operation ($R^{**}S$) where R and S are real values, either R is equal to zero and S is negative, or R is negative and S is not an integer whose absolute value is less than or equal to limit.
CEE1V5	2	2021	For an exponentiation operation ($X^{**}Y$), the parameter combination of $Y*\log_2(X)$ generated a number greater than or equal to limit.
CEE1V8	2	2024	An overflow has occurred($X^{**}Y$).
CEE1V9	1	2025	An underflow has occurred.
CEE1VF	2	2031	The value of the argument was a nonpositive whole number($X^{**}Y$).

RESLTRS (Output)

Specify the area where the exponentiation is stored.

Chapter 9 Message Processing Subroutines

9.1 CEEMOUT

Add the user-defined message string to the message file.

Calling format

```
CALL "CEEMOUT" USING
  BY REFERENCE MSGSTR,
  BY REFERENCE DESTIN,
  BY REFERENCE FC.
```

Parameter data definition

```
01 MSGSTR.
  02 Vstring-length PIC S9(4) BINARY.
  02 Vstring-text.
    03 Vstring-char PIC X,
      OCCURS 0 TO 256 TIMES
      DEPENDING ON Vstring-length of MSGSTR.
01 DESTIN PIC S9(9) BINARY.
01 FC.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
```

MSGSTR (Input)

Specify the message string(length is contained).

The message string is added to the file specified by environment variable [@CBR_LE_MSGFILE](#).

When environment variable [@CBR_LE_MSGFILE](#) is not specified, it adds it to the file name "SYSOUT".

DESTIN (Input)

Specify the destination code.

Specify the 2 is always in this system.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE0E3	3	0451	An invalid destination code.
CEE0E9	3	0457	The message file is not found.

Chapter 10 Country wise language support Subroutines

10.1 CEE3CTY

Set the default country.

Calling format

```
CALL "CEE3CTY" USING  
  BY REFERENCE FUNCTN,  
  BY REFERENCE COUNTRY,  
  BY REFERENCE FC.
```

Parameter data definition

```
01 FUNCTN PIC S9(9) BINARY.  
01 COUNTRY PIC X(2).  
01 FC.  
  02 Condition-Token-Value.  
  COPY CEEIGZCT.  
    03 Case-1-Condition-ID.  
      04 Severity PIC S9(4) BINARY.  
      04 Msg-No PIC S9(4) BINARY.  
    03 Case-2-Condition-ID  
      REDEFINES Case-1-Condition-ID.  
      04 Class-Code PIC S9(4) BINARY.  
      04 Cause-Code PIC S9(4) BINARY.  
    03 Case-Sev-Ctl PIC X.  
    03 Facility-ID PIC XXX.  
  02 I-S-Info PIC S9(9) BINARY.
```

FUNCTN (Input)

Specify the subroutine to be performed.

A specifiable value is the following.

- 1-SET
Sets the COUNTRY parameter as the current country code. The top of the stack is, in effect, replaced with COUNTRY parameter.
- 2-QUERY
Returns the current country code on the top of the stack. The current country code is set in the COUNTRY parameter.
- 3-PUSH
Pushes the COUNTRY parameter on to the top of the country code stack.
- 4-POP
Pops the current country code, it is set to the COUNTRY parameter.

COUNTRY (input/output)

The country code is stored. The country code is a fixed character string of two characters. There is no case sensitivity.

FUNCTN value	Content of COUNTRY
1 or 3	Specify the country code. (as input parameter)
2	Returns the country code on the top of the country code stack. (as output parameter)
4	Returns the discarded country code on the country code stack.(as output parameter)

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE3BV	2	3455	Only one country code was on the stack when a POP request.
CEE3C0	3	3456	The country code for the PUSH or SET function was invalid.
CEE3C1	3	3457	The function FUNCTN specified was not recognized.

10.2 CEE3LNG

Sets the current national language.

You can also use CEE3LNG to query the current national language.

Calling format

```
CALL "CEE3LNG" USING
  BY REFERENCE FUNCTN,
  BY REFERENCE LANG,
  BY REFERENCE FC.
```

Parameter data definition

```
01 FUNCTN PIC S9(9) BINARY.
01 LANG PIC X(3).
01 FC.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
```

FUNCTN (Input)

Specify the subroutine to be performed.

A specifiable value is the following.

- 1-SET
Sets the LANG parameter as the current national language. The top of the stack is, in effect, replaced with LANG parameter. When setting the national language the LANG parameter is converted into the uppercase letter. For example, "enu" and "ENU", are considered to be the same national language.
- 2-QUERY
Returns the current national language on the top of the stack. The current national language converts into the uppercase letter and is set in the LANG parameter.
- 3-PUSH
Pushes the LANG parameter on to the top of the national language stack.
- 4-POP
Pops the current national language from the national language stack. It is set to the LANG parameter.

LANG (input/output)

The national language is stored. The country code is a fixed character string of three characters. There is no case sensitivity.

FUNCTN value	Content of LANG
1 or 3	Specify the national language identification. (as input parameter) Note: Only the following languages are supported. <ul style="list-style-type: none">- ENU : Mixed-case U.S. English- UEN : Uppercase U.S. English- JPN : Japanese.
2	Returns the current national language on top of the stack. (as output parameter).
4	Returns the discarded national language. (as output parameter).

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE3BQ	2	3450	Only one language was on the stack when a POP request.
CEE3BR	3	3451	The desired language LANG for the PUSH or SET function was invalid.
CEE3BS	3	3452	The function FUNCTN specified was not recognized.

10.3 CEE3MCS

Returns the default currency sign of the specified country.

Calling format

```
CALL "CEE3MCS" USING
  BY REFERENCE COUNTRY,
  BY REFERENCE CURSYM,
  BY REFERENCE FC.
```

Parameter data definition

```
01 COUNTRY PIC X(2).
01 CURSYM PIC X(4).
01 FC.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID.
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
```

COUNTRY (Input)

Specify the country code.

The country code is a fixed character string of two characters. There is no case sensitivity.

If no value is specified, the default country code that specified in the environment variable [@CBR_LE_COUNTRY](#) or CEE3CTY subroutine is used.

CURSYM (Output)

Specify the area where the default currency sign of the specified country is stored.

The currency sign is left-justified, and padded on the right with blanks, if necessary.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE3C7	2	3463	The country code COUNTRY was not valid.

10.4 CEE3MDS

Returns the default decimal-point separator of the specified country.

Calling format

```
CALL "CEE3MDS" USING
  BY REFERENCE COUNTRY,
  BY REFERENCE DECSEP,
  BY REFERENCE FC.
```

Parameter data definition

```
01 COUNTRY PIC X(2).
01 DECSEP PIC X(2).
01 FC.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
```

COUNTRY (Input)

Specify the country code.

The country code is a fixed character string of two characters. There is no case sensitivity.

If no value is specified, the default country code that specified in the environment variable [@CBR_LE_COUNTRY](#) or CEE3CTY subroutine is used.

DECSEP (Output)

Specify the area where the default decimal-point separator of the specified country is stored.

The decimal-point separator is left-justified, and padded on the right with blanks, if necessary.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE3C4	2	3460	The decimal separator 'DECSEP' was truncated.
CEE3C5	2	3461	The country code COUNTRY was invalid.

10.5 CEE3MTS

Returns the default thousands separator of the specified country.

Calling format

```
CALL "CEE3MTS" USING
  BY REFERENCE COUNTRY,
  BY REFERENCE THOUSEP,
  BY REFERENCE FC.
```

Parameter data definition

```
01 COUNTRY PIC X(2).
01 THOUSEP PIC X(2).
01 FC.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
```

COUNTRY (Input)

Specify the country code.

The country code is a fixed character string of two characters. There is no case sensitivity.

If no value is specified, the default country code that specified in the environment variable [@CBR_LE_COUNTRY](#) or CEE3CTY subroutine is used.

THOUSEP (Output)

Specify the area where the default thousands separator of the specified country is stored.

The thousands separator is left-justified, and padded on the right with blanks, if necessary.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE3C8	2	3464	The thousands separator 'THOUSEP' was truncated.
CEE3C9	2	3465	The country code COUNTRY was invalid.

10.6 CEEFMDA

Returns the default date picture string of the specified country.

Calling format

```
CALL "CEEFMDA" USING
  BY REFERENCE COUNTRY,
  BY REFERENCE PICSTR,
  BY REFERENCE FC.
```

Parameter data definition

```
01 COUNTRY PIC X(2).
01 PICSTR PIC X(80).
01 FC.
  02 Condition-Token-Value.
  COPY CEEIGZCT.
    03 Case-1-Condition-ID.
      04 Severity PIC S9(4) BINARY.
      04 Msg-No PIC S9(4) BINARY.
    03 Case-2-Condition-ID
      REDEFINES Case-1-Condition-ID.
      04 Class-Code PIC S9(4) BINARY.
      04 Cause-Code PIC S9(4) BINARY.
    03 Case-Sev-Ctl PIC X.
    03 Facility-ID PIC XXX.
  02 I-S-Info PIC S9(9) BINARY.
```

COUNTRY (Input)

Specify the country code.

The country code is a fixed character string of two characters. There is no case sensitivity.

If no value is specified, the default country code that specified in the environment variable [@CBR_LE_COUNTRY](#) or CEE3CTY subroutine is used.

When specifying an invalid value, the default date format is 'YYYY-MM-DD'.

PICSTR (Output)

Specify the area where the default date picture string of the specified country is stored.

The picture string is left-justified and padded on the right with blanks if necessary

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE3CB	2	3467	The country code COUNTRY was invalid.

10.7 CEEFMDT

Returns the default date and time picture strings of the specified country.

Calling format

```
CALL "CEEFMDT" USING
  BY REFERENCE COUNTRY,
  BY REFERENCE PICSTR,
  BY REFERENCE FC.
```

Parameter data definition

```
01 COUNTRY PIC X(2).
01 PICSTR PIC X(80).
01 FC.
   02 Condition-Token-Value.
   COPY CEEIGZCT.
     03 Case-1-Condition-ID.
       04 Severity PIC S9(4) BINARY.
       04 Msg-No PIC S9(4) BINARY.
     03 Case-2-Condition-ID
       REDEFINES Case-1-Condition-ID.
       04 Class-Code PIC S9(4) BINARY.
       04 Cause-Code PIC S9(4) BINARY.
     03 Case-Sev-Ctl PIC X.
     03 Facility-ID PIC XXX.
02 I-S-Info PIC S9(9) BINARY.
```

COUNTRY (Input)

Specify the country code.

The country code is a fixed character string of two characters. There is no case sensitivity.

If no value is specified, the default country code that specified in the environment variable [@CBR_LE_COUNTRY](#) or CEE3CTY subroutine is used.

When specifying an invalid value, the default date and time picture string is 'YYYY-MM-DD HH:MI:SS'.

PICSTR (Output)

Specify the area where the default date and time picture string of the specified country is stored.

The picture string is left-justified and padded on the right with blanks, if necessary.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE3CF	2	3471	The country code COUNTRY was invalid.

10.8 CEEFMTM

Returns the default time picture string of the specified country.

Calling format

```
CALL "CEEFMTM" USING
  BY REFERENCE COUNTRY,
  BY REFERENCE PICSTR,
  BY REFERENCE FC.
```

Parameter data definition

```
01 COUNTRY PIC X(2).
01 PICSTR PIC X(80).
01 FC.
   02 Condition-Token-Value.
   COPY CEEIGZCT.
     03 Case-1-Condition-ID.
       04 Severity PIC S9(4) BINARY.
       04 Msg-No PIC S9(4) BINARY.
```

```

03 Case-2-Condition-ID
   REDEFINES Case-1-Condition-ID.
04 Class-Code PIC S9(4) BINARY.
04 Cause-Code PIC S9(4) BINARY.
03 Case-Sev-Ctl PIC X.
03 Facility-ID PIC XXX.
02 I-S-Info PIC S9(9) BINARY.

```

COUNTRY (Input)

Specify the country code.

The country code is a fixed character string of two characters. There is no case sensitivity.

If no value is specified, the default country code that specified in the environment variable [@CBR_LE_COUNTRY](#) or CEE3CTY subroutine is used.

When specifying an invalid value, the default time picture string is 'HH:MI:SS'.

PICSTR (Output)

Specify the area where the default time picture string of the specified country is stored.

The picture string is left-justified and padded on the right with blanks if necessary.

FC (Output)

Specify the feedback code area.

The returned feedback codes and their meanings are explained below.

Code	Severity	Msg-No	Meaning
CEE000	0	0	Successfully.
CEE3CD	2	3469	The country code COUNTRY was invalid.
CEE3CE	2	3470	The date and time string was truncated and it became undefined.

Chapter 11 Other subroutines

11.1 Use of other subroutines

Other sub routines are not supported.

- When you call the following subroutines, the subroutine call is accepted, but no action occurs.
The feedback code (FC) is set as follows.

Code	Severity	Msg-No	Meaning
FJX999	4	9999	An unsupported subroutine was called.

- CEE3CIB
 - CEE3GRN
 - CEE3SPM
 - CEE3SRP
 - CEEGQDT
 - CEEHDLR
 - CEEHDLU
 - CEEITOK
 - CEEMRCR
 - CEESGL
 - CEE3RPH
 - CEE3DMP
 - CEETEST
 - CEE3GRC
 - CEE3SRC
 - CEECFMI
 - CEEMGET
 - CEEMSG
- When you call a sub routine other than the above, the subroutine call is not accepted
When those subroutines are called in the program, unrecoverable error JMP0015I -U (CANNOT CALL PROGRAM) of runtime system occur.

Chapter 12 Using the runtime environment variable

The execution environment variables used by the LE subroutine are as follows.

- 12.1 @CBR_LE_COUNTRY (Specify the default country code)
- 12.2 @CBR_LE_STORAGE (Specify the character used to initialize the heap area when allocating and freeing the heap)
- 12.3 @CBR_LE_HEAP (Specify the initial size and extended size for the heap allocation)
- 12.4 @CBR_LE_MSGFILE (Specify message file name)

12.1 @CBR_LE_COUNTRY (Specify the default country code)

In the LE subroutine, specify the default country code used by subroutines whose behaviors differ by country.

```
@CBR_LE_COUNTRY=country_code
```

country_code

Specify the default country-code.

The country code is a fixed character string of two characters (alphabetic characters).

For the country codes that can be specified, refer to the IBM manual.

If you omit the specification of this environment variable, "US" is assumed.

12.2 @CBR_LE_STORAGE (Specify the character used to initialize the heap area when allocating and freeing the heap)

In the LE subroutine that uses the heap area, specify the character used to initialize the heap area when allocating and freeing the heap.

```
@CBR_LE_STORAGE=heap_alloc_value,heap_free_value
```

heap_alloc_value

Specify the character that initializes the heap area when allocating the heap.

heap_free_value

Specify the character that initializes the heap area before freeing the heap.

The initialized character is specified in the following format. Each byte of the heap storage allotted by the storage management function is initialized by the specified character.

- One character enclosed in quotation marks(')
For example, when 'a' is specified, the heap storage is initialized to 'aaa....aaa'.
- 2-digit hexadecimal number without quotation marks
For example, when FE is specified, the heap storage is initialized to X'FEFEFE ... FE'.

If you omit the specification of this environment variable, the NULL character is assumed.

12.3 @CBR_LE_HEAP (Specify the initial size and extended size for the heap allocation)

In the CEECRHP subroutines, specify the default allocation size and default extended size that is used when the allocation size (HPSIZE) or extended size (INCR) is not specified.

```
@CBR_LE_HEAP=init_size,incr_size
```

init_size

Specify the default allocation size.

incr_size

Specify the default extended size.

The size value can be specified in n bytes, nK bytes, or nM bytes.

The actual size of the storage allocated is rounded to a multiple of 8 bytes.

If you omit the specification of this environment variable, a size of 32K is assumed.

12.4 @CBR_LE_MSGFILE (Specify message file name)

In the CEEMOUT subroutines, specify the name of the file to which the message is output.

```
@CBR_LE_MSGFILE=filename
```

filename

Specify the output destination message file name.

If you omit the specification of this environment variable, SYSOUT is assumed as the file name.

Appendix A List of LE Subroutines

Table A.1 List of LE Subroutines

No	Name	Description	[Min64]	[NET]
Bit Operation Subroutines				
1	CEESICLR	Clears the bit.	O	O
2	CEESISSET	Sets the bit.	O	O
3	CEESISHF	Sifts the bit.	O	O
4	CEESITST	Tests the bit.	O	O
List of Condition processing Subroutines				
1	CEEDCOD	Decomposes an existing condition token.	O	O
2	CEENCOD	Dynamically creates a condition token.	O	O
List of Date and time Subroutines				
1	CEECBLDY	Converts a date string to the COBOL integer format.	O	O
2	CEEDATE	Converts a Lilian date to the character format.	O	O
3	CEEDATM	Converts the number of seconds since 00:00:00, October 14, 1582 to a character string format.	O	O
4	CEEDAYS	Converts a date string to a Lilian format.	O	O
5	CEEDYWK	Calculates a day of the week from a Lilian date.	O	O
6	CEEGMT	Gets the current Greenwich Mean Time (GMT) converted into following information. - The Lilian date - The number of seconds since 00:00:00 14 October 1582.	O	O
7	CEEGMTO	Gets the difference between the local system time and Greenwich Mean Time (GMT).	O	O
8	CEEISEC	Converts binary integers (year, month, day, hour, minute, second, and millisecond) to the number of seconds since 00:00:00 14 October 1582.	O	O
9	CEELOCT	Gets a current local date and time in the following formats. - Lilian date (the number of days since 14 October 1582) - Lilian seconds (the number of seconds since 00:00:00 14 October 1582) - Gregorian character string (in the form YYYYMMDDHHMISS999)	O	O
10	CEEQCEN	Queries the century window.	O	O
11	CEESCEN	Sets the century window	O	O
12	CEESECI	Converts the number of seconds since 00:00:00 14 October 1582 to binary integers (year, month, day, hour, minute, second, and millisecond).	O	O
13	CEESECS	Converts the timestamp to the number of Lilian seconds (number of seconds since 00:00:00 14 October 1582).	O	O
14	CEEUTC	Gets the coordinated universal time(it is an alias of CEEGMT).	O	O
List of Dynamic storage area Subroutines				
1	CEECRHP	Allocates heaps.	O	O

No	Name	Description	[Minx64]	[NET]
2	CEECZST	Changes the size of the heap element.	O	O
3	CEEDSHP	Frees the entire heap allocated by CEECRHP or CEEGTST	O	O
4	CEEFRST	Frees the storage allocated by CEEGTST.	O	O
5	CEEGTST	Gets the storage from the specified heap ID.	O	O
List of General Subroutines				
1	CEE3PRM	Returns the runtime parameter specified at the call of the program.	O	O
2	CEE3USR	Sets or refers to the user area field.	O	O
3	CEEGPID	This subroutine is not supported.	O	O
4	CEERANO	Generates a sequence of uniform pseudo-random numbers between 0.0 and 1.0.	O	O
List of Initialization and Termination Subroutines				
1	CEE3ABD	The program is terminated abnormally.	O	O
List of Math Subroutines				
1	CEESxABS	Returns the absolute value of argument.	O	O
2	CEESxACS	Return the arc cosine of argument.	O	O
3	CEESxASN	Returns the arcsine of argument	O	O
4	CEESxATH	Returns the hyperbolic arctangent of argument	O	O
5	CEESxATN	Returns the arctangent of argument r.	O	O
6	CEESxAT2	Calculates a result by using the equation: RESLTRS = the angle (in radians) between the positive X axis and a vector defined by (ARG2RS, ARG1RS).	O	O
7	CEESxCOS	Returns the cosine of argument	O	O
8	CEESxCOSH	Returns the hyperbolic cosine of argument.	O	O
9	CEESxCTN	Returns the cotangent of argument.	O	O
10	CEESxDIM	Returns the positive difference between two numbers.	O	O
11	CEESxEXP	Calculates of raised to a power.	O	O
12	CEESxINT	Returns the truncated value of the parameter.	O	O
13	CEESxLG1	Returns the logarithm base 10.	O	O
14	CEESxLG2	Returns the logarithm base 2.	O	O
15	CEESxLOG	Returns the logarithm base e.	O	O
16	CEESxMOD	Performs the modular arithmetic.	O	O
17	CEESxNIN	Calculates the nearest integer.	O	O
18	CEESxNWN	Calculates the nearest whole number.	O	O
19	CEESxSGN	Performs the transfer of sign.	O	O
20	CEESxSIN	Returns the sine of argument.	O	O
21	CEESxSNH	Calculates the hyperbolic sine	O	O
22	CEESxSQT	Returns the square root.	O	O
23	CEESxTAN	Returns the tangent of argument.	O	O
24	CEESxTANH	Calculates the hyperbolic tangent.	O	O

No	Name	Description	[Winx64]	[NET]
25	CEESxXPx	Calculates the exponentiation.	O	O
List of Message processing Subroutines				
1	CEEMOUT	Add the user-defined message string to the message file.	O	O
List of Country wise language support Subroutines				
1	CEE3CTY	Sets the default country.	O	O
2	CEE3LNG	Sets the current national language.	O	O
3	CEE3MCS	Returns the default currency sign of the specified country.	O	O
4	CEE3MDS	Returns the default decimal separator for the country specified.	O	O
5	CEE3MTS	Returns the default thousands separator for the specified country.	O	O
6	CEEFMDA	Returns the default date picture string for a specified country.	O	O
7	CEEFMDT	Returns the default date and time picture strings for the country specified.	O	O
8	CEEFMTM	Returns the default time picture string for the country specified.	O	O

O: support