CDF

Fortran Reference Manual

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Chapter 1

1 Compiling

Each program, subroutine, or function that calls the CDF library or references CDF parameters must include one or more CDF include files. On VMS systems a logical name, CDF$INC, that specifies the location of the CDF include files is defined in the definitions files, DEFINITIONS.COM, provided with the CDF distribution. On UNIX systems (including Mac OS X) an environment variable, CDF_INC, that serves the same purpose is defined in the definitions files definitions.<shell-type> where <shell-type> is the type of shell being used: C for the C-shell (csh and tcsh), K for the Korn (ksh), BASH, and POSIX shells, and B for the Bourne shell (sh). This section assumes that you are using the appropriate definitions files on those systems. The location of cdf.inc is specified as described in the appropriate sections for those systems.

On VMS and UNIX systems the following line would be included at/near the top of each routine:

```
INCLUDE '<inc-path>cdf.inc'
```

where <inc-path> is the files name of the directory containing cdf.inc. On VMS systems CDF$INC: may be used for <inc-path>. On UNIX systems <inc-path> must be a relative or absolute files name. (An environment variable may not be used.) Another option would be to create a symbolic link to cdf.inc (using ln -s) making cdf.inc appear to be in the same directory as the source files to be compiled. In that case specifying <inc-path> would not be necessary. On UNIX systems you will need to know where on your system cdf.inc has been installed.

The cdf.inc include files declares the FUNCTIONs available in the CDF library (CDF var num, CDF lib, etc.). Some Fortran compilers will display warning messages about unused variables if these functions are not used in a routine (because they will be assumed to be variables not function declarations). Most of these Fortran compilers have a command line option (e.g., -nounused) that will suppress these warning messages. If a suitable command line option is not available (and the messages are too annoying to ignore), the function declarations could be removed from cdf.inc but be sure to declare each CDF function that a routine uses.[1]

Digital Visual Fortran[1]

On Windows NT/2000/XP systems using Digital Visual Fortran, the following lines would be included at the top of each routine/source files:

```
.
. (PROGRAM, SUBROUTINE, or FUNCTION statement)
.
INCLUDE 'cdfdvf.inc'
INCLUDE 'cdfdf.inc'
```

[1] Normally, you need to run DFVARS.BAT in bin directory to set up the proper environment from the command prompt.

The include files cdfdvf.inc contains an INTERFACE statement for each subroutine/function in the CDF library. Including this files is absolutely essential no matter if you are using the Internal Interface (CDF lib) or Standard Interface (e.g., CDF create, etc.) cdfdvf.inc is located in the same directory as cdf.inc. The include file cdfdf.inc is similar to cdfdf.inc, with some statements commented out for Digital Visual Fortran compiler.

1.1 VMS/OpenVMS Systems

An example of the command to compile a source file on VMS/OpenVMS systems would be as follows:

```
$ FORTRAN <source-name>
```

where <source-name> is the name of the source file being compiled. (The .FOR extension is not necessary.) The object module created will be named <source-name>.OBJ.

NOTE: If you are running OpenVMS on a DEC Alpha and are using a CDF distribution built for a default double-precision floating-point representation of D_FLOAT, you will also have to specify /FLOAT=D_FLOAT on the CC command line in order to correctly process double-precision floating-point values.

1.2 UNIX Systems

An example of the command to compile a source file on UNIX flavored systems would be as follows:[2]

```
% f77 -c <source-name>.f
```

where <source-file>.f is the name of the source file being compiled. (The .f extension is required.)

The -c option specifies that only an object module is to be produced. (The link step is described in Chapter 2.) The object module created will be named <source-name>.o.

1.3 Windows Systems, Digital Visual Fortran

An example of the command to compile a source file on Windows NT/95/98 systems using Digital Visual Fortran would be as follows:[3]

```
> DF /c /iface:nomixed_strfilesn_arg /nowarn /optimize:0 /I<inc-path> <source-name>.f
```

where <source-name>.f is the name of the source file being compiled (the .f extension is required) and <inc-path> is the file name of the directory containing cdfdvf.inc and cdfdf.inc. You will need to know where on your system cdfdvf.inc and cdfdf.inc have been installed. <inc-path> may be either an absolute or relative file name.

[2] The name of the Fortran compiler may be different depending on the flavor of UNIX being used.
[3] This example assumes you have properly set the MS-DOS environment variables used by the Digital Visual Fortran compiler.

The /c option specifies that only an object module is to be produced. (The link step is described in Chapter 2.) The object module will be named <source-name>.obj.

The /iface:nomixed str len arg option specifies that Fortran string arguments will have their string lengths appended to the end of the argument list by the compiler.

The /optimize:0 option specifies that no code optimization is done. We had a problem using the default optimization.

The /nowarn option specifies that no warning messages will be given.

You can run the batch files, DFVARS.BAT, came with the Digital Visual Fortran, to set them up.

Chapter 2

2 Linking

Your applications must be linked with the CDF library.[4] Both the Standard and Internal interfaces for C applications are built into the CDF library. On VMS systems a logical name, CDF$LIB, which specifies the location of the CDF library, is defined in the definitions file, DEFINITIONS.COM, provided with the CDF distribution. On UNIX systems (including Mac OS X) an environment variable, CDF_LIB, which serves the same purpose, is defined in the definitions file definitions.<shell-type> where <shell-type> is the type of shell being used: C for the C-shell (csh and tcsh), K for the Korn (ksh), BASH, and POSIX shells, and B for the Bourne shell (sh). This section assumes that you are using the appropriate definitions file on those systems. On MS-DOS and Macintosh (MacOS) systems, definitions files are not available. The location of the CDF library is specified as described in the appropriate sections for those systems.

2.1 VAX/VMS & VAX/OpenVMS Systems

An example of the command to link your application with the CDF library (LIBCDF.OLB) on VAX/VMS and VAX/OpenVMS systems would be as follows:

```
$ LINK <object-file(s)>, CDF$LIB:LIBCDF/LIBRARY
```

where<object-file(s)> is your application's object module(s). (The .OBJ extension is not necessary.) The name of the executable created will be the name part of the first object file listed with .EXE appended. A different executable name may be specified by using the /EXECUTABLE qualifier.

It may also be necessary to specify SYS$LIBRARY:VAXCRTL/LIBRARY at the end of the LINK command if your system does not properly define LNK$LIBRARY (or LNK$LIBRARY_1, etc.).

2.2 DEC Alpha/OpenVMS Systems

[4] A shareable version of the CDF library is also available on VMS and some flavors of UNIX. Its use is described in Chapter 3. A dynamic link library (DLL), LIBCDF.DLL, is available on MS-DOS systems for Microsoft and Borland Windows applications. Consult the Microsoft and Borland documentation for details on using a DLL. Note that the DLL for Microsoft is created using Microsoft C 7.00.

An example of the command to link your application with the CDF library (LIBCDF.OLB) on DEC Alpha/OpenVMS systems would be as follows:

```
$ LINK <object-file(s)>, CDF$LIB:LIBCDF/LIBRARY, SYS$LIBRARY:<crtl>/LIBRARY
```

where <object-file(s)> is your application's object module(s) (the .OBJ extension is not necessary) and <crtl> is VAXCRTL if your CDF distribution is built for a default double-precision floating-point representation of G_FLOAT or VAXCRTLD for a default of D_FLOAT. (You must specify a VAX C run-time library because the CDF library is written in C.) The name of the executable created will be the name part of the first object file listed with .EXE appended. A different executable name may be specified by using the /EXECUTABLE qualifier.

2.3 UNIX Systems

An example of the command to link your application with the CDF library (libcdf.a) on UNIX flavored systems would be as follows:

```
% f77 <object-file(s)>.o ${CDF_LIB}/libcdf.a
```

where <object-file(s)>.o is your application's object module(s). (The .o extension is required.) The name of the executable created will be a.out by default. It may also be explicitly specified using the –o option. Some UNIX systems may also require that -lc (the C run-time library), -lm (the math library), and/or -ldl (the dynamic linker library) be specified at the end of the command line. This may depend on the particular release of the operating system being used. Note that in a "makefile" where CDF_LIB is imported, $(CDF_LIB) would be specified instead of ${CDF_LIB}.

2.3.1 Combining the Compile and Link

On UNIX systems the compile and link may be combined into one step as follows:

```
% f77 <source-file(s)>.f ${CDF_LIB}/libcdf.a
```

where <source-file(s)>.f is the name of the source file(s) being compiled/linked. (The .f extension is required.) Some UNIX systems may also require that -lc, -lm, and/or -ldl be specified at the end of the command line. Note that in a "makefile"" where CDF_LIB is imported, $(CDF_LIB) would be specified instead of ${CDF_LIB}.

2.4 Windows Systems, Digital Visual Fortran

NOTE: Even though your application is written in Fortran and compiled with a Fortran compiler, compatible C run-time system libraries (as supplied with Microsoft Visual C++) will be necessary to successfully link your application. This is because the CDF library is written in C and calls C run-time system functions.

An example of the command used to link an application to the CDF library (LIBCDF.LIB) on Windows NT/95/98 systems using Digital Visual Fortran and Microsoft Visual C++ would be as follows:[5]

[5] This example assumes you have properly set the MS-DOS environment variables (e.g., LIB should be set to include directories that contain C's LIBC.LIB and Fortran's DFOR.LIB.)

```
> LINK <objs> <lib-path>libcdf.lib /out:<name.exe> /nodefaultlib:libcd
```

where <objs> is your application's object module(s) (the .obj extension is necessary); <name.exe> is the name of the executable file to be created and <lib-path> is the file name of the directory containing LIBCDF.LIB. You will need to know where on your system LIBCDF.LIB has been installed. <lib-path> may be either an absolute or relative file name.

The /nodefaultlib:libcd option specifies that the LIBCD.LIB is to be ignored during the library search for resolving references.

Chapter 3

3 Linking Shared CDF Library

A shareable version of the CDF library is also available on VMS systems, some flavors of UNIX[6], Windows NT/95/98[7] and Macintosh.[8] The shared version is put in the same directory as the non-shared version and is named as follows:

Machine/Operating System	Shared CDF Library
VAX (VMS & OpenVMS)	LIBCDF.EXE
DEC Alpha (OpenVMS)	LIBCDF.EXE
Sun (SOLARIS)	libcdf.so
HP 9000 (HP-UX)[9]	libcdf.sl
IBM RS6000 (AIX)[4]	libcdf.o
DEC Alpha (OSF/1)	libcdf.so
SGi (6.x)	libcdf.so
Linux (PC & Power PC)	libcdf.so
Windows NT/2000/XP	dllcdf.dll
Macintosh OS X[4]	libcdf.dylib

The commands necessary to link to a shareable library vary among operating systems. Examples are shown in the following sections.

3.1 VAX (VMS & OpenVMS)

```
$ ASSIGN CDF$LIB:LIBCDF.EXE CDF$LIBCDFEXE
$ LINK <object-file(s)>, SYS$INPUT:/OPTIONS
  CDF$LIBCDFEXE/SHAREABLE
```

[6] On UNIX systems, when executing a program linked to the shared CDF library, the environment variable LD_LIBRARY_PATH must be set to include the directory containing libcdf.so or libcdf.sl.
[7] When executing a program linked to the dynamically linked CDF library (DLL), the environment variable PATH must be set to include the directory containing dllcdf.dll.
[8] On Mac systems, when executing a program linked to the shared CDF library, dllcdf.ppc or dllcdf.68k must be copied into System's Extension folder.
[9] Not yet tested. Contact GSFC-CDF-support@lists.nasa.gov to coordinate the test.

```
  SYS$SHARE:VAXCRTL/SHAREABLE
  <Control-Z>
$  DEASSIGN  CDF$LIBCDFEXE
```

where<object-file(s)> is your application's object module(s). (The .OBJ extension is not necessary.) The name of the executable created will be the name part of the first object file listed with .EXE appended. A different executable name may be specified by using the /EXECUTABLE qualifier.

NOTE: on VAX/VMS and VAX/OpenVMS systems the shareable CDF library may also be installed in SYS$SHARE. If that is the case, the link command would be as follows:

```
$ LINK <object-file(s)>, SYS$INPUT:/OPTIONS
  SYS$SHARE:LIBCDF/SHAREABLE
  SYS$SHARE:VAXCRTL/SHAREABLE
  <Control-Z>
```

3.2 DEC Alpha (OpenVMS)

```
$ ASSIGN CDF$LIB:LIBCDF.EXE CDF$LIBCDFEXE
$ LINK <object-file(s)>, SYS$INPUT:/OPTIONS
  CDF$LIBCDFEXE/SHAREABLE
  SYS$LIBRARY:<crtl>/LIBRARY
  <Control-Z>
$ DEASSIGN CDF$LIBCDFEXE
```

where <object-file(s)> is your application's object module(s) (the .OBJ extension is not necessary) and <crtl> is VAXCRTL if your CDF distribution is built for a default double-precision floating-point representation of G_FLOAT or VAXCRTLD for a default of D_FLOAT or VAXCRTLT for a default of IEEE_FLOAT. (You must specify a VAX C run-time library [RTL] because the CDF library is written in C.) The name of the executable created will be the name part of the first object file listed with .EXE appended. A different executable name may be specified by using the /EXECUTABLE qualifier.

NOTE: on DEC Alpha/OpenVMS systems the shareable CDF library may also be installed in SYS$SHARE. If that is the case, the link command would be as follows:

```
$ LINK <object-file(s)>, SYS$INPUT:/OPTIONS
  SYS$SHARE:LIBCDF/SHAREABLE
  SYS$LIBRARY:<crtl>/LIBRARY
  <Control-Z>
```

3.3 SUN (SOLARIS)

```
% f77 -o <exe-file> <object-file(s)>.o ${CDF_LIB}/libcdf.so -lc -lm
```

where <object-file(s)>.o is your application's object module(s) (the .o extension is required) and <exe-file> is the name of the executable file created. Note that in a “makefile” where CDF_LIB is imported, $(CDF_LIB) would be specified instead of ${CDF_LIB}.

3.4 HP 9000 (HP-UX)

```
% f77 -o <exe-file> <object-file(s)>.o ${CDF_LIB}/libcdf.sl -lc -lm
```

where <object-file(s)>.o is your application's object module(s) (the .o extension is required) and <exe-file> is the name of the executable file created. Note that in a "makefile" where CDF_LIB is imported, $(CDF_LIB) would be specified instead of ${CDF_LIB}.

3.5 IBM RS6000 (AIX)

```
% f77 -o <exe-file> <object-file(s)>.o -L${CDF_LIB} ${CDF_LIB}/libcdf.o -lc -lm
```

where <object-file(s)>.o is your application's object module(s) (the .o extension is required) and <exe-file> is the name of the executable file created. Note that in a "makefile" where CDF_LIB is imported, $(CDF_LIB) would be specified instead of ${CDF_LIB}.

3.6 DEC Alpha (OSF/1)

```
% f77 -o <exe-file> <object-file(s)>.o ${CDF_LIB}/libcdf.so -lm -lc
```

where <object-file(s)>.o is your application's object module(s) (the .o extension is required) and <exe-file> is the name of the executable file created. Note that in a "makefile" where CDF_LIB is imported, $(CDF_LIB) would be specified instead of ${CDF_LIB}.

3.7 SGi (IRIX 6.x)

```
% f77 -o <exe-file> <object-file(s)>.o  ${CDF_LIB}/libcdf.so -lm -lc
```

where <object-file(s)>.o is your application's object module(s) (the .o extension is required) and <exe-file> is the name of the executable file created. Note that in a "makefile" where CDF_LIB is imported, $(CDF_LIB) would be specified instead of ${CDF_LIB}.

3.8 Linux (PC & Power PC)

```
% g77 -o <exe-file> <object-file(s)>.o  ${CDF_LIB}/libcdf.so -lm -lc
```

where <object-file(s)>.o is your application's object module(s) (the .o extension is required) and <exe-file> is the name of the executable file created. Note that in a "makefile" where CDF_LIB is imported, $(CDF_LIB) would be specified instead of ${CDF_LIB}.

3.9 Windows

```
% link /out:<exe-file>.exe  <object-file(s)>.obj  <lib-path>dllcdf.lib
      /nodefaultlib:libcd
```

where <object-file(s)>.obj is your application's object module(s) (the .obj extension is required) and <exe-file>.exe is the name of the executable file created, and <lib-path> may be either an absolute or relative directory name that has dllcdf.lib. The environment variable LIB has to set to the directory that contains LIBC.LIB. Your PATH environment variable needs to be set to include the directory that contains dllcdf.dll when the executable is run.

Chapter 4

4 Programming Interface

The following sections describe various aspects of the Fortran programming interface for CDF applications. These include constants and types defined for use by all CDF application programs written in Fortran. These constants and types are defined in cdf.inc. The file cdf.inc should be INCLUDEed in all application source files referencing CDF routines/parameters.

4.1 Argument Passing

The CDF library is written entirely in C. Most computer systems have Fortran and C compilers that allow a Fortran application to call a C function without being concerned that different programming languages are involved. The CDF library takes advantage of the mechanisms provided by these compilers so that your Fortran application can appear to be calling another Fortran subroutine/function (in actuality the CDF library written in C). Pass all arguments exactly as shown in the description of each CDF function. This includes character strings (i.e., %REF(...) is not required). Be aware, however, that trailing blanks on variable and attribute names will be considered as part of the name. If the trailing blanks are not desired, pass only the part of the character string containing the name (e.g., VAR NAME(1:8)).

NOTE: Unfortunately, the Microsoft C and Microsoft Fortran compilers on the IBM PC and the C and Fortran compilers on the NeXT computer do not provide the needed mechanism to pass character strings from Fortran to C without explicitly NUL terminating the strings. Your Fortran application must place an ASCII NUL character after the last character of a CDF, variable, or attribute name. An example of this follows:

```
.
.
CHARACTER ATTR_NAME*9           ! Attribute name
.
.
ATTR_NAME(1:8) = 'VALIDMIN'     ! Actual attribute name
ATTR_NAME(9:9) = CHAR(0)        ! ASCII NUL character
.
.
```

CHAR(0) is an intrinsic Fortran function that returns the ASCII character for the numerical value passed in (0 is the numerical value for an ASCII NUL character). ATTR_NAME could then be passed to one of the CDF library functions.

When the CDF library passes out a character string on an IBM PC (using the Microsoft compilers) or on a NeXT computer, the number of characters written will be exactly as shown in the description of the function called. You must declare your Fortran variable to be exactly that size.

4.2 Item Referencing

For Fortran applications all items are referenced starting at one (1). These include variable, attribute, and attribute entry numbers, record numbers, dimensions, and dimension indices. Note that both rVariables and zVariables are numbered starting at one (1).

4.3 Status Code Constants

These constants are of type INTEGER*4.

CDF_OK	A status code indicating the normal completion of a CDF function.
CDF_WARN	Threshold constant for testing severity of non-normal CDF status codes.

Chapter 8 describes how to use these constants to interpret status codes.

4.4 CDF Formats

SINGLE_FILE	The CDF consists of only one file. This is the default file format.
MULTI_FILE	The CDF consists of one header file for control and attribute data and one additional file for each variable in the CDF.

4.5 CDF Data Types

One of the following constants must be used when specifying a CDF data type for an attribute entry or variable.

CDF_BYTE	1-byte, signed integer.
CDF_CHAR	1-byte, signed character.
CDF_INT1	1-byte, signed integer.
CDF_UCHAR	1-byte, unsigned character.
CDF_UINT1	1-byte, unsigned integer.

CDF_INT2	2-byte, signed integer.
CDF_UINT2	2-byte, unsigned integer.
CDF_INT4	4-byte, signed integer.
CDF_UINT4	4-byte, unsigned integer.
CDF_INT8	8-byte, signed integer.
CDF_REAL4	4-byte, floating point.
CDF_FLOAT	4-byte, floating point.
CDF_REAL8	8-byte, floating point.
CDF_DOUBLE	8-byte, floating point.
CDF_EPOCH	8-byte, floating point.
CDF_EPOCH16	two 8-byte, floating point.
CDF_ETIME_TT2000	8-byte, signed integer.

CDF_CHAR and CDF_UCHAR are considered character data types. These are significant because only variables of these data types may have more than one element per value (where each element is a character).

NOTE: When using a DEC Alpha running OSF/1 keep in mind that a long is 8 bytes and that an int is 4 bytes. Use int C variables with the CDF data types CDF_INT4 and CDF_UINT4 rather than long C variables.

NOTE: When using an PC (MS-DOS) keep in mind that an int is 2 bytes and that a long is 4 bytes. Use long C variables with the CDF data types CDF_INT4 and CDF_UINT4 rather than int C variables.

4.6 Data Encodings

A CDF's data encoding affects how its attribute entry and variable data values are stored (on disk). Attribute entry and variable values passed into the CDF library (to be written to a CDF) should always be in the host machine's native encoding. Attribute entry and variable values read from a CDF by the CDF library and passed out to an application will be in the currently selected decoding for that CDF (see the Concepts chapter in the CDF User's Guide).

HOST_ENCODING	Indicates host machine data representation (native). This is the default encoding, and it will provide the greatest performance when reading/writing on a machine of the same type.
NETWORK_ENCODING	Indicates network transportable data representation (XDR).
VAX_ENCODING	Indicates VAX data representation. Double-precision floating-point values are encoded in Digital's D_FLOAT representation.

ALPHAVMSd_ENCODING	Indicates DEC Alpha running OpenVMS data representation. Double-precision floating-point values are encoded in Digital's D_FLOAT representation.
ALPHAVMSg_ENCODING	Indicates DEC Alpha running OpenVMS data representation. Double-precision floating-point values are encoded in Digital's G_FLOAT representation.
ALPHAVMSi_ENCODING	Indicates DEC Alpha running OpenVMS data representation. Double-precision floating-point values are encoded in IEEE representation.
ALPHAOSF1_ENCODING	Indicates DEC Alpha running OSF/1 data representation.
SUN_ENCODING	Indicates SUN data representation.
SGi_ENCODING	Indicates Silicon Graphics Iris and Power Series data representation.
DECSTATION_ENCODING	Indicates DECstation data representation.
IBMRS_ENCODING	Indicates IBMRS data representation (IBM RS6000 series).
HP_ENCODING	Indicates HP data representation (HP 9000 series).
IBMPC_ENCODING	Indicates Intel i386 data representation.
NeXT_ENCODING	Indicates NeXT data representation.
MAC_ENCODING	Indicates Macintosh data representation.
ARM_LITTLE_ENCODING	Indicates ARM architecture in little-endian data representation.
ARM_BIG_ENCODING	Indicates ARM architecture in big-endian data representation.
IA64VMSi_ENCODING	Indicates Itanium 64 running OpenVMS data representation. Double-precision floating-point values are encoded in IEEE representation.
IA64VMSd_ENCODING	Indicates Itanium 64 running OpenVMS data representation. Double-precision floating-point values are encoded in Digital's D_FLOAT representation.
IA64VMSg_ENCODING	Indicates Itanium 64 running OpenVMS data representation. Double-precision floating-point values are encoded in Digital's G_FLOAT representation.

When creating a CDF (via the Standard interface) or respecifying a CDF's encoding (via the Internal Interface), you may specify any of the encodings listed above. Specifying the host machine's encoding explicitly has the same effect as specifying HOST_ENCODING.

When inquiring the encoding of a CDF, either NETWORK_ENCODING or a specific machine encoding will be returned. (HOST_ENCODING is never returned.)

4.7 Data Decodings

A CDF's decoding affects how its attribute entry and variable data values are passed out to a calling application. The decoding for a CDF may be selected and reselected any number of times while the CDF is open. Selecting a decoding does not affect how the values are stored in the CDF file(s) - only how the values are decoded by the CDF library. Any decoding may be used with any of the supported encodings. The Concepts chapter in the CDF User's Guide describes a CDF's decoding in more detail.

HOST_DECODING	Indicates host machine data representation (native). This is the default decoding.
NETWORK_DECODING	Indicates network transportable data representation (XDR).
VAX_DECODING	Indicates VAX data representation. Double-precision floating-point values will be in Digital's D_FLOAT representation.
ALPHAVMSd_DECODING	Indicates DEC Alpha running OpenVMS data representation. Double-precision floating-point values will be in Digital's D_FLOAT representation.
ALPHAVMSg_DECODING	Indicates DEC Alpha running OpenVMS data representation. Double-precision floating-point values will be in Digital's G_FLOAT representation.
ALPHAVMSi_DECODING	Indicates DEC Alpha running OpenVMS data representation. Double-precision floating-point values will be in IEEE representation.
ALPHAOSF1_DECODING	Indicates DEC Alpha running OSF/1 data representation.
SUN_DECODING	Indicates SUN data representation.
SGi_DECODING	Indicates Silicon Graphics Iris and Power Series data representation.
DECSTATION_DECODING	Indicates DECstation data representation.
IBMRS_DECODING	Indicates IBMRS data representation (IBM RS6000 series).
HP_DECODING	Indicates HP data representation (HP 9000 series).
IBMPC_DECODING	Indicates Intel i386 data representation.
NeXT_DECODING	Indicates NeXT data representation.
MAC_DECODING	Indicates Macintosh data representation.
ARM_LITTLE_DECODING	Indicates ARM architecture in little-endian data representation.
ARM_BIG_DECODING	Indicates ARM architecture in big-endian data representation.
IA64VMSi_DECODING	Indicates Itanium 64 running OpenVMS data representation. Double-precision floating-point values are encoded in IEEE representation.
IA64VMSd_DECODING	Indicates Itanium 64 running OpenVMS data representation. Double-precision floating-point values are encoded in Digital's D_FLOAT representation.

IA64VMSg_DECODING	Indicates Itanium 64 running OpenVMS data representation. Double-precision floating-point values are encoded in Digital's G_FLOAT representation.

The default decoding is HOST_DECODING. The other decodings may be selected via the Internal Interface with the <SELECT_,CDF_DECODING_> operation. The Concepts chapter in the CDF User's Guide describes those situations in which a decoding other than HOST_DECODING may be desired.

4.8 Variable Majorities

A CDF's variable majority determines the order in which variable values (within the variable arrays) are stored in the CDF file(s). The majority is the same for rVariable and zVariables.

ROW_MAJOR	C-like array ordering for variable storage. The first dimension in each variable array varies the slowest. This is the default majority.
COLUMN_MAJOR	Fortran-like array ordering for variable storage. The first dimension in each variable array varies the fastest.

Knowing the majority of a CDF's variables is necessary when performing hyper reads and writes. During a hyper read the CDF library will place the variable data values into the memory buffer in the same majority as that of the variables. The buffer must then be processed according to that majority. Likewise, during a hyper write, the CDF library will expect to find the variable data values in the memory buffer in the same majority as that of the variables.

The majority must also be considered when performing sequential reads and writes. When sequentially reading a variable, the values passed out by the CDF library will be ordered according to the majority. When sequentially writing a variable, the values passed into the CDF library are assumed (by the CDF library) to be ordered according to the majority.

As with hyper reads and writes, the majority of a CDF's variables affects multiple variable reads and writes. When performing a multiple variable write, the full-physical records in the buffer passed to the CDF library must have the CDF's variable majority. Likewise, the full-physical records placed in the buffer by the CDF library during a multiple variable read will be in the CDF's variable majority.

For Fortran applications the compiler defined majority for arrays is column major. The first dimension of multi-dimensional arrays varies the fastest in memory.

4.9 Record/Dimension Variances

Record and dimension variances affect how variable data values are physically stored.

VARY	True record or dimension variance.
NOVARY	False record or dimension variance.

If a variable has a record variance of VARY, then each record for that variable is physically stored. If the record variance is NOVARY, then only one record is physically stored. (All of the other records are virtual and contain the same values.)

If a variable has a dimension variance of VARY, then each value/subarray along that dimension is physically stored. If the dimension variance is NOVARY, then only one value/subarray along that dimension is physically stored. (All other values/subarrays along that dimension are virtual and contain the same values.)

4.10 Compressions

The following types of compression for CDFs and variables are supported. For each, the required parameters are also listed. The Concepts chapter in the CDF User's Guide describes how to select the best compression type/parameters for a particular data set. Among the available compression types, GZIP provides the best result.

NO_COMPRESSION	No compression.
RLE_COMPRESSION	Run-length encoding compression. There is one parameter. 1. The style of run-length encoding. Currently, only the run-length encoding of zeros is supported. This parameter must be set to RLE_OF_ZEROs.
HUFF_COMPRESSION	Huffman compression. There is one parameter. 1. The style of Huffman encoding. Currently, only optimal encoding trees are supported. An optimal encoding tree is determined for each block of bytes being compressed. This parameter must be set to OPTIMAL_ENCODING_TREES.
AHUFF_COMPRESSION	Adaptive Huffman compression. There is one parameter. 1. The style of adaptive Huffman encoding. Currently, only optimal encoding trees are supported. An optimal encoding tree is determined for each block of bytes being compressed. This parameter must be set to OPTIMAL_ENCODING_TREES.
GZIP_COMPRESSION	Gnu's “zip" compression.[10] There is one parameter. 1. The level of compression. This may range from 1 to 9. 1 provides the least compression and requires less execution time. 9 provides the most compression but requires the most execution time. Values in-between provide varying compromises of these two extremes. 6 nornally provides a better balance between compression and execution.

4.11 Sparseness

[10] Disabled for PC running 16-bit DOS/Windows 3.x.

4.11.1 Sparse Records

The following types of sparse records for variables are supported.

NO_SPARSERECORDS	No sparse records.
PAD_SPARSERECORDS	Sparse records - the variable's pad value is used when reading values from a missing record.
PREV_SPARSERECORDS	Sparse records - values from the previous existing record are used when reading values from a missing record. If there is no previous existing record the variable's pad value is used.

4.11.2 Sparse Arrays

The following types of sparse arrays for variables are supported.[11]

NO_SPARSEARRAYS	No sparse arrays.

4.12 Attribute Scopes

Attribute scopes are simply a way to explicitly declare the intended use of an attribute by user applications (and the CDF toolkit).

GLOBAL_SCOPE	Indicates that an attribute's scope is global (applies to the CDF as a whole).
VARIABLE_SCOPE	Indicates that an attribute's scope is by-variable. (Each rEntry or zEntry corresponds to an rVariable or zVariable, respectively.)

4.13 Read-Only Modes

Once a CDF has been opened, it may be placed into a read-only mode to prevent accidental modification (such as when the CDF is simply being browsed). Read-only mode is selected via the Internal Interface using the <SELECT_,CDF_READONLY_MODE_> operation. When read-only mode is set, all metadata is read into memory for future reference. This improves overall metadata access performance but is extra overhead if metadata is not needed. Note that if the CDF is modified while not in read-only mode, subsequently setting read-only mode in the same session will not prevent future modifications to the CDF.

READONLYon	Turns on read-only mode.
READONLYoff	Turns off read-only mode.

[11] The sparse arrays are not (and will not be) supported.

4.14 zModes

Once a CDF has been opened, it may be placed into one of two variations of zMode. zMode is fully explained in the Concepts chapter in the CDF User's Guide. A zMode is selected for a CDF via the Internal Interface using the <SELECT_,CDF_zMODE_> operation.

zMODEoff	Turns off zMode.
zMODEon1	Turns on zMode/1.
zMODEon2	Turns on zMode/2.

4.15 -0.0 to 0.0 Modes

Once a CDF has been opened, the CDF library may be told to convert -0.0 to 0.0 when read from or written to that CDF. This mode is selected via the Internal Interface using the <SELECT_,CDF_NEGtoPOSfp0_MODE_> operation.

NEGtoPOSfp0on	Convert -0.0 to 0.0 when read from or written to a CDF.
NEGtoPOSfp0off	Do not convert -0.0 to 0.0 when read from or written to a CDF.

4.16 Operational Limits

These are limits within the CDF library. If you reach one of these limits, please contact CDF User Support.

CDF_MAX_DIMS	Maximum number of dimensions for the rVariables or a zVariable.
CDF_MAX_PARMS	Maximum number of compression or sparseness parameters.

The CDF library imposes no limit on the number of variables, attributes, or attribute entries that a CDF may have. On the PC, however, the number of rVariables and zVariables will be limited to 100 of each in a multi-file CDF because of the 8.3 naming convention imposed by MS-DOS.

4.17 Limits of Names and Other Character Strings

CDF_PATHNAME_LEN	Maximum length of a CDF file name (excluding the .cdf or .vnn appended by the CDF library to construct file names). A CDF file name may contain disk and directory specifications that conform to the conventions of the operating systems being used (including logical names on VMS systems and environment variables on UNIX systems).

CDF_VAR_NAME_LEN256	Maximum length of a variable name.
CDF_ATTR_NAME_LEN256	Maximum length of an attribute name.
CDF_COPYRIGHT_LEN	Maximum length of the CDF copyright text.
CDF_STATUSTEXT_LEN	Maximum length of the explanation text for a status code.

4.18 Backward File Compatibility with CDF 2.7

By default, a CDF file created by CDF V3.0 or a later release is not readable by any of the CDF releases before CDF V3.0 (e.g. CDF 2.7.x, 2.6.x, 2.5.x, etc.). The file incompatibility is due to the 64-bit file offset used in CDF 3.0 and later releases (to allow for files greater than 2G bytes). Note that before CDF 3.0, 32-bit file offset was used.

There are two ways to create a file that's backward compatible with CDF 2.7 and 2.6, but not 2.5. Fortran subroutine, **CDF_set_FileBackward**, can be called to control the backward compatibility from an application before a CDF file is created (i.e. CDF_create_CDF). This subroutine takes an argument to control the backward file compatibility. Passing a flag value of **BACKWARDFILEon**, defined in **cdf.inc**, to the subroutine will cause new files being created to be backward compatible. The created files are of version V2.7.2, not V3.*. This option is useful for those who wish to create and share files with colleagues who still use a CDF V2.6/V2.7 library. If this option is specified, the maximum file size is limited to 2G bytes. Passing a flag value of **BACKWARDFILEoff**, also defined in **cdf.inc**, will use the default file creation mode and new files created will not be backward compatible with older libraries. The created files are of version 3.* and thus their file sizes can be greater than 2G bytes. Not calling this function has the same effect of calling the function with an argument value of **BACKWARDFILEoff**.

The following example uses the Internal Interface routine to create two CDF files: "MY_TEST1.cdf" is a V3.* file while "MY_TEST2.cdf" a V2.7 file. Alternatively, the Standard Interface routine CDF_create_CDF can be used for the file creation.

```
.
.
include 'cdf.inc'
.
.
integer*4       id1, id2                /*  CDF  identifier.  */
integer*4       status                  /*  Returned status code.  */
integer*4       numDims = 0             /*  Number of dimensions. */
integer*4       dimSizes[1] = {0}       /*  Dimension sizes. */
.
.
status =  CDF_lib (CREATE_, CDF_, "MY_TEST1", numDims, dimSizes, id1,
1                       NULL_, status)
if (status .lt.  CDF_OK)  call UserStatusHandler  (status)
.
.
call CDF_set_FileBackward(BACKWARDFILEon)
status =  CDF_lib (CREATE_, CDF_, "MY_TEST2", numDims, dimSizes, id2,
1                       NULL_, status)
if (status .NE.  CDF_OK)  call UserStatusHandler  (status)
.
.
```

Another method is through an environment variable and no function call is needed (and thus no code change involved in any existing applications). The environment variable, **CDF_FILEBACKWARD** on all Unix platforms and Windows, or **CDF$FILEBACKWARD** on Open/VMS, is used to control the CDF file backward compatibility. If its value is set to "**TRUE**", all new CDF files are backward compatible with CDF V2.7 and 2.6. This applies to any applications or CDF tools dealing with creation of new CDFs. If this environment variable is not set, or its value is set to anything other than "TRUE", any files created will be of the CDF 3.* version and these files are not backward compatible with the CDF 2.7.2 or earlier versions .

Normally, only one method should be used to control the backward file compatibility. If both methods are used, the subroutine call through CDF_set_FileBackward will take the precedence over the environment variable.

You can use the **CDF_get_FileBackward** subroutine to check the current value of the backward-file-compatibility flag. It returns **1** if the flag is set (i.e. create files compatible with V2.7 and 2.6) or **0** otherwise.

```
include 'cdf.inc'
.
.
integer*4       flag                    /*  CDF  identifier.  */
.
flag = CDF_get_FileBackward()
```

4.19 Checksum

To ensure the data integrity while transferring CDF files from/to different platforms at different locations, the checksum feature was added in CDF V3.2 as an option for the single-file format CDF files (not for the multi-file format). By default, the checksum feature is not turned on for new files. Once the checksum bit is turned on for a particular file, the data integrity check of the file is performed every time it is open; and a new checksum is computed and stored when it is closed. This overhead (performance hit) may be noticeable for large files. Therefore, it is strongly encouraged to turn off the checksum bit once the file integrity is confirmed or verified.

If the checksum bit is turned on, a 16-byte signature message (a.k.a. message digest) is computed from the entire file and appended to the end of the file when the file is closed (after any create/write/update activities). Every time such file is open, other than the normal steps for opening a CDF file, this signature, serving as the authentic checksum, is used for file integrity check by comparing it to the re-computed checksum from the current file. If the checksums match, the file's data integrity is verified. Otherwise, an error message is issued. Currently, the valid checksum modes are: **NO_CHECKSUM** and **MD5_CHECKSUM**, both defined in cdf.h. With MD5_CHECKSUM, the **MD5** algorithm is used for the checksum computation. The checksum operation can be applied to CDF files that were created with V2.6 or later.

There are several ways to add or remove the checksum bit. One way is to use the Interface call (Standard or Internal) with a proper checksum mode. Another way is through the environment variable. Finally, CDFedit and CDFconvert (CDF tools included as part of the standard CDF distribution package) can be used for adding or removing the checksum bit. Through the Interface call, you can set the checksum mode for both new or existing CDF files while the environment variable method only allows to set the checksum mode for new files.

See Section 6.2.5 and 6.2.26 for the Standards Interface functions and Section 7.6 for the Internal Interface functions. The environment variable method requires no function calls (and thus no code change is involved for existing applications). The environment variable **CDF_CHECKSUM** on all Unix platforms and Windows, or **CDF$CHECKSUM** on Open/VMS, is used to control the checksum option. If its value is set to "**MD5**", all new CDF files will have their checksum bit set with a signature message produced by the MD5 algorithm. If the environment variable is not set or its value is set to anything else, no checksum is set for the new files.

The following example uses the Internal Interface to set one new CDF file with the MD5 checksum and set another existing file's checksum to none.

```
.
.
include 'cdf.inc'
.
.
integer*4       id1, id2                    /*  CDF  identifier.  */
integer*4       status                      /*  Returned status code.  */
integer*4       numDims = 0                 /*  Number of dimensions. */
integer*4       dimSizes[1] = {0}           /*  Dimension sizes. */
integer*4       checksum                    /*  Number of dimensions. */
.
.
status =  CDF_lib (CREATE_, CDF_, "MY_TEST1", numDims, dimSizes, id1,
1                       NULL_, status)
if (status .NE.  CDF_OK)  call UserStatusHandler  (status)


checksum = MD5_CHECKSUM
 status =  CDFlib (SELECT_, CDF_, id1,
1                       PUT_, CDF_CHECKSUM_, checksum,
2                       NULL_, status)
 if (status .NE.  CDF_OK)  UserStatusHandler  (status)
.
 status =  CDFlib (OPEN_, CDF_, "MY_TEST2", id2,
1                       NULL_, status);
 if (status .NE.  CDF_OK)  UserStatusHandler  (status)
.
.
 checksum = NO_CHECKSUM
 status =  CDFlib (SELECT_, CDF_, id2,
1                      PUT_, CDF_CHECKSUM_, checksum,
2                      NULL_, status)
if (status .NE.  CDF_OK)  UserStatusHandler  (status)
.
.
```

Alternatively, the Standard Interface function **CDF_set_Checksum** can be used for the same purpose.

The following example uses the Internal Interface to get the checksum mode used in a CDF.

```
.
.
#include "cdf.inc"
.
.
integer*4       id;                         /*  CDF  identifier.  */
integer*4       status;                     /*  Returned status code.  */
integer*4       checksum;                   /*  Checksum code.  */
.
.
status =  CDFlib (OPEN_, CDF_, "MY_TEST1", id,
                      NULL_, status);
if (status .NE.  CDF_OK)  CALL UserStatusHandler  (status);
```

```
.
.
status =  CDFlib (SELECT_, CDF_, id,
                  GET_, CDF_CHECKSUM_, checksum,
                  NULL_, status);
if (status .NE. CDF_OK)  CALL UserStatusHandler  (status)
if (checksum .EQ. MD5_CHECKSUM) THEN
  …..
ENDIF

.
```

Alternatively, the Standard Interface function **CDF_get_Checksum** can be used for the same purpose.

4.20 Data Validation

To ensure the data integrity of CDF files and secure operation of CDF-based applications, a data validation feature has been added to the CDF opening logic. This process, as the default, performs sanity checks on the data fields in the CDF's internal data structures to make sure that the values are within valid ranges and consistent with the defined values/types/entries. It also ensures that the variable and attribute associations within the file are valid. Any compromised CDF files, if not validated properly, could cause applications to function unexpectedly, e.g., segmentation fault due to a buffer overflow. The main purpose of this feature is to safeguard the CDF operations, catch any bad data in the file and end the application gracefully if any bad data is identified. Using this feature, in most cases, will slow down the file opening process especially for large or very fragmented files. Therefore, it is recommended that this feature be turned off once a file's integrity is confirmed or verified. Or, the file in question may need a file conversion, which will consolidate the internal data structures and eliminate the fragmentations. Check the **cdfconvert** tool program in the CDF User's Guide for further information. [12]

This This validation feature is controlled by setting/unsetting the environment variable **CDF_VALIDATE** on all Unix platforms, Mac OS X and Windows, or **CDF$VALIDATE** on Open/VMS. If its value is not set or set to "**yes**", all CDF files are subjected to the data validation process. If the environment variable is set to "**no**", then no validation is performed. The environment variable can be set at logon or through the command line, which goes into effect during a terminal session, or within an application, which is good only while the application is running. Setting the environment variable, **CDF_set_Validate**, at application level will overwrite the setup from the command line. The validation is set to be on when **VALIDATEFILEon** is passed in as an argument. **VALIDATEFILEoff** will turn off the validation. The Fortran subroutine, **CDF_get_Validate** will return the validation mode, **1** (one) means data being validated, **0** (zero) otherwise. If the environment variable is not set, the default is to validate the CDF file upon opening.

The following example sets the data validation on when it opens the CDF file, "TEST".

```
.
.
include 'cdf.inc'
.
.
integer*4       id                      /*  CDF  identifier.  */
integer*4       status                  /*  Returned status code.  */
.
.
CALL CDF_set_Validate (VALIDATEFILEon)
status =  CDF_lib (OPEN_, CDF_, "TEST", id,
```

[12] The data validation during the open process will not check the variable data. It is still possible that data could be corrupted, especially compression is involved. To fully validate a CDF file, use cdfdump tool with "-detect" switch.

```
1                       NULL_, status)
if (status .NE.  CDF_OK)  call UserStatusHandler  (status)

.
.
```

The following example turns off the data validation when it opens the CDF file, “TEST”.

```
.
.
include ‘cdf.inc’
.
.
integer*4       id                      /*  CDF  identifier.  */
integer*4       status                  /*  Returned status code.  */
.
.
CALL CDF_SET_Validate (VALIDATEFILEoff)
status =  CDF_lib (OPEN_, CDF_, “TEST”, id,
1                       NULL_, status)
if (status .NE.  CDF_OK)  call UserStatusHandler  (status)

.
.
```

4.21 8-Byte Integer

Both data types of CDF_INT8 and CDF_TIME_TT2000 use 8-byes signed integer. While there are several ways to define such integer by various Fortran compilers on various platforms, The following **Kind** notation appears to be accepted by GNU Fortran (gfortran) that support CDF. This is the data type that CDF library uses for these two CDF data types.. In **cdf.inc**, the **KIND_INT8** is defined as following:

```
INTEGER, PARAMETER :: INT8 = 18
INTEGER, PARAMETER :: KIND_INT8 = SELECTED_INT_KIND (INT8)
```

In Fortran application, once the cdf.inc is included, we can use the following statements to define such 8-byte integers:

```
INCLUDE ‘CDF.INC’
INTEGER (KIND=KIND_INT8) TT2000(8), MMM(8), DINT8(2,3),
   .                    OUT8(2,3), NN
```

Chapter 5

5 Standard Interface

The following sections describe the original Standard Interface routines callable from Fortran applications. Most functions return a status code of type INTEGER*4 (see Chapter 8). The Internal Interface is described in Chapter 7. An application can use both interfaces when necessary.

These routines have been available since earlier CDF versions. Very limited access to zVariables is available here and there is no access to entries associated with zVariable. While they are still supported in the V3.* library, a new set of Standard Interface routines is made available to complement this limited list. Those routines are described in the Chapter 6.

5.1 CDF_attr_create

SUBROUTINE CDF_attr_create (

```
INTEGER*4    id,                ! in  -- CDF  identifier.
CHARACTER    attr_name*(*),     ! in  -- Attribute name.
INTEGER*4    attr_scope,        ! in  -- Scope of attribute.
INTEGER*4    attr_num,          ! out -- Attribute number.
INTEGER*4    status)            ! out -- Completion status
```

CDF_attr_create creates an attribute in the specified CDF. An attribute with the same name must not already exist in the CDF.

The arguments to CDF_attr_create are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.
attr_name	The name of the attribute to create. This may be at most CDF_ATTR_NAME_LEN256 characters. Attribute names are case-sensitive.
attr_scope	The scope of the new attribute. Specify one of the scopes described in Section 4.12.

attr_num	The number assigned to the new attribute. This number must be used in subsequent CDF function calls when referring to this attribute. An existing attribute's number may be determined with the CDF_attr_num function.
status	The completion status code. Chapter 8 explains how to interpret status codes.

5.1.1 Example(s)

The following example creates two attributes. The TITLE attribute is created with global scope - it applies to the entire CDF (most likely the title of the data set stored in the CDF). The Units attribute is created with variable scope - each entry describes some property of the corresponding variable (in this case the units for the data).

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                    ! CDF identifier.
INTEGER*4 status                ! Returned status code.
CHARACTER UNITS_attr_name*5     ! Name of "Units" attribute.

INTEGER*4 UNITS_attr_num        ! "Units" attribute number.
INTEGER*4 TITLE_attr_num        ! "TITLE" attribute number.
INTEGER*4 TITLE_attr_scope      ! "TITLE" attribute scope.

DATA UNITS_attr_name/'Units'/, TITLE_attr_scope/GLOBAL_SCOPE/
.
.
CALL CDF_attr_create (id, 'TITLE', TITLE_attr_scope, TITLE_attr_num, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
CALL CDF_attr_create (id, UNITS_attr_name, VARIABLE_SCOPE, UNITS_attr_num,
1                     status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

5.2 CDF_attr_entry_inquire

SUBROUTINE CDF_attr_entry_inquire (

```
INTEGER*4  id,                  ! in  -- CDF  identifier.
INTEGER*4 attr_num,             ! in  -- Attribute number.
INTEGER*4 entry_num,            ! in  -- Entry number.
INTEGER*4  data_type,           ! out -- Data type.
INTEGER*4  num_elements,        ! out -- Number of elements  (of the data type).
INTEGER*4  status)              ! out -- Completion status
```

CDF_attr_entry_inquire is used to inquire about a specific attribute entry. to inquire about the attribute in general, use CDF_attr_inquire (see Section 5.4). CDF_attr_entry_inquire would normally be called before calling CDF_attr_get in order to determine the data type and number of elements (of that data type) for an entry. This would be necessary to correctly allocate enough memory to receive the value read by CDF_attr_get.

The arguments to CDF_attr_entry_inquire are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.
attr_num	The attribute number for which to inquire an entry. This number may be determined with a call to CDF_attr_num (see Section 5.5).
entry_num	The entry number to inquire. If the attribute is global in scope, this is simply the gEntry number and has meaning only to the application. If the attribute is variable in scope, this is the number of the associated rVariable (the rVariable being described in some way by the rEntry).
data_type	The data type of the specified entry. The data types are defined in Section 4.5.
num_elements	The number of elements of the data type. For character data types (CDF_CHAR and CDF_UCHAR), this is the number of characters in the string (an array of characters). For all other data types this is the number of elements in an array of that data type.
status	The completion status code. Chapter 8 explains how to interpret status codes.

5.2.1 Example(s)

The following example inquires each entry for an attribute. Note that entry numbers need not be consecutive - not every entry number between one (1) and the maximum entry number must exist. For this reason NO_SUCH_ENTRY is an expected error code. Note also that if the attribute has variable scope, the entry numbers are actually rVariable numbers.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                                    ! CDF identifier.
INTEGER*4 status                                ! Returned status code.
INTEGER*4 attr_n                                ! Attribute number.
INTEGER*4 entryN                                ! Entry number.
CHARACTER attr_name*(CDF_ATTR_NAME_LEN256)      ! Attribute name.
INTEGER*4 attr_scope                            ! Attribute scope.
INTEGER*4 max_entry                             ! Maximum entry number used.
INTEGER*4 data_type                             ! Data type.
INTEGER*4 num_elems                             ! Number of elements (of the
                                                ! data type).
.
.
attr_n = CDF_attr_num (id, 'TMP')
IF (attr_n .LT. 1) CALL UserStatusHandler (attr_n) ! If less than one (1),
                                                   ! then it must be a
                                                   ! warning/error code.
CALL CDF_attr_inquire (id, attr_n, attr_name, attr_scope, max_entry, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
DO entryN = 1, max_entry
   CALL CDF_attr_entry_inquire (id, attr_n, entryN, data_type, num_elems,
   1                            status)
```

```
      IF (status .LT. CDF_OK) THEN
          IF (status .NE. NO_SUCH_ENTRY) CALL UserStatusHandler (status)
      ELSE
C        (process entries)
         .
         .
      END IF
   END DO
```

5.3 CDF_attr_get

SUBROUTINE CDF_attr_get (

```
INTEGER*4  id,          ! in  -- CDF  identifier.
INTEGER*4  attr_num,    ! in  -- attribute number.
INTEGER*4  entry_num,   ! in  -- Entry number.
<type>     value,       ! out -- Value (<type> is dependent on the data type of the enrty).
INTEGER*4  status)      ! out -- Completion status
```

CDF_attr_get is used to read an attribute entry from a CDF. In most cases it will be necessary to call CDF_attr_entry_inquire before calling CDF_attr_get in order to determine the data type and number of elements (of that data type) for the entry.

The arguments to CDF_attr_get are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.
attr_num	The attribute number. This number may be determined with a call to CDF_attr_num (see Section 5.5).
entry_num	The entry number. If the attribute is global in scope, this is simply the gEntry number and has meaning only to the application. If the attribute is variable in scope, this is the number of the associated rVariable (the rVariable being described in some way by the rEntry).
value	The value read. This buffer must be large enough to hold the value. The function CDF_attr_entry_inquire would be used to determine the entry data type and number of elements (of that data type). The value is read from the CDF and placed into memory at address value. **WARNING:** If the entry has one of the character data types (CDF_CHARor CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the entry does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

5.3.1 Example(s)

The following example displays the value of the UNITS attribute for the rEntry corresponding to the PRES_LVL rVariable (but only if the data type is CDF_CHAR).

```
   .
   .
   INCLUDE '<path>cdf.inc'
   .
   .
   INTEGER*4 id               ! CDF identifier.
   INTEGER*4 status           ! Returned status code.
   INTEGER*4 attr_n           ! Attribute number.
   INTEGER*4 entryN           ! Entry number.
   INTEGER*4 data_type        ! Data type.
   INTEGER*4 num_elems        ! Number of elements (of data type).
   CHARACTER buffer*100       ! Buffer to receive value (in this case it is
                              ! assumed that 100 characters is enough).
   .
   .
   attr_n = CDF_attr_Num (id, 'UNITS')
   IF (attr_n .LT. 0) CALL UserStatusHandler (attr_n) ! If less than one (1),
                                                      ! then it must be a
                                                      ! warning/error code.

   entryN = CDF_var_num (id, 'PRES_LVL')              ! The rEntry number is
                                                      ! the rVariable number.

   IF (entryN .LT. 0) CALL UserStatusHandler (entryN) ! If less than one (1),
                                                      ! then it must be a
                                                      ! warning/error code.

   CALL CDF_attr_entry_inquire (id, attr_n, entryN, data_type, num_elems,
   1                            status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)

   IF (data_type .EQ. CDF_CHAR) THEN
       CALL CDF_attr_get (id, attr_n, entryN, buffer, status)
       IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
       WRITE (6,10) buffer(1:num_elems)
10     FORMAT (' ',A)
   END IF
   .
   .
```

5.4 CDF_attr_inquire

SUBROUTINE CDF_attr_inquire (

```
INTEGER*4    id,                                  ! in  -- CDF  identifier.
INTEGER*4    attr_num,                            ! in  -- Attribute number.
CHARACTER    attr_name*(CDF_ATTR_NAME_LEN256),    ! out -- Attribute name.
INTEGER*4    attr_scope,                          ! out -- Attribute scope.
INTEGER*4    max_entry,                           ! out -- Maximum  gEntry or rEntry number.
INTEGER*4    status)                              ! out -- Completion status
```

CDF_attr_inquire is used to inquire about the specified attribute. to inquire about a specific attribute entry, use CDF_attr_entry_inquire (Section 5.2).

The arguments to CDF_attr_inquire are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.
attr_num	The number of the attribute to inquire. This number may be determined with a call to CDF_attr_num (see Section 5.5).
attr_name	The attribute's name. This character string must be large enough to hold CDF_ATTR_NAME_LEN256 characters and will be blank padded if necessary.
attr_scope	The scope of the attribute. Attribute scopes are defined in Section 4.12.
max_entry	For gAttributes this is the maximum gEntry number used. For vAttributes this is the maximum rEntry number used. in either case this may not correspond with the number of entries (if some entry numbers were not used). The number of entries actually used may be inquired with the CDF_lib function (see Section 7). If no entries exist for the attribute, then a value of zero (0) will be passed back.
status	The completion status code. Chapter 8 explains how to interpret status codes.

5.4.1 Example(s)

The following example displays the name of each attribute in a CDF. The number of attributes in the CDF is first determined using the function CDF_inquire. Note that attribute numbers start at one (1) and are consecutive.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 status                        ! Returned status code.
INTEGER*4 num_dims                      ! Number of dimensions.
INTEGER*4 dim_sizes(CDF_MAX_DIMS)       ! Dimension sizes (allocate to
                                        ! allow the maximum number of
                                        ! dimensions).
INTEGER*4 encoding                      ! Data encoding.
INTEGER*4 majority                      ! Variable majority.
INTEGER*4 max_rec                       ! Maximum record number in CDF.
INTEGER*4 num_vars                      ! Number of variables in CDF.
INTEGER*4 num_attrs                     ! Number of attributes in CDF.
INTEGER*4 attr_n                        ! Attribute number.
CHARACTER attr_name*(CDF_ATTR_NAME_LEN256)! Attribute name.
INTEGER*4 attr_scope                    ! Attribute scope.
INTEGER*4 max_entry                     ! Maximum entry number.
.
.
CALL CDF_inquire (id, num_dims, dim_sizes, encoding, majority,
1                 max_rec, num_vars, num_attrs, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
```

```
   DO attr_n = 1, num_attrs
      CALL CDF_attr_inquire (id, attr_n, attr_name, attr_scope, max_entry,
      1                      status)
      IF (status .LT. CDF_OK) THEN        ! INFO status codes ignored.
          CALL UserStatusHandler (status)
      ELSE
          WRITE (6,10) attr_name
10        FORMAT (' ',A)
      END IF
   END DO
   .
   .
```

5.5 CDF_attr_num

```
INTEGER*4  FUNCTION CDF_attr_num (

INTEGER*4    id,                    ! in-- CDF  id
CHARACTER  attr_name*(*));          ! in-- attribute name
```

CDF_attr_num is used to determine the attribute number associated with a given attribute name. If the attribute is found, CDF_attr_num returns its number - which will be equal to or greater than one (1). If an error occurs (e.g., the attribute name does not exist in the CDF), an error code (of type INTEGER*4) is returned. Error codes are less than zero (0).

The arguments to CDF_attr_num are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.
attr_name	The name of the attribute for which to search. This may be at most CDF_ATTR_NAME_LEN256 characters. Attribute names are case-sensitive.

CDF_attr_num may be used as an embedded function call when an attribute number is needed. CDF attr num is declared in cdf.inc. (Fortran functions must be declared so that the returned value is interpreted correctly.)

5.5.1 Example(s)

In the following example the attribute named pressure will be renamed to PRESSURE with CDF_attr_num being used as an embedded function call. Note that if the attribute pressure did not exist in the CDF, the call to CDF_attr_num would have returned an error code. Passing that error code to CDF_attr_rename as an attribute number would have resulted in CDF_attr_rename also returning an error code. CDF_attr_rename is described in Section 5.7.

```
   .
   .
   INCLUDE '<path>cdf.inc'
   .
   .
   INTEGER*4 id          ! CDF identifier.
   INTEGER*4 status      ! Returned status code.
   .
```

```
.
CALL CDF_attr_rename (id, CDF_attr_num(id,'pressure'), 'PRESSURE', status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

5.6 CDF_attr_put

SUBROUTINE CDF_attr_put (

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  attr_num,        ! in  -- Attribute number.
INTEGER*4  entry_num,       ! in  -- Entry number.
INTEGER*4  data_type,       ! in  -- Data type of this entry.
INTEGER*4  num_elements,    ! in  -- Number of elements  (of the data type).
<type>     value,           ! out -- Value (<type> is dependent on the data type of the enrty).
INTEGER*4  status)          ! out -- Completion status
```

CDF_attr_put is used to write an attribute entry to a CDF. The entry may or may not already exist. If it does exist, it is overwritten. The data type and number of elements (of that data type) may be changed when overwriting an existing entry.

The arguments to CDF_attr_put are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.
attr_num	The attribute number. This number may be determined with a call to CDF_attr_num (see Section 5.5).
entry_num	The entry number. If the attribute is global in scope, this is simply the gEntry number and has meaning only to the application. If the attribute is variable in scope, this is the number of the associated rVariable (the rVariable being described in some way by the rEntry).
data_type	The data type of the specified entry. Specify one of the data types defined in Section 4.5.
num_elements	The number of elements of the data type. For character data types (CDF_CHAR and CDF_UCHAR), this is the number of characters in the string (an array of characters). For all other data types this is the number of elements in an array of that data type.
value	The value(s) to write. The entry value is written to the CDF from memory address value. **WARNING:** If the entry has one of the character data types (CDF_CHARor CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the entry does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

num_elements elements of the data type data_type will be written to the CDF starting from memory address value.

5.6.1 Example(s)

The following example writes two attribute entries. The first is to gEntry number one (1) of the gAttribute TITLE. The second is to the variable scope attribute VALIDs for the rEntry that corresponds to the rVariable TMP.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
PARAMETER TITLE_LEN = 10         ! Length of CDF title.
.
.
INTEGER*4 id                     ! CDF identifier.
INTEGER*4 status                 ! Returned status code.
INTEGER*4 entry_num              ! Entry number.
INTEGER*4 num_elements           ! Number of elements (of data type).
CHARACTER title*(TITLE_LEN)      ! Value of TITLE attribute, rEntry number 1.
INTEGER*2 TMPvalids(2)           ! Value(s) of VALIDs attribute,
                                 ! rEntry for rVariable TMP

DATA title/'CDF title.'/, TMPvalids/15,30/
.
.
entry_num = 1
CALL CDF_attr_put (id, CDF_attr_num(id,'TITLE'), entry_num, CDF_CHAR,
1                  TITLE_LEN, title, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
num_elements = 2
CALL CDF_attr_put (id, CDF_attr_num(id,'VALIDs'), CDF_var_num(id,'TMP'),
1                  CDF_INT2, num_elements, TMPvalids, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

5.7 CDF_attr_rename

SUBROUTINE CDF_attr_rename (

```
INTEGER*4    id,                 ! in  -- CDF  identifier.
INTEGER*4    attr_num,           ! in  -- Attribute number.
CHARACTER    attr_name*(*),      ! in  -- New attribute name.
INTEGER*4    status)             ! out -- Completion status
```

CDF_attr_rename is used to rename an existing attribute. An attribute with the new name must not already exist in the CDF.

The arguments to CDF_attr_rename are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.
attr_num	The number of the attribute to rename. This number may be determined with a call to CDF_attr_num (see Section 5.5).
attr_name	The new attribute name. This may be at most CDF_ATTR_NAME_LEN256 characters. Attribute names are case-sensitive.
status	The completion status code. Chapter 8 explains how to interpret status codes.

5.7.1 Example(s)

In the following example the attribute named LAT is renamed to LATITUDE.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 status      ! Returned status code.
.
.
CALL CDF_attr_rename (id, CDF_attr_num(id,'LAT'), 'LATITUDE', status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

5.8 CDF_close

SUBROUTINE CDF_close (.

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 status) ! out -- Completion status

CDF_close closes the specified CDF. The CDF's cache buffers are flushed; the CDF's open file is closed (or files in the case of a multi-file CDF); and the CDF identifier is made available for reuse.

NOTE: You must close a CDF with CDF_close to guarantee that all modifications you have made will actually be written to the CDF's file(s). If your program exits, normally or otherwise, without a successful call to CDF_close, the CDF's cache buffers are left unflushed.

The arguments to CDF_close are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.

status The completion status code. Chapter 8 explains how to interpret status codes.

5.8.1 Example(s)

The following example will close an open CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 status      ! Returned status code.
.
.
CALL CDF_close (id, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

5.9 CDF_create

SUBROUTINE CDF_create (

```
CHARACTER   CDF_name*(*),       ! in  -- CDF file name.
INTEGER*4   num_dims,           ! in  -- Number of dimensions, rVariables.
INTEGER*4   dim_sizes(*),       ! in  -- Dimension sizes, rVariables.
INTEGER*4   encoding,           ! in  -- Data encoding.
INTEGER*4   majority,           ! in  -- Variable majority.
INTEGER*4   id,                 ! out -- CDF identifier.
INTEGER*4   status)             ! out -- Completion status
```

CDF_create creates a CDF as defined by the arguments. A CDF cannot be created if it already exists. (The existing CDF will not be overwritten.) If you want to overwrite an existing CDF, you must first open it with CDF_open, delete it with CDF_delete, and then recreate it with CDF_create. If the existing CDF is corrupted, the call to CDF_open will fail. (An error code will be returned.) In this case you must delete the CDF at the command line. Delete the dotCDF file (having an extension of .cdf), and if the CDF has the multi-file format, delete all of the variable files (having extensions of .v0,.v1,. . . and .z0,.z1,.. .).

The arguments to CDF_create are defined as follows:

CDF_name The file name of the CDF to create. (Do not specify an extension.) This may be at most CDF_PATHNAME_LEN characters. A CDF file name may contain disk and directory specifications that conform to the conventions of the operating system being used (including logical names on VMS systems and environment variables on UNIX systems).

UNIX: File names are case-sensitive.

num_dims	Number of dimensions the rVariables in the CDF are to have. This may be as few as zero (0) and at most CDF_MAX_DIMS.
dim_sizes	The size of each dimension. Each element of dim_sizes specifies the corresponding dimension size. Each size must be greater then zero (0). For 0-dimensional rVariables this argument is ignored (but must be present).
encoding	The encoding for variable data and attribute entry data. Specify one of the encodings described in Section 4.6.
majority	The majority for variable data. Specify one of the majorities described in Section 4.8.
id	The identifier for the created CDF. This identifier must be used in all subsequent operations on the CDF.
status	The completion status code. Chapter 8 explains how to interpret status codes.

When a CDF is created, both read and write access are allowed. The default format for a CDF created with CDF_create is specified in the configuration file of your CDF distribution. Consult your system manager for this default. The CDF_lib function (Internal Interface) may be used to change a CDF's format.

NOTE: CDF_close must be used to close the CDF before your application exits to ensure that the CDF will be correctly written to disk (see Section 5.8).

5.9.1 Example(s)

The following example will create a CDF named test1 with network encoding and row majority.

```
.

.
INCLUDE '<path>cdf.inc'

.

.

INTEGER*4 id                ! CDF identifier.
INTEGER*4 status            ! Returned status code.
INTEGER*4 num_dims          ! Number of dimensions, rVariables.
INTEGER*4 dim_sizes(3)      ! Dimension sizes, rVariables.
INTEGER*4 majority          ! Variable majority.

DATA num_dims/3/, dim_sizes/180,360,10/, majority/ROW_MAJOR/
.
.
CALL CDF_create ('test1', num_dims, dim_sizes, NETWORK_ENCODING,
1                 majority, id, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

ROW_MAJOR and NETWORK_ENCODING are defined in cdf.inc.

5.10 CDF_delete

SUBROUTINE CDF_delete (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 status) ! out -- Completion status

CDF_delete deletes the specified CDF. The CDF files deleted include the dotCDF file (having an extension of .cdf), and if a multi-file CDF, the variable files (having extensions of .v0,.v1,. . . and .z0,.z1,.. .).

You must open a CDF before you are allowed to delete it. If you have no privilege to delete the CDF files, they will not be deleted. If the CDF is corrupted and cannot be opened, the CDF file(s) must be deleted at the command line.

The arguments to CDF_delete are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.
status	The completion status code. Chapter 8 explains how to interpret status codes.

5.10.1 Example(s)

The following example will open and then delete an existing CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 status                        ! Returned status code.

.
.
CALL CDF_open ('test2', id, status)
IF (status .LT. CDF_OK) THEN            ! INFO status codes ignored.
    CALL UserStatusHandler (status)
ELSE
    CALL CDF_delete (id, status)
    IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
END IF
.
.
```

5.11 CDF_doc

SUBROUTINE CDF_doc (

INTEGER*4	id,	! in -- CDF identifier.
INTEGER*4	version,	! out -- Version number.
INTEGER*4	release,	! out -- Release number.
CHARACTER	copy_right*(CDF_COPYRIGHT_LEN),	! out -- Copyright.
INTEGER*4	status)	! out -- Completion status

CDF_doc is used to inquire general documentation about a CDF. The version/release of the CDF library that created the CDF is provided (e.g., CDF V2.4 is version 2, release 4) along with the CDF copyright notice.

The arguments to CDF_doc are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.
version	The version number of the CDF library that created the CDF.
release	The release number of the CDF library that created the CDF.
copy_right	The copyright notice of the CDF library that created the CDF. This character string must be large enough to hold CDF_COPYRIGHT_LEN characters and will be blank padded if necessary. This string will contain a newline character after each line of the copyright notice.
status	The completion status code. Chapter 8 explains how to interpret status codes.

The copyright notice is formatted for printing without modification. The version and release are used together (e.g., CDF V2.4 is version 2, release 4).

5.11.1 Example(s)

The following example will inquire and display the version/release and copyright notice.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                                ! CDF identifier.
INTEGER*4 status                            ! Returned status code.
INTEGER*4 version                           ! CDF version number.
INTEGER*4 release                           ! CDF release number.
CHARACTER copyright*(CDF_COPYRIGHT_LEN)     ! Copyright notice.
INTEGER*4 last_char                         ! Last character position
                                            ! actually used in the copyright.
INTEGER*4 start_char                        ! Starting character position
                                            ! ina line of the copyright.
CHARACTER lf*1                              ! Linefeed character.

.
.
CALL CDF_doc (id, version, release, copyright, status)
```

```
   IF (status .LT. CDF_OK) THEN                 ! INFO status codes ignored
       CALL UserStatusHandler (status)

   ELSE
       WRITE (6,101) version, release
101    FORMAT (' ','Version: ',I3,' Release:',I3)
       last_CHARACTER= CDF_COPYRIGHT_LEN
       DO WHILE (copyright(last_char:last_char) .EQ. ' ')
          last_CHARACTER= last_CHARACTER- 1
       END DO
       lf = CHAR(10)
       start_CHARACTER= 1
       DO i = 1, last_char
          IF (copyright(i:i) .EQ. lf) THEN
              WRITE (6,301) copyright(start_char:i-1)
301           FORMAT (' ',A)
              start_CHARACTER= i + 1
          END IF
       END DO
   END IF
   .
   .
```

5.12 CDF_error

SUBROUTINE CDF_error (

```
INTEGER*4    status,                          ! in  -- Status code.
CHARACTER  message*(CDF_STATUSTEXT_LEN))      ! out -- Explanation text for the status code.
```

CDF_error is used to inquire the explanation of a given status code (not just error codes). Chapter 8 explains how to interpret status codes and Appendix A lists all of the possible status codes.

The arguments to CDF_error are defined as follows:

status	The status code to check.
message	The explanation of the status code. This character string must be large enough to hold CDF_STATUSTEXT_LEN characters and will be blank padded if necessary.

5.12.1 Example(s)

The following example displays the explanation text if an error code is returned from a call to CDF_open.

```
   .
   .
   INCLUDE '<path>cdf.inc'
   .
   .
```

```
   INTEGER*4 id                            ! CDF identifier.
   INTEGER*4 status                        ! Returned status code.
   CHARACTER text*(CDF_STATUSTEXT_LEN)     ! Explanation text.
   INTEGER*4 last_char                     ! Last character position
                                           ! actually used in the copyright.
   .
   .
   CALL CDF_open ('giss_wetl', id, status)
   IF (status .LT. CDF_WARN) THEN          ! INFO and WARNING codes ignored.
       CALL CDF_error (status, text)
       last_CHARACTER= CDF_STATUSTEXT_LEN
       DO WHILE (text(last_char:last_char) .EQ. ' ')
          last_CHARACTER= last_CHARACTER- 1
       END DO
       WRITE (6,101) text(1:last_char)
101    FORMAT (' ','ERROR> ',A)
   END IF
   .
   .
```

5.13 CDF_getrvarsrecorddata

SUBROUTINE CDF_getrvarsrecorddata(

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  num_var          ! in  -- Number of rVariables.
INTEGER*4  var_nums(*)      ! in  -- rVariable numbers.
INTEGER*4  rec_num          ! in  -- Record number.
<type>  buffer              ! out -- First variable buffer in a common block (<type> depends
                            !        on the data type of the rVariable).
INTEGER*4  status           ! out  -- Completion status.
```

CDF_getrvarsrecorddata is used to read a full record data at a specific record number for a selected group of rVariables in a CDF. It expects that the data buffer for each rVariable is big enough to hold a full physical record[13] data and properly put in a common block. No space is needed for each rVariable's non-variant dimensional elements. Retrieved record data from the variable group is filled into respective rVariable's buffer.

The arguments to CDF_getrvarsrecorddata are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDFcreate, CDF_open or a similar CDF creation or opening functionality from the Internal Interface.
num_vars	The number of the rVariables in the group involved this read operation.
var_nums	The numbers of the rVariables involved for which to read a whole record data.
rec_num	The record number at which to read the whole record data for the group of rVariables.
buffer	The first variable buffer to read in a common block. The number of buffers should match to the num_var argument. Each buffer should hold a full physical record data.

[13] Physical record is explained in the Primer chapter in the CDF User's Guide.

5.13.1 Example(s)

The following example will read an entire single record data for a group of rVariables. The CDF's rVariables are 2-dimensional with sizes **[2,2]**. The rVariables involved in the read are **Time**, **Longitude**, **Latitude** and **Temperature**. The record to read is **5**. Since the dimension variances for **Time** are **[NONVARY,NONVARY]**, a scalar variable of INTEGER*4 is allocated for its data type **CDF_INT4**. For **Longitude**, a 1-dimensional array of REAL*4 is allocated as its dimension variances are **[VARY,NONVARY]** with data type **CDF_REAL4**. A similar allocation is done for **Latitude** for its **[NONVARY,VARY]** dimension variances and **CDF_REAL4** data type. For **Temperature**, a 2-dimensional array of REAL*4 is allocated due to its **[VARY,VARY]** dimension variances and **CDF_REAL4** data type.

```
INCLUDE '<path>cdf.inc'
  .
  .
INTEGER*4       id                ! CDF identifier.
INTEGER*4       status            ! Returned status code.
INTEGER*4       num_var           ! Number of rVariables.
INTEGER*4       var_nums(4)       ! rVariable numbers in CDF.
INTEGER*4       rec_num           ! Record number to read.
INTEGER*4       time              ! Datatype: INT4.
                                  ! Rec/dim variances: T/FF.
REAL*4          longitude(2)      ! Datatype: REAL4.
                                  ! Rec/dim variances: T/TF.
REAL*4          latitude(2)       ! Datatype: REAL4.
                                  ! Rec/dim variances: T/FT.
REAL*4          temperature(2,2)  ! Datatype: REAL4.
                                  ! Rec/dim variances: T/TT.
COMMON /BLK/time, longitude, latitude, temperature

.
.
num_var = 4                       ! Number of rVariables
rec_num = 5                       ! Record number to read
var_nums(1) = CDF_var_num (id, 'Time')    ! rVariable number
IF (var_nums(1) .LT. 1)                   ! If less than one (1),
1       CALL UserStatusHandler (var_nums(1))        ! then it is actually a
                                          ! warning/error code.
var_nums(2) = CDF_var_num (id, 'Longitude')
IF (var_nums(2) .LT. 1) CALL UserStatusHandler (var_nums(2))

var_nums(3) = CDF_var_num (id, 'Latitude')
IF (var_nums(3) .LT. 1) CALL UserStatusHandler (var_nums(3))

var_nums(4) = CDF_var_num (id, 'Temperature')
IF (var_nums(4) .LT. 1) CALL UserStatusHandler (var_nums(4))

CALL CDF_getrvarsrecorddata (id, num_var, var_nums, rec_num,
1                                 time, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
  .
  .
```

Note that the ordering of the variable data buffer in the COMMON block BLK is very important. Always arrange data buffer in the order in such way that the variables with the bigger data types come in front of the variables with the smaller data types. They should be in this ordering: 8-byte, 4-byte, 2-byte, and 1-byte. Unexpected results may return if such ordering is not followed. This function can be a replacement for the similar functionality provided from the Internal Interface as <GET_, rVARs_RECDATA_>.

5.14 CDF_getzvarsrecorddata

SUBROUTINE CDF_getzvarsrecorddata(

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4  num_var            ! in  -- Number of zVariables.
INTEGER*4  var_nums(*)        ! in  -- zVariable numbers.
INTEGER*4  rec_num            ! in  -- Record number.
<type>  buffer                ! out  -- First variable buffer in a common block (<type> depends
                              !         on the data type of the zVariable).
INTEGER*4  status             ! out  -- Completion status.
```

CDF_getzvarsrecorddata is used to read a full record data at a specific record number for a selected group of zVariables in a CDF. It expects that the data buffer for each zVariable is big enough to hold a full physical record[14] data and properly put in a common block. No space is needed for each zVariable's non-variant dimensional elements. Retrieved record data from the variable group is filled into respective zVariable's buffer.

The arguments to CDF_getzvarsrecorddata are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDFcreate, CDF_open or a similar CDF creation or opening functionality from the Internal Interface.
num_vars	The number of the zVariables in the group involved this read operation.
var_nums	The numbers of the zVariables involved for which to read a whole record data.
rec_num	The record number at which to read the whole record data for the group of zVariables.
buffer	The first variable buffer to read in a common block. The number of buffers should match to the num_var argument. Each buffer should hold a full physical record data.

5.14.1 Example(s)

The following example will read an entire single record data for a group of zVariables. The zVariables involved in the read are **Time**, **Longitude**, **Delta**, **Temperature** and **NAME**. The record to read is **4**. Since **Temperature** is 0-dimensional with **CDF_FLOAT** data type, a scalar variable of REAL*4 is allocated. For **Longitude**, a 1-dimensional array of INTEGER*2 (size **[3]**) is given for its dimension variance **[VARY]** and data type **CDF_INT2**. Similar data variables are provided for **Longitude** and **Time**. They both are 2-dimensional array of INTEGER*4 (sizes **[3,2]**) for their dimension variances **[VARY,VARY]** and data type either **CDF_INT4** or **CDF_UINT4**. For **NAME**, a 1-dimensional array of CHARACTER*10 (size **[2]**) is allocated due to its **[VARY]** dimension variance and **CDF_CHAR** data type with the number of element 10.

[14] Physical record is explained in the Primer chapter in the CDF User's Guide.

```
INCLUDE '<path>cdf.inc'
 .
.
INTEGER*4       id                ! CDF identifier.
INTEGER*4       status            ! Returned status code.
INTEGER*4       num_var           ! Number of zVariables.
INTEGER*4       var_nums(5)       ! zVariable numbers in CDF.
INTEGER*4       rec_num           ! Record number to write.
INTEGER*4       time(3,2)         ! Datatype: UINT4.
                                  ! Rec/dim variances: T/TT.
INTEGER*4       delta(3,2)        ! Datatype: INT4 .
                                  ! Rec/dim variances: T/TT.
INTEGER*2       longitude(3)      ! Datatype: INT2.
                                  ! Rec/dim variances: T/T.
REAL*4          temperature       ! Datatype: FLOAT.
                                  ! Rec/dim variances: T/.
CHARACTER*10 name(2)              ! Datatype: CHAR/10.
                                  ! Rec/dim variances: T/T.
COMMON /BLK/delta, time, temperature, longitude, name
.
.
num_var = 5                       ! Number of zVariables
rec_num = 4                       ! Record number to read

status = CDF_LIB (GET_, zVAR_NUMBER_, 'Delta', var_nums(1),
1                 NULL_, status)                ! zVariable number
IF (var_nums(1) .LT. 1)           ! If less than one (1),
x  CALL UserStatusHandler (var_nums(1))  ! then it is actually a
                                         ! warning/error code.

status = CDF_LIB (GET_, zVAR_NUMBER_, 'Time', var_nums(2),
1                 NULL_, status)
IF (var_nums(2) .LT. 1) CALL UserStatusHandler (var_nums(2))

status = CDF_LIB (GET_, zVAR_NUMBER_, 'Longitude', var_nums(3),
1                 NULL_, status)
IF (var_nums(3) .LT. 1) CALL UserStatusHandler (var_nums(3))

status = CDF_LIB (GET_, zVAR_NUMBER_, 'Temperature', var_nums(4),
1                 NULL_, status)
IF (var_nums(4) .LT. 1) CALL UserStatusHandler (var_nums(4))

status = CDF_LIB (GET_, zVAR_NUMBER_, 'NAME', var_nums(5),
1                 NULL_, status)
IF (var_nums(5) .LT. 1) CALL UserStatusHandler (var_nums(5))

CALL CDF_getzvarsrecorddata (id, num_var, var_nums, rec_num,
1                            time, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
  .
  .
```

Note that the ordering of the variable data buffer in the COMMON block BLK is very important. Always arrange data buffer in the order in such way that the variables with the bigger data types come in front of the variables with the smaller data types. They should be in this ordering: 8-byte, 4-byte, 2-byte, and 1-byte. Unexpected results may return if

such ordering is not followed. This function can be a replacement for the similar functionality provided from the Internal Interface as <GET_, zVARs_RECDATA_>.

5.15 CDF_inquire

SUBROUTINE CDF_inquire(

```
INTEGER*4  id,                          ! in  -- CDF  identifier
INTEGER*4  num_dims,                    ! out -- Number of dimensions,  rVariables.
INTEGER*4  dim_sizes(CDF_MAX_DIMS),     ! out -- Dimension sizes,  rVariables.
INTEGER*4  encoding,                    ! out -- Data encoding.
INTEGER*4  majority,                    ! out -- Variable majority.
INTEGER*4  max_rec,                     ! out -- Maximum record number in the CDF,  rVariables.
INTEGER*4  num_vars,                    ! out -- Number of rVariables in the CDF.
INTEGER*4  num_attrs,                   ! out -- Number of attributes in the CDF.
INTEGER*4  status)                      ! out -- Completion status
```

CDF_inquire inquires the basic characteristics of a CDF. An application needs to know the number of rVariable dimensions and their sizes before it can access rVariable data. Knowing the variable majority can be used to optimize performance and is necessary to properly use the variable hyper functions (for both rVariables and zVariables).

The arguments to CDF_inquire are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.
num_dims	The number of dimensions for the rVariables in the CDF.
dim_sizes	The dimension sizes of the rVariables in the CDF. dim_sizes is a 1-dimensional array containing one element per dimension. Each element of dim_sizes receives the corresponding dimension size. For 0-dimensional rVariables this argument is ignored (but must be present).
encoding	The encoding of the variable data and attribute entry data. The encodings are defined in Section 4.6.
majority	The majority of the variable data. The majorities are defined in Section 4.8.
max_rec	The maximum record number written to an rVariable in the CDF. Note that the maximum record number written is also kept separately for each rVariable in the CDF. The value of max_rec is the largest of these. Some rVariables may have fewer records actually written. CDF_lib (Internal Interface) may be used to inquire the maximum record written for an individual rVariable (see Section 7).
num_vars	The number of rVariables in the CDF.
num_attrs	The number of attributes in the CDF.
status	The completion status code. Chapter 8 explains how to interpret status codes.

5.15.1 Example(s)

The following example will inquire the basic information about a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 status                        ! Returned status code.
INTEGER*4 num_dims                      ! Number of dimensions, rVariables.
INTEGER*4 dim_sizes(CDF_MAX_DIMS)       ! Dimension sizes, rVariables
                                        ! (allocate to allow the maximum
                                        ! number of dimensions).
INTEGER*4 encoding                      ! Data encoding.
INTEGER*4 majority                      ! Variable majority.
INTEGER*4 max_rec                       ! Maximum record number.
INTEGER*4 num_vars                      ! Number of rVariables in CDF.
INTEGER*4 num_attrs                     ! Number of attributes in CDF.
.
.
CALL CDF_inquire (id, num_dims, dim_sizes, encoding, majority,
.
max_rec, num_vars, num_attrs, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

5.16 CDF_open

SUBROUTINE CDF_open (

```
CHARACTER   CDF_name*(*),       ! in  -- CDF file name.
INTEGER*4   id,                 ! out -- CDF  identifier.
INTEGER*4   status)             ! out -- Completion status
```

CDF_open opens an existing CDF. The CDF is initially opened with only read access. This allows multiple applications to read the same CDF simultaneously. When an attempt to modify the CDF is made, it is automatically closed and reopened with read/write access. (The function will fail if the application does not have or cannot get write access to the CDF.)

The arguments to CDF_open are defined as follows:

CDF_name — The file name of the CDF to open. (Do not specify an extension.) This may be at most CDF_PATHNAME_LEN characters. A CDF file name may contain disk and directory specifications that conform to the conventions of the operating system being used (including logical names on VMS systems and environment variables on UNIX systems).

UNIX: File names are case-sensitive.

id	The identifier for the opened CDF. This identifier must be used in all subsequent operations on the CDF.
status	The completion status code. Chapter 8 explains how to interpret status codes.

NOTE: CDF_close must be used to close the CDF before your application exits to ensure that the CDF will be correctly written to disk (see Section 5.8).

5.16.1 Example(s)

The following example will open a CDF named NOAA1.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 status                        ! Returned status code.
CHARACTER CDF_name*(CDF_PATHNAME_LEN)   ! File name of CDF.

DATA CDF_name/'NOAA1'/
.
.
CALL CDF_open (CDF_name, id, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

5.17 CDF_putrvarsrecorddata

SUBROUTINE CDF_putrvarsrecorddata(

```
INTEGER*4  id,              ! in  --  CDF  identifier.
INTEGER*4  num_var          ! in  -- Number of rVariables.
INTEGER*4  var_nums(*)      ! in  -- rVariable numbers.
INTEGER*4  rec_num          ! in  -- Record number.
<type>  buffer              ! in  -- First variable buffer in a common block (<type> depends
                            !        on the data type of the rVariable).
INTEGER*4  status           ! out  -- Completion status.
```

CDF_putrvarsrecorddata is used to write a full record data at a specific record number for a selected group of rVariables in a CDF. It expects that the data buffer for each zVariable is big enough to contain a full physical record data and properly put in a common block. No space is expected for each rVariable's non-variant dimensional elements. Record data from each buffer is written to its respective rVariable.

The arguments to CDF_putrvarsrecorddata are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDFcreate, CDF_open or a similar CDF creation or opening functionality from the Internal Interface.
num_vars	The number of the rVariables in the group involved this write operation.
var_nums	The numbers of the rVariables involved for which to write a whole record data.
rec_num	The record number at which to write the whole record data for the group of rVariables.
buffer	The first variable buffer to write in a common block. The number of buffers should match to the num_var argument. Each buffer should hold a full physical record data.

5.17.1 Example(s)

The following example will write an entire single record data for a group of rVariables. The CDF's rVariables are 2-dimensional with sizes **[2,2]**. The rVariables involved in the write are **Time**, **Longitude**, **Latitude** and **Temperature**. The record to write is **5**. Since the dimension variances for **Time** are **[NONVARY,NONVARY]**, a scalar variable of INTEGER*4 is allocated for its data type **CDF_INT4**. For **Longitude**, a 1-dimensional array of REAL*4 is allocated as its dimension variances are **[VARY,NONVARY]** with data type **CDF_REAL4**. A similar allocation is done for **Latitude** for its **[NONVARY,VARY]** dimension variances and **CDF_REAL4** data type. For **Temperature**, a 2-dimensional array of REAL*4 is allocated due to its **[VARY,VARY]** dimension variances and **CDF_REAL4** data type.

```
INCLUDE '<path>cdf.inc'
  .
  .
INTEGER*4       id              ! CDF identifier.
INTEGER*4       status          ! Returned status code.
INTEGER*4       num_var         ! Number of rVariables.
INTEGER*4       var_nums(4)     ! rVariable numbers in CDF.
INTEGER*4       rec_num         ! Record number to write.
INTEGER*4       time /123/      ! Datatype: INT4.
                                ! Rec/dim variances: T/FF.
REAL*4          longitude(2)    ! Datatype: REAL4.
1               /100.01, -100.02/ ! Rec/dim variances: T/TF.
REAL*4          latitude(2)     ! Datatype: REAL4.
1               /23.45,   -54.32/ ! Rec/dim variances: T/FT.
REAL*4          temperature(2,2) ! Datatype: REAL4.
1               /20.0, 40.0,    ! Rec/dim variances: T/TT.
2                30.0, 50.0/

COMMON /BLK/time, longitude, latitude, temperature

.
.
num_var = 4                                 ! Number of rVariables
rec_num = 5                                 ! Record number to write
var_nums(1) = CDF_var_num (id, 'Time')      ! rVariable number
IF (var_nums(1) .LT. 1)                     ! If less than one (1),
1       CALL UserStatusHandler (var_nums(1))        ! then it is actually a
                                            ! warning/error code.
var_nums(2) = CDF_var_num (id, 'Longitude')
IF (var_nums(2) .LT. 1) CALL UserStatusHandler (var_nums(2))
```

```
var_nums(3) = CDF_var_num (id, 'Latitude')
IF (var_nums(3) .LT. 1) CALL UserStatusHandler (var_nums(3))

var_nums(4) = CDF_var_num (id, 'Temperature')
IF (var_nums(4) .LT. 1) CALL UserStatusHandler (var_nums(4))

CALL CDF_putrvarsrecorddata (id, num_var, var_nums, rec_num,
1                                time, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
  .
  .
```

Note that the ordering of the variable data buffer in the COMMON block BLK is very important. Always arrange data buffer in the order in such way that the variables with the bigger data types come in front of the variables with the smaller data types. They should be in this ordering: 8-byte, 4-byte, 2-byte, and 1-byte. Unexpected results may return if such ordering is not followed. This function can be a replacement for the similar functionality provided from the Internal Interface as <PUT_, rVARs_RECDATA_>.

5.18 CDF_putzvarsrecorddata

```
SUBROUTINE CDF_putzvarsrecorddata(

INTEGER*4  id,                ! in   -- CDF  identifier.
INTEGER*4  num_var            ! in   -- Number of zVariables.
INTEGER*4  var_nums(*)        ! in   -- zVariable numbers.
INTEGER*4  rec_num            ! in   -- Record number.
<type>  buffer                ! in   -- First variable buffer in a common block (<type> depends
                              !         on the data type of the zVariable).
INTEGER*4  status             ! out  -- Completion status.
```

CDF_putzvarsrecorddata is used to write a full record data at a specific record number for a selected group of zVariables in a CDF. It expects that the data buffer for each zVariable is big enough to contain a full physical record data and properly put in a common block. No space is expected for each zVariable's non-variant dimensional elements. Record data from each buffer is written to its respective zVariable.

The arguments to CDF_putzvarsrecorddata are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDFcreate, Cdf_open or a similar CDF creation or opening functionality from the Internal Interface.
num_vars	The number of the zVariables in the group involved this write operation.
var_nums	The numbers of the zVariables involved for which to write a whole record data.
rec_num	The record number at which to write the whole record data for the group of zVariables.
buffer	The first variable buffer to write in a common block. The number of buffers should match to the num_var argument. Each buffer should hold a full physical record data.

5.18.1 Example(s)

The following example will write an entire single record data for a group of zVariables. The zVariables involved in the write are **Time**, **Longitude**, **Delta**, **Temperature** and **NAME**. The record to write is **4**. Since **Temperature** is 0-dimensional with **CDF_FLOAT** data type, a scalar variable of REAL*4 is allocated. For **Longitude**, a 1-dimensional array of INTEGER*2 (size **[3]**) is given for its dimension variance **[VARY]** and data type **CDF_INT2**. Similar data variables are provided for **Longitude** and **Time**. They both are 2-dimensional array of INTEGER*4 (sizes **[3,2]**) for their dimension variances **[VARY,VARY]** and data type either **CDF_INT4** or **CDF_UINT4**. For **NAME**, a 1-dimensional array of CHARACTER*10 (size **[2]**) is allocated due to its **[VARY]** dimension variance and **CDF_CHAR** data type with the number of element 10.

```
INCLUDE '<path>cdf.inc'
 .
.
INTEGER*4       id                ! CDF identifier.
INTEGER*4       status            ! Returned status code.
INTEGER*4       num_var           ! Number of zVariables.
INTEGER*4       var_nums(5)       ! zVariable numbers in CDF.
INTEGER*4       rec_num           ! Record number to write.
INTEGER*4       time(3,2)         ! Datatype: UINT4.
1                 /10, 20,        ! Rec/dim variances: T/TT.
2                  30, 40,
3                  50, 60/
INTEGER*4       delta(3,2)        ! Datatype: INT4 .
1                 /1, 2,          ! Rec/dim variances: T/TT.
2                  5, 6,
3                  9, 10/
INTEGER*2       longitude(3)      ! Datatype: INT2.
1                 /10, 20, 30/    ! Rec/dim variances: T/T.
REAL*4          temperature       ! Datatype: FLOAT.
1                 /1234.56/       ! Rec/dim variances: T/.
CHARACTER*10 name(2)              ! Datatype: CHAR/10.
1                 /'ABCDEFGHIJ',          ! Rec/dim variances: T/T.
2                 '12345678'/

COMMON /BLK/delta, time, temperature, longitude, name
.
.
num_var = 5                       ! Number of zVariables
rec_num = 4                       ! Record number to write

status = CDF_LIB (GET_, zVAR_NUMBER_, 'Delta', var_nums(1),
1                 NULL_, status)                  ! zVariable number
IF (var_nums(1) .LT. 1)           ! If less than one (1),
x  CALL UserStatusHandler (var_nums(1))  ! then it is actually a
                                         ! warning/error code.

status = CDF_LIB (GET_, zVAR_NUMBER_, 'Time', var_nums(2),
1                 NULL_, status)
IF (var_nums(2) .LT. 1) CALL UserStatusHandler (var_nums(2))

status = CDF_LIB (GET_, zVAR_NUMBER_, 'Longitude', var_nums(3),
1                 NULL_, status)
IF (var_nums(3) .LT. 1) CALL UserStatusHandler (var_nums(3))
```

```
status = CDF_LIB (GET_, zVAR_NUMBER_, 'Temperature', var_nums(4),
1                 NULL_, status)
IF (var_nums(4) .LT. 1) CALL UserStatusHandler (var_nums(4))

status = CDF_LIB (GET_, zVAR_NUMBER_, 'NAME', var_nums(5),
1                 NULL_, status)
IF (var_nums(5) .LT. 1) CALL UserStatusHandler (var_nums(5))

CALL CDF_putzvarsrecorddata (id, num_var, var_nums, rec_num,
1                            time, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
  .
  .
```

Note that the ordering of the variable data buffer in the COMMON block BLK is very important. Always arrange data buffer in the order in such way that the variables with the bigger data types come in front of the variables with the smaller data types. They should be in this ordering: 8-byte, 4-byte, 2-byte, and 1-byte. Unexpected results may return if such ordering is not followed. This function can be a replacement for the similar functionality provided from the Internal Interface as <PUT_, zVARs_RECDATA_>.

5.19 CDF_var_close

```
SUBROUTINE CDF_var_close (

INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4  var_num,           ! in  -- rVariable number.
INTEGER*4  status)            ! out -- Completion status
```

CDF_var_close is used to close an rVariable in a multi-file CDF. This function is not applicable to single-file CDFs. The use of CDF_var_close is not required since the CDF library automatically closes the rVariable files when a multi-file CDF is closed or when there are insufficient file pointers available (because of an open file quota) to keep all of the rVariable files open. CDF_var_close would be used by an application since it knows best how its rVariables are going to be accessed. Closing an rVariable would also free the cache buffers that are associated with the rVariable's file. This could be important in those situations where memory is limited (e.g., the IBM PC). The caching scheme used by the CDF library is described in the Concepts chapter in the CDF User's Guide. Note that there is not a function that opens an rVariable. The CDF library automatically opens an rVariable when it is accessed by an application (unless it is already open).

The arguments to CDF_var_close are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.
var_num	The number of the rVariable to close. This number may be determined with a call to CDF_var_num (see Section 5.25).
status	The completion status code. Chapter 8 explains how to interpret status codes.

5.19.1 Example(s)

The following example will close an rVariable in a multi-file CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id            ! CDF identifier.
INTEGER*4 status        ! Returned status code.
.
.
CALL CDF_var_close (id, CDF_var_num(id,'Flux'), status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

5.20 CDF_var_create

SUBROUTINE CDF_var_create (

```
INTEGER*4   id,                 ! in  -- CDF  identifier.
CHARACTER   var_name*(*),       ! in  -- rVariable name.
INTEGER*4   data_type,      ! in  -- Data type.
INTEGER*4   num_elements,       ! in  -- Number of elements  (of the data type).
INTEGER*4   rec_variance,       ! in  -- Record  variance.
INTEGER*4   dim_variances(*),   ! in  -- Dimension variances.
INTEGER*4   var_num,            ! out -- rVariable number.
```

CDF_var_create is used to create a new rVariable in a CDF. A variable (rVariable or zVariable) with the same name must not already exist in the CDF.

The arguments to CDF_var_create are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.
var_name	The name of the rVariable to create. This may be at most CDF_VAR_NAME_LEN256 characters. Variable names are case-sensitive.
data_type	The data type of the new rVariable. Specify one of the data types defined in Section 4.5.
num_elements	The number of elements of the data type at each value. For character data types (CDF_CHAR and CDF_UCHAR), this is the number of characters in the string (each value consists of the entire string). For all other data types this must always be one (1) - multiple elements at each value are not allowed for non-character data types.
rec_variance	The rVariable's record variance. Specify one of the variances defined in Section 4.9.
dim_variances	The rVariable's dimension variances. Each element of dim_variances specifies the corresponding dimension variance. For each dimension specify one of the variances

	defined in Section 4.9. For 0-dimensional rVariables this argument is ignored (but must be present).
var_num	The number assigned to the new rVariable. This number must be used in subsequent CDF function calls when referring to this rVariable. An existing rVariable's number may be determined with the CDF_var_num function.
status	The completion status code. Chapter 8 explains how to interpret status codes.

5.20.1 Example(s)

The following example will create several rVariables in a CDF whose rVariables are 2-dimensional. In this case EPOCH, LAT, and LON are independent rVariables, and TMP is a dependent rVariable.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                    ! CDF identifier.
INTEGER*4 status                ! Returned status code.

INTEGER*4 EPOCH_rec_vary        ! EPOCH record variance.
INTEGER*4 LAT_rec_vary          ! LAT record variance.
INTEGER*4 LON_rec_vary          ! LON record variance.
INTEGER*4 TMP_rec_vary          ! TMP record variance.
INTEGER*4 EPOCH_dim_varys(2)    ! EPOCH dimension variances.
INTEGER*4 LAT_dim_varys(2)      ! LAT dimension variances.
INTEGER*4 LON_dim_varys(2)      ! LON dimension variances.
INTEGER*4 TMP_dim_varys(2)      ! TMP dimension variances.
INTEGER*4 EPOCH_var_num         ! EPOCH variable number.
INTEGER*4 LAT_var_num           ! LAT rVariable number.
INTEGER*4 LON_var_num           ! LON rVariable number.
INTEGER*4 TMP_var_num           ! TMP rVariable number.

DATA EPOCH_rec_vary/VARY/, LAT_rec_vary/NOVARY/,
1    LON_rec_vary/NOVARY/, TMP_rec_vary/VARY/

DATA EPOCH_dim_varys/NOVARY,NOVARY/, LAT_dim_varys/NOVARY,VARY/,
1    LON_dim_varys/VARY,NOVARY/, TMP_dim_varys/VARY,VARY/
.
.
CALL CDF_var_create (id, 'EPOCH', CDF_EPOCH, 1,
1                    EPOCH_rec_vary, EPOCH_dim_varys, EPOCH_var_num, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)

CALL CDF_var_create (id, 'LATITUDE', CDF_INT2, 1,
1                    LAT_rec_vary, LAT_dim_varys, LAT_var_num, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)

CALL CDF_var_create (id, 'LONGITUDE', CDF_INT2, 1,
1                    LON_rec_vary, LON_dim_varys, LON_var_num, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)

CALL CDF_var_create (id, 'TEMPERATURE', CDF_REAL4, 1,
```

```
1                    TMP_rec_vary, TMP_dim_varys, TMP_var_num, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

5.21 CDF_var_get

SUBROUTINE CDF_var_get (

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  var_num,         ! in  -- rVariable number.
INTEGER*4  rec_num,         ! in  -- Record number.
INTEGER*4  indices(*),      ! in  -- Dimension indices.
<type>     value,           ! out -- Value (<type> is dependent on the data type of the rVariable).
INTEGER*4  status)          ! out -- Completion status
```

CDF_var_get is used to read a single value from an rVariable. CDF_var_hyper_get may be used to read more than one rVariable value with a single call (see Section 5.22).

The arguments to CDF_var_get are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.
var_num	The number of the rVariable from which to read. This number may be determined with a call to CDF_var_num (see Section 5.25).
rec_num	The record number at which to read.
indices	The array indices within the specified record at which to read. Each element of indices specifies the corresponding dimension index. For 0-dimensional rVariables this argument is ignored (but must be present).
value	The value read. This buffer must be large enough to hold the value. CDF_var_inquire would be used to determine the rVariable's data type and number of elements (of that data type) at each value. The value is read from the CDF and placed at memory address value. **WARNING:** If the rVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the rVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

5.21.1 Example(s)

The following example will read and hold an entire record of data from an rVariable. The CDF's rVariables are 3-dimensional with sizes [180,91,10]. For this rVariable the record variance is VARY, the dimension variances are [VARY,VARY,VARY], and the data type is CDF_REAL4.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                ! CDF identifier.
INTEGER*4 status            ! Returned status code.
REAL*4 tmp(180,91,10)       ! Temperature values.
INTEGER*4 indices(3)        ! Dimension indices.
INTEGER*4 var_n             ! rVariable number.
INTEGER*4 rec_num           ! Record number.
INTEGER*4 d1, d2, d3        ! Dimension index values.
.
.
var_n = CDF_var_num (id, 'Temperature')
IF (var_n .LT. 1) CALL UserStatusHandler (var_n)    ! If less than one (1),
                                                    ! then it is actually a
                                                    ! warning/error code.
rec_num = 13

DO d1 = 1, 180
  indices(1) = d1
  DO d2 = 1, 91
     indices(2) = d2
     DO d3 = 1, 10
       indices(3) = d3
       CALL CDF_var_get (id, var_n, rec_num, indices, tmp(d1,d2,d3), status)
       IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
     END DO
  END DO
END DO
.
.
```

5.22 CDF_var_hyper_get

SUBROUTINE CDF_var_hyper_get (

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  var_num,         ! in  -- rVariable number.
INTEGER*4  rec_start,       ! in  -- Starting record number.
INTEGER*4  rec_count,       ! in  -- Number of records.
INTEGER*4  rec_interval,    ! in  -- Subsampling interval between records.
INTEGER*4  indices(*),      ! in  -- Dimension indices of starting value.
INTEGER*4  counts(*),       ! in  -- Number of values along each dimension.
INTEGER*4  intervals(*),    ! in  -- Subsampling intervals along each dimension.
<type>     buffer,          ! in  -- Buffer of values (<type> is dependent on the data type of the rVariable).
INTEGER*4  status)          ! out -- Completion status
```

CDF_var_hyper_get is used to read a buffer of one or more values from an rVariable. It is important to know the variable majority of the CDF before using CDF_var_hyper_get because the values placed into the buffer will be in that

majority. CDF_inquire can be used to determine the default variable majority of a CDF distribution. The Concepts chapter in the CDF User's Guide describes the variable majorities.

The arguments to CDF_var_hyper_get are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.
var_num	The number of the rVariable from which to read. This number may be determined with a call to CDF_var_num (see Section 5.25).
rec_start	The record number at which to start reading.
rec_count	The number of records to read.
rec_interval	The interval between records for subsampling (e.g., an interval of 2 means read every other record).
indices	The indices (within each record) at which to start reading. Each element of indices specifies the corresponding dimension index. If there are zero (0) dimensions, this argument is ignored (but must be present).
counts	The number of values along each dimension to read. Each element of counts specifies the corresponding dimension count. For 0-dimensional rVariables this argument is ignored (but must be present).
intervals	For each dimension, the interval between values for subsampling (e.g., an interval of 2 means read every other value). Each element of intervals specifies the corresponding dimension interval. For 0-dimensional rVariables, this argument is ignored (but must be present).
buffer	The buffer of values read. The majority of the values in this buffer will be the same as that of the CDF. This buffer must be large to hold the values. CDF_var_inquire would be used to determine the rVariable's data type and number of elements (of that data type) at each value. The values are read from the CDF and placed into memory starting at address buffer. **WARNING:** If the rVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the rVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

5.22.1 Example(s)

The following example will read an entire record of data from an rVariable. The CDF's rVariables are 3-dimensional with sizes [180,91,10] and CDF's variable majority is ROW_MAJOR. For the rVariable the record variance is VARY, the dimension variances are [VARY,VARY,VARY], and the data type is CDF_REAL4. This example is similar to the example in Section 5.21 except that it uses a single call to CDF_var_hyper_get rather than numerous calls to CDF_var_get.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
```

```
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
REAL*4 tmp(180,91,10)      ! Temperature values.
INTEGER*4 var_n            ! rVariable number.
INTEGER*4 rec_start        ! Record number.
INTEGER*4 rec_count        ! Record counts.
INTEGER*4 rec_interval     ! Record interval.
INTEGER*4 indices(3)       ! Dimension indices.
INTEGER*4 counts(3)        ! Dimension counts.
INTEGER*4 intervals(3)     ! Dimension intervals.

DATA rec_start/13/, rec_count/1/, rec_interval/1/,
1    indices/1,1,1/, counts/180,91,10/, intervals/1,1,1/
.
.
var_n = CDF_var_num (id, 'Temperature')
IF (var_n .LT. 1) CALL UserStatusHandler (var_n)   ! If less than one (1),
                                                   ! then it is actually a
                                                   ! warning/error code.

CALL CDF_var_hyper_get (id, var_n, rec_start, rec_count, rec_interval,
1                       indices, counts, intervals, tmp, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

Note that if the CDF's variable majority had been ROW_MAJOR, the tmp array would have been declared REAL*4 tmp[10][91][180] for proper indexing.

5.23 CDF_var_hyper_put

SUBROUTINE CDF_var_hyper_put (

```
INTEGER*4 id,              ! in  -- CDF identifier.
INTEGER*4 var_num,         ! in  -- rVariable number.
INTEGER*4 rec_start,       ! in  -- Starting record number.
INTEGER*4 rec_count,       ! in  -- Number of records.
INTEGER*4 rec_interval,    ! in  -- Interval between records.
INTEGER*4 indices(*),      ! in  -- Dimension indices of starting value.
INTEGER*4 counts(*),       ! in  -- Number of values along each dimension.
INTEGER*4 intervals(*),    ! in  -- Interval between values along each dimension.
<type>    buffer,          ! in  -- Buffer of values (<type> is dependent on the data type of the rVariable).
INTEGER*4 status)          ! out -- Completion status
```

CDF_var_hyper_put is used to write a buffer of one or more values to an rVariable. It is important to know the variable majority of the CDF before using CDF_var_hyper_put because the values in the buffer to be written must be in the same majority. CDF_inquire can be used to determine the default variable majority of a CDF distribution. The Concepts chapter in the CDF User's Guide describes the variable majorities.

The arguments to CDF_var_hyper_put are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.
var_num	The number of the rVariable to which to write. This number may be determined with a call to CDF_var_num (see Section 5.25).
rec_start	The record number at which to start writing.
rec_count	The number of records to write.
rec_interval	The interval between records for subsampling[15] (e.g., An interval of 2 means write to every other record).
indices	The indices (within each record) at which to start writing. Each element of indices specifies the corresponding dimension index. If there are zero (0) dimensions, this argument is ignored (but must be present).
counts	The number of values along each dimension to write. Each element of count specifies the corresponding dimension count. For 0-dimensional rVariables this argument is ignored (but must be present).
intervals	For each dimension the interval between values for subsampling[16] (e.g., an interval of 2 means write to every other value). intervals is a 1-dimensional array containing one element per rVariable dimension. Each element of intervals specifies the corresponding dimension interval. For 0-dimensional rVariables this argument is ignored (but a place holder is necessary).
buffer	The buffer of values to write. The majority of the values in this buffer must be the same as that of the CDF. The values starting at memory address buffer are written to the CDF. **WARNING:** If the rVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the entry does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

5.23.1 Example(s)

The following example writes values to the rVariable LATITUDE of a CDF whose rVariables are 2-dimensional with dimension sizes [360,181]. For LATITUDE the record variance is NOVARY, the dimension variances are [NOVARY,VARY], and the data type is CDF_INT2. This example is similar to the example in Section 5.26 except that it uses a single call to CDF_var_hyper_put rather than numerous calls to CDF_var_put.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
```

[15] "Subsampling" is not the best term to use when writing data, but you should know what we mean.
[16] Again, not the best term.

```
INTEGER*2 lat              ! Latitude value.
INTEGER*2 lats(181)        ! Buffer of latitude values.
INTEGER*4 var_n            ! rVariable number.
INTEGER*4 rec_start        ! Record number.
INTEGER*4 rec_count        ! Record counts.
INTEGER*4 rec_interval     ! Record interval.
INTEGER*4 indices(2)       ! Dimension indices.
INTEGER*4 counts(2)        ! Dimension counts.
INTEGER*4 intervals(2)     ! Dimension intervals.

DATA rec_start/1/, rec_count/1/, rec_interval/1/,
1    indices/1,1/, counts/1,181/, intervals/1,1/
.
.
var_n = CDF_var_num (id, 'LATITUDE')
IF (var_n .LT. 1) CALL UserStatusHandler (var_n)    ! If less than one (1),
                                                    ! then not an rVariable
                                                    ! number but rather a
                                                    ! warning/error code
DO lat = -90, 90
   lats(91+lat) = lat
END DO

CALL CDF_var_hyper_put (id, var_n, rec_start, rec_count, rec_interval,
1                       indices, counts, intervals, lats, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

5.24 CDF_var_inquire

SUBROUTINE CDF_var_inquire (

```
INTEGER*4   id,                                  ! in  -- CDF identifier.
INTEGER*4   var_num,                             ! in  -- rVariable number.
CHARACTER   var_name*(CDF_VAR_NAME_LEN256),      ! out -- rVariable name.
INTEGER*4   data_type,                 ! out -- Data type.
INTEGER*4   num_elements,                        ! out -- Number of elements (of the data type).
INTEGER*4   rec_variance,                        ! out -- Record variance.
INTEGER*4   dim_variances(CDF_MAX_DIMS),         ! out -- Dimension variances.
INTEGER*4   status)                              ! out -- Completion status
```

CDF_var_inquire is used to inquire about the specified rVariable. This function would normally be used before reading rVariable values (with CDF_var_get or CDF_var_hyper_get) to determine the data type and number of elements (of that data type).

The arguments to CDF_var_inquire are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.

var_num	The number of the rVariable to inquire. This number may be determined with a call to CDF_var_num (see Section 5.25).
var_name	The rVariable's name. This character string must be large enough to hold CDF_VAR_NAME_LEN256 characters and will be blank padded if necessary.
data_type	The data type of the rVariable. The data types are defined in Section 4.5.
num_elements	The number of elements of the data type at each rVariable value. For character data types (CDF_CHAR and CDF_UCHAR), this is the number of characters in the string. (Each value consists of the entire string.) For all other data types, this will always be one (1) - multiple elements at each value are not allowed for non-character data types.
rec_variance	The record variance. The record variances are defined in Section 4.9.
dim_variances	The dimension variances. Each element of dim_variances receives the corresponding dimension variance. The dimension variances are defined in Section 4.9. For 0-dimensional rVariable this argument is ignored (but must be present).
status	The completion status code. Chapter 8 explains how to interpret status codes.

5.24.1 Example(s)

The following example inquires about an rVariable named HEAT_FLUX in a CDF. Note that the rVariable name returned by CDF_var_inquire will be the same as that passed in to CDF_var_num.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 status                        ! Returned status code.
CHARACTER var_name*(CDF_VAR_NAME_LEN256)     ! rVariable name.
INTEGER*4 data_type                     ! Data type.
INTEGER*4 num_elems                     ! Number of elements (of data type).
INTEGER*4 rec_vary                      ! Record variance.
INTEGER*4 dim_varys(CDF_MAX_DIMS)       ! Dimension variances (allocate to
                                        ! allow the maximum number of
                                        ! dimensions).
.
.
CALL CDF_var_inquire (id, CDF_var_num(id,'HEAT_FLUX'), var_name, data_type,
1                     num_elems, rec_vary, dim_varys, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

5.25 CDF_var_num

INTEGER*4 FUNCTION CDF_var_num (

```
INTEGER*4    id,                ! in-- CDF  identifier.
CHARACTER  var_name*(*));       ! in-- Variable name.
```

CDF_var_num is used to determine the number associated with a given rVariable or zVariable name. If the variable is found, CDF_var_num returns its number - which will be equal to or greater than one (1). If an error occurs (e.g., the rVariable does not exist in the CDF), an error code (of type INTEGER*4) is returned. Error codes are less than zero (0).

The arguments to CDF_var_num are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.
VarName	The name of the variable, either rVariable or zVariable, for which to search. This may be at most CDF_VAR_NAME_LEN256 characters. Variable names are case-sensitive.

CDF_var_num may be used as an embedded function call when a variable number is needed. CDF_var_num is declared in cdf.inc. (Fortran functions must be declared so that the returned value is interpreted correctly.)

5.25.1 Example(s)

In the following example CDF_var_num is used as an embedded function call when inquiring about an rVariable.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 status                        ! Returned status code.
CHARACTER var_name*(CDF_VAR_NAME_LEN256)     ! rVariable name.
INTEGER*4 data_type                     ! Data type of the rVariable.
INTEGER*4 num_elements                  ! Number of elements (of the
                                        ! data type).
INTEGER*4 rec_variances                 ! Record variance.
INTEGER*4 dim_variances(CDF_MAX_DIMS)   ! Dimension variances.
.
.
CALL CDF_var_inquire (id, CDF_var_num(id,'LATITUDE'), var_name, data_type,
1                     num_elements, rec_variance, dim_variances, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

In this example the rVariable named LATITUDE was inquired. Note that if LATITUDE did not exist in the CDF, the call to CDF_var_num would have returned an error code. Passing that error code to CDF_var_inquire as an rVariable number would have resulted in CDF_var_inquire also returning an error code. Also note that the name written into var_name is already known (LATITUDE). In some cases the rVariable names will be unknown - CDF_var_inquire would be used to determine them. CDF_var_inquire is described in Section 5.24.

5.26 CDF_var_put

SUBROUTINE CDF_var_put (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4  var_num,           ! in  -- rVariable number.
INTEGER*4  rec_num,           ! in  -- Record number.
INTEGER*4  indices(*),        ! in  -- Dimension indices.
<type>     value,             ! out -- Value (<type> is dependent on the data type of the rVariable).
INTEGER*4  status)            ! out -- Completion status
```

CDF_var_put is used to write a single value to an rVariable. CDF_var_hyper_put may be used to write more than one rVariable value with a single call (see Section 5.23).

The arguments to CDF_var_put are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.
var_num	The number of the rVariable to which to write. This number may be determined with a call to CDF_var_num (see Section 5.25).
rec_num	The record number at which to write.
indices	The array indices within the specified record at which to write. Each element of indices specifies the corresponding dimension index. For 0-dimensional rVariables this argument is ignored (but must be present).
value	The value to write. The value is written to the CDF from memory address value. **WARNING:** If the rVariable has one of the character data types (CDF_CHARor CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the rVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

5.26.1 Example(s)

The following example writes values to the rVariable named LATITUDE in a CDF whose rVariables are 2-dimensional with dimension sizes [360,181]. For LATITUDE the record variance is NOVARY, the dimension variances are [NOVARY,VARY], and the data type is CDF_INT2.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*2 lat              ! Latitude value.
INTEGER*4 var_n            ! rVariable number.
INTEGER*4 rec_num          ! Record number.
```

```
INTEGER*4 indices(2)       ! Dimension indices.

DATA rec_num/1/, indices/1,1/
.
.
var_n = CDF_var_num (id, 'LATITUDE')
IF (var_n .LT. 1) CALL UserStatusHandler (var_n)    ! If less than one (1),
                                                    ! then not an rVariable
                                                    ! number but rather a
                                                    ! warning/error code.
DO lat = -90, 90
   indices(2) = 91 + lat
   CALL CDF_var_put (id, var_n, rec_num, indices, lat, status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
END DO
.
.
```

Since the record variance is NOVARY, the record number (rec_num) is set to one (1). Also note that because the dimension variances are [NOVARY,VARY], only the second dimension is varied as values are written. (The values are "virtually" the same at each index of the first dimension.)

5.27 CDF_var_rename

SUBROUTINE CDF_var_rename (

```
INTEGER*4    id,                ! in  -- CDF identifier.
INTEGER*4    var_num,           ! in  -- rVariable number.
CHARACTER    var_name*(*),      ! in  -- New name.
INTEGER*4    status)            ! out -- Completion status
```

CDF_var_rename is used to rename an existing rVariable. A variable (rVariable or zVariable) with the same name must not already exist in the CDF.

The arguments to CDF_var_rename are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create or CDF_open.
var_num	The number of the rVariable to rename. This number may be determined with a call to CDF_var_num (see Section 5.25).
var_name	The new rVariable name. This may be at most CDF_VAR_NAME_LEN256 characters. Variable names are case-sensitive.
status	The completion status code. Chapter 8 explains how to interpret status codes.

5.27.1 Example(s)

In the following example the rVariable named TEMPERATURE is renamed to TMP (if it exists). Note that if CDF_var_num returns a value less than one (1) then that value is not an rVariable number but rather a warning/error code.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 status      ! Returned status code.
INTEGER*4 var_num     ! rVariable number.
.
.
var_num = CDF_var_num (id, 'TEMPERATURE')
IF (var_num .LT. 1) THEN
    IF (var_num .NE. NO_SUCH_VAR) CALL UserStatusHandler (var_num)
ELSE
    CALL CDF_var_rename (id, var_num, 'TMP', status)
    IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
END IF
.
.
```

Chapter 6

6 Extended Standard Interface

The following sections describe the new, extended set of Standard Interface routines callable from Fortran applications. Most subroutines return a status code of type INTEGER*4 (see Chapter 8). The Internal Interface is described in Chapter 7. An application can use either or both interfaces when necessary.

Previously, the Standard Interface only provided a very limited functionality within the CDF library. For example, it could not handle zVariables and vAttribute zEntries (they were only accessible via the Internal Interface). Since V3.1, the Standard Interface has been expanded to include many new operations that are previously only available through the Internal Interface.

The original Standard Interface functions[17] and subroutines[18], described in Chapter 5, in the previous library version are still available and work the same way as before. To encourage the use of zVariables, the preferred variable type over the rVariables in the CDF, new subroutines are explicitly added to the library to handle zVariables, their data as well as entries in the variable-scoped attributes. The original Standard Interface functions/subroutines can be used to operate the rVariables and their associated rEntries. The Internal Interface needs to be called to operate the functions/items that are not available from the new Standard Interface.

A naming convention is adopted by the new Standard Interface subroutines to separate the operations on zVariable, as well as entry, i.e., gEntry, rEntry and zEntry.

The new functions, based on the operands, are grouped into four (4) categories: library, CDFs, variables and attributes/entries.

6.1 Library

The functions in this section are related to the library being used for the CDF operations and are common for any CDF entity, i.e., CDFs, variables, attributes and entries.

[17] They are: CDF_attr_Num and CDF_var_Num.
[18] They are: CDF_create, CDF_open, CDF_doc, CDF_inquire, CDF_close, CDF_delete, CDF_attr_Create, CDF_attr_Rename, CDF_attr_Inquire, CDF_attr_Entry_Inquire, CDF_attr_Put, CDF_attr_Get, CDF_var_Create, CDF_var_Rename, CDF_var_Inquire, CDF_var_Put, CDF_var_Get, CDF_var_Hyper_Put, CDF_var_Hyper_Get, CDF_var_Close, CDF_getrVarsRecordData, CDF_getzVarsRecordData, CDF_putrVarsRecordData and CDF_putzVarsRecordData.

6.1.1 CDF_get_datatype_size

SUBROUTINE CDF_get_datatype_size (

```
INTEGER*4  data_type,          ! in --  CDF data type.
INTEGER*4  size,               ! out --  Size in bytes.
INTEGER*4  status)             ! out --  Completion status
```

CDF_get_datatype_size acquires the size (in bytes) of an element of the specified CDF data type

The arguments to CDF_get_datatype_size are defined as follows:

data_type	The CDF data type.
size	Size in bytes of that data type.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.1.1.1. Example(s)

The following example acquires the size (in bytes) of CDF data type CDF_INT4 (it should be 4 bytes).

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 size              ! Size of the data type.
INTEGER*4 status            ! Returned status code.

.
.
CALL CDF_get_datatype_size (CDF_INT4, size, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.1.2 CDF_get_lib_copyright

SUBROUTINE CDF_get_lib_copyright (

```
CHARACTER  copyright*(*),      ! out --  CDF library copyright notice.
INTEGER*4  status)             ! out --  Completion status
```

CDF_get_lib_copyright acquires the copyright notice of the CDF library being used.

The arguments to CDF_get_lib_copyright are defined as follows:

copyright	The copyright notice from the CDF library.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.1.2.1. Example(s)

The following example acquires the CDF library's copyright notice.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
CHARACTER copyright*(CDF_COPYRIGHT_LEN)      ! Copyright notice.
INTEGER*4 status                             ! Returned status code.

.
.
CALL CDF_get_lib_copyright (copyright, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.1.3 CDF_get_lib_version

SUBROUTINE CDF_get_lib_version (

```
INTEGER*4  version,              ! out --  CDF library version.
INTEGER*4  release,              ! out -- CDF library release.
INTEGER*4  increment,            ! out -- CDF library increment.
CHARACTER  sub_increment*(*) !  out -- CDF library sub-increment..
INTEGER*4  status)               ! out --  Completion status.
```

CDF_get_lib_version acquires the version and release information from the CDF library being used.

The arguments to CDF_get_lib_version are defined as follows:

version The CDF library version.

release The CDF library release.

increment The CDF library increment.

sub_increment The CDF library sub-increment.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.1.3.1. Example(s)

The following example acquires the CDF library's version/release information.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 version          ! Library version.
INTEGER*4 release          ! Library release.
INTEGER*4 increment        ! Library increment.
CHARACTER sub_increment*1  ! Library sub-increment.
INTEGER*4 status           ! Returned status code.

.
.
CALL CDF_get_lib_version (version, release, increment,
1                         sub_increment, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.1.4 CDF_get_status_text

SUBROUTINE CDF_get_status_text (

INTEGER*4 status_id, ! in -- CDF status identifier.
CHARACTER text*(*), ! out -- Status text description.
INTEGER*4 status) ! out -- Completion status

CDF_get_status_text is used to inquire the explanation of a given status code (not just error codes). Chapter 8 explains how to interpret status codes and Appendix A lists all of the possible status codes.

The arguments to CDF_get_status_text are defined as follows:

status_id	The status code to check.
message	The explanation of the status code. This character string must be large enough to hold CDF_STATUSTEXT_LEN characters and will be blank padded if necessary.
status	The status of checking.

6.1.4.1. Example(s)

The following example displays the explanation text if an error code is returned from a call to CDF_open_cdf.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
```

```
   INTEGER*4 id                            ! CDF identifier.
   INTEGER*4 status1, status2              ! Returned status code.
   CHARACTER text*(CDF_STATUSTEXT_LEN)     ! Explanation text.
   INTEGER*4 last_char                     ! Last character position
                                           ! actually used in the copyright.
   .
   .
   CALL CDF_open_cdf ('giss_wetl', id, status1)
   IF (status1 .LT. CDF_WARN) THEN         ! INFO and WARNING codes ignored.
       CALL CDF_get_status_text (status1, text, status2)
       last_CHARACTER= CDF_STATUSTEXT_LEN
       DO WHILE (text(last_char:last_char) .EQ. ' ')
          last_CHARACTER= last_CHARACTER- 1
       END DO
       WRITE (6,101) text(1:last_char)
101    FORMAT (' ','ERROR> ',A)
   END IF
   .
   .
```

6.2 CDF

The functions in this section provide CDF-specific operations. Any operations on variables or attributes in a CDF are described in the following sections. This CDF has to be a newly created or opened from an existing one.

6.2.1 CDF_close_cdf

SUBROUTINE CDF_close_cdf (.

```
INTEGER*4 id,                ! in  -- CDF identifier.
INTEGER*4 status)            ! out -- Completion status
```

CDF_close_cdf closes the specified CDF. The CDF's cache buffers are flushed; the CDF's open file is closed (or files in the case of a multi-file CDF); and the CDF identifier is made available for reuse. This routine is identical to the original Standard Interface routine CDF_close.

NOTE: You must close a CDF with CDF_close_cdf to guarantee that all modifications you have made will actually be written to the CDF's file(s). If your program exits, normally or otherwise, without a successful call to CDF_close_cdf, the CDF's cache buffers are left unflushed.

The arguments to CDF_close_cdf are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.1.1. Example(s)

The following example will close an open CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 status      ! Returned status code.
.
.
CALL CDF_close_cdf (id, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.2 CDF_create_cdf

SUBROUTINE CDF_create_cdf (

```
CHARACTER   CDF_name*(*),          ! in  --  CDF file name.
INTEGER*4   status)                ! out --  Completion status
```

CDF_create_cdf creates a CDF as defined by the arguments. This function provides the simplest form of CDF creation without the number of dimensions, dimension sizes, encoding and majority arguments required in the original Standard Interface routine, CDF_create, or the similar process from the Internal Interface CDF_lib routine. The created CDF will have zero (0) dimension (thus no dimension sizes) and use the default encoding (HOST_ENCODING) and majority (ROW_MAJOR), specified in the configuration file of your CDF distribution. This routine should be used to create CDFs that will have only zVariables, or rVariables with no dimensionality. Use CDF_create or CDF_lib routine to create CDFs to hold rVariables with dimensions. A CDF cannot be created if it already exists. (The existing CDF will not be overwritten.) If you want to overwrite an existing CDF, you must first open it with CDF_open_cdf, delete it with CDF_delete, and then recreate it with CDF_create_cdf. If the existing CDF is corrupted, the call to CDF_open_cdf will fail. (An error code will be returned.) In this case you must delete the CDF at the command line. Delete the dotCDF file (having an extension of .cdf), and if the CDF has the multi-file format, delete all of the variable files (having extensions of .v0,.v1,. . . and .z0,.z1,.. .).

The arguments to CDF_create_cdf are defined as follows:

CDF_name	The file name of the CDF to create. (Do not specify an extension.) This may be at most CDF_PATHNAME_LEN characters. A CDF file name may contain disk and directory specifications that conform to the conventions of the operating system being used (including logical names on VMS systems and environment variables on UNIX systems). **UNIX:** File names are case-sensitive.
id	The identifier for the created CDF. This identifier must be used in all subsequent operations on the CDF.
status	The completion status code. Chapter 8 explains how to interpret status codes.

When a CDF is created, both read and write access are allowed. The default format for a CDF created with CDF_create is specified in the configuration file of your CDF distribution. Consult your system manager for this default. The CDF_lib function (Internal Interface) may be used to change a CDF's format.

NOTE: CDF_close_cdf must be used to close the CDF before your application exits to ensure that the CDF will be correctly written to disk (see Section 6.2.1).

6.2.2.1. Example(s)

The following example will create a CDF named test1 with default encoding and majority.

```
.

.
INCLUDE '<path>cdf.inc'

.

.

INTEGER*4 id                ! CDF identifier.
INTEGER*4 status            ! Returned status code.

.
.
CALL CDF_create_cdf ('test1', id, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.3 CDF_delete_cdf

SUBROUTINE CDF_delete_cdf (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 status) ! out -- Completion status

CDF_delete_cdf deletes the specified CDF. The CDF files deleted include the dotCDF file (having an extension of .cdf), and if a multi-file CDF, the variable files (having extensions of .v0,.v1,. . . and .z0,.z1,.. .).

You must open a CDF before you are allowed to delete it. If you have no privilege to delete the CDF files, they will not be deleted. If the CDF is corrupted and cannot be opened, the CDF file(s) must be deleted at the command line.

The arguments to CDF_delete_cdf are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.2.3.1. Example(s)

The following example will open and then delete an existing CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 status                        ! Returned status code.

.
.
CALL CDF_open_cdf ('test2', id, status)
IF (status .LT. CDF_OK) THEN            ! INFO status codes ignored.
    CALL UserStatusHandler (status)
ELSE
    CALL CDF_delete_cdf (id, status)
    IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
END IF
.
.
```

6.2.4 CDF_get_cachesize

SUBROUTINE CDF_get_cachesize (

```
INTEGER*4 id,           ! in  -- CDF identifier.
INTEGER*4 num_buffers,  ! out -- Number of cache buffers.
INTEGER*4 status)       ! out -- Completion status
```

CDF_get_cachesize acquires the number of cache buffers being used for the dotCDF file when a CDF is open. Refer to the CDF User's Guide for the description of caching scheme used by the CDF library.

The arguments to CDF_get_cachesize are defined as follows:

id The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

num_buffers The number of cache buffers.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.2.4.1. Example(s)

The following example acquires the number of cache buffers used for a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 num_buffers                   ! Number of cache buffers.
INTEGER*4 status                        ! Returned status code.

.
.
CALL CDF_get_cachesize (id, num_buffers, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.5 CDF_get_checksum

SUBROUTINE CDF_get_checksum (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 checksum, ! out -- Checksum mode.
INTEGER*4 status) ! out -- Completion status

CDF_get_checksum acquires the checksum mode of a CDF file. Refer to Section 4.19 for the description of checksum.

The arguments to CDF_get_ checksum are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
checksum	The checksum mode.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.5.1. Example(s)

The following example acquires the checksum mode for a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 checksum                      ! Checksum mode.
INTEGER*4 status                        ! Returned status code.
```

```
.
.
CALL CDF_get_checksum(id, checksum, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.6 CDF_get_compress_cachesize

SUBROUTINE CDF_get_compress_cachesize (

```
INTEGER*4  id,                ! in  --  CDF  identifier.
INTEGER*4  num_buffers,       ! out --  Number of cache buffers.
INTEGER*4  status)            ! out --  Completion status
```

CDF_get_compress_cachesize acquires the number of cache buffers used for the compression scratch CDF file. Refer to the CDF User's Guide for the description of caching scheme used by the CDF library.

The arguments to CDF_get_compress_cachesize are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
num_buffers	The number of cache buffers.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.6.1. Example(s)

The following example acquires the number of cache buffers used for the compression scratch CDF file.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                          ! CDF identifier.
INTEGER*4 num_buffers                 ! Number of cache buffers.
INTEGER*4 status                      ! Returned status code.

.
.
CALL CDF_get_compress_cachesize (id, num_buffers, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.7 CDF_get_compression

SUBROUTINE CDF_get_compression (

```
INTEGER*4 id,                ! in  -- CDF identifier.
INTEGER*4 compress_type,     ! out -- Compression type.
INTEGER*4 compress_parms(*), ! out -- Compression parameters.
INTEGER*4 compress_percent,  ! out -- Compression percentage.
INTEGER*4 status)            ! out -- Completion status
```

CDF_get_compression acquires the compression information of the CDF. It returns the compression type (method) and, if compressed, the compression parameters and compression percentage. CDF compression types/parameters are described in Section 4.10. The compression percentage is the result of the compressed file divided by its original, uncompressed file size.[19]

The arguments to CDF_get_compression are defined as follows:

id — The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

compress_type — The compression type.

compress_parms — The compression parameters.

compress_percent — The compression percentage.

status — The completion status code. Chapter 8 explains how to interpret status codes.

6.2.7.1. Example(s)

The following example acquires the compression information from a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 compress_type                 ! Compression type.
INTEGER*4 compress_parms(CDF_MAX_DIMS) ! Compression parameters.
INTEGER*4 compress_percent              ! Compression percentage.
INTEGER*4 status                        ! Returned status code.

.
.
CALL CDF_get_compression (id, compress_type, compress_parms,
1                         compress_percent, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

[19] The compression ratio is (100 – compression cercentage): the lower the compression percentage, the better the compression ratio.

6.2.8 CDF_get_compression_info

SUBROUTINE CDF_get_compression_info (

```
char  *CDFname,                 ! in  -- CDF  name.  */
INTEGER*4  compress_type,       ! out -- Compression type.
INTEGER*4  compress_parms(*),   ! out -- Compression parameters.
INTEGER*4  compress_percent,    ! out -- Compression percentage.
INTEGER*4  status)              ! out -- Completion status
```

CDF_get_compression_info returns the compression type/parameters and compression percentage of a CDF without having to open the CDF. This refers to the compression of the CDF - not of any compressed variables.

The arguments to CDFgetCompressionInfo are defined as follows:

CDFname	The pathname of a CDF file without the .cdf file extension.
compress_type	The compression type.
compress_parms	The compression parameters.
compress_percent	The compression percentage.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.8.1. Example(s)

The following example acquires the compression information from a CDF named “MYCDF.cdf”.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 compress_type                ! Compression type.
INTEGER*4 compress_parms(CDF_MAX_DIMS) ! Compression parameters.
INTEGER*4 compress_percent             ! Compression percentage.
INTEGER*4 status                       ! Returned status code.

.
.
CALL CDF_get_compression_info ('MYCDF', id, compress_type, compress_parms,
1                              compress_percent, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.9 CDF_get_copyright

SUBROUTINE CDF_get_copyright (

```
INTEGER*4  id,                  ! in  -- CDF  identifier.
CHARACTER  copyright*(*),       ! out -- Copyright notice.
INTEGER*4  status)              ! out -- Completion status
```

CDF_get_copyright acquires the copyright notice in a CDF.

The arguments to CDF_get_copyright are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
copyright	The copyright notice.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.9.1. Example(s)

The following example acquires the copyright notice from a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                                    ! CDF identifier.
CHARACTER copyright*(CDF_COPYRIGHT_LEN)         ! Copyright.
INTEGER*4 status                                ! Returned status code.

.
.
CALL CDF_get_copyright (id, copyright, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.10 CDF_get_decoding

SUBROUTINE CDF_get_decoding (

```
INTEGER*4  id,                  ! in -- CDF  identifier.
INTEGER*4  decoding,            ! out -- CDF decoding.
INTEGER*4  status)              ! out -- Completion status
```

CDF_get_decoding acquires the decoding for the data in a CDF. The decodings are described in Section 4.7.

The arguments to CDF_get_decoding are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
decoding	The decoding.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.10.1. Example(s)

The following example acquires the decoding code for a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 decoding         ! Decoding.
INTEGER*4 status           ! Returned status code.

.
.
CALL CDF_get_decoding (id, decoding, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.11 CDF_get_encoding

SUBROUTINE CDF_get_encoding (

```
INTEGER*4  id,             ! in --  CDF  identifier.
INTEGER*4  decoding,       ! out --  CDF encoding.
INTEGER*4  status)         ! out --  Completion status
```

CDF_get_encoding acquires the encoding code used for the data in a CDF. The encodings are described in Section 4.6.

The arguments to CDF_get_encoding are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
encoding	The encoding.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.11.1. Example(s)

The following example acquires the encoding code used in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 encoding         ! Encoding.
INTEGER*4 status           ! Returned status code.

.
.
CALL CDF_get_encoding (id, encoding, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.12 CDF_get_format

SUBROUTINE CDF_get_format (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 format, ! out -- CDF format.
INTEGER*4 status) ! out -- Completion status

CDF_get_format acquires the file format, single or multi-file, of the CDF. The formats are described in Section 4.4.

The arguments to CDF_get_format are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
format	The format.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.12.1. Example(s)

The following example acquires the file format for a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 format           ! Format.
```

```
INTEGER*4 status           ! Returned status code.

.
.
CALL CDF_get_format (id, format, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.13 CDF_get_leapsecondlastupdated

SUBROUTINE CDF_get_leapsecondlastupdated (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 lastUpdated, ! out -- The new leap second last added to the table in YYYYMMDD.
INTEGER*4 status) ! out -- Completion status

CDF_get_ leapsecondlastupdated acquires the the date that the last leap second was added to the leap second table, which was used to created the CDF.

The arguments to CDF_get_ leapsecondlastupdated are defined as follows:

id The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

lastUpdated The date the last leap second was added to the leap second table.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.2.13.1. Example(s)

The following example acquires the file format for a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 lastupdated      ! The last updated date for leap second table.
INTEGER*4 status           ! Returned status code.

.
.
CALL CDF_get_format (id, lastupdated, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.14 CDF_get_majority

SUBROUTINE CDF_get_majority (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4  majority,          ! out -- Variable  majority.
INTEGER*4  status)            ! out --  Completion status
```

CDF_get_majority acquires the variable majority, row or column-major, of the CDF. The majorities are described in Section 4.8.

The arguments to CDF_get_majority are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
majority	The variable majority of the CDF.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.14.1. Example(s)

The following example acquires the variable majority of a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 majority    ! Variable majority.
INTEGER*4 status      ! Returned status code.

.
.
CALL CDF_get_majority (id, majority, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.15 CDF_get_name

SUBROUTINE CDF_get_name (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4  name,              ! out -- CDF name.
INTEGER*4  status)            ! out --  Completion status
```

CDF_get_name acquires the name of the specified CDF.

The arguments to CDF_get_name are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
name	The name of the CDF.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.15.1. Example(s)

The following example acquires the name of a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
CHARACTER name*(CDF_PATHNAME_LEN)       ! CDF name.
INTEGER*4 status                        ! Returned status code.

.
.
CALL CDF_get_name (id, name, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.16 CDF_get_negtoposfp0_mode

SUBROUTINE CDF_get_negtoposfp0_mode (

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4 negtoposfp0,      ! out -- -0.0 to 0.0 mode.
INTEGER*4  status)          ! out --  Completion status
```

CDF_get_negtoposfp0_mode acquires –0.0 to 0.0 mode of the CDF. You can use CDF_set_negtoposfp0_mode subroutine to set the mode. The –0.0 to 0.0 modes are described in Section 4.15.

The arguments to CDF_get_negtoposfp0_mode are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
negtoposfp0	The –0.0 to 0.0 mode of the CDF.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.2.16.1. Example(s)

The following example acquires the –0.0 to 0.0 mode of a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                ! CDF identifier.
INTEGER*4 negtoposfp0       ! -0.0 to 0.0 mode.
INTEGER*4 status            ! Returned status code.

.
.
CALL CDF_get_negtoposfp0_mode (id, negtoposfp0, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.17 CDF_get_readonly_mode

SUBROUTINE CDF_get_readonly_mode (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 readonly, ! out -- Read-only mode of the CDF.
INTEGER*4 status) ! out -- Completion status

CDF_get_readonly_mode acquires the read-only mode for a CDF. You can use CDF_set_readonly_mode to set the mode. The read-only modes are described in Section 4.13.

The arguments to CDF_get_readonly_mode are defined as follows:

id The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

readonly The read-only mode.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.2.17.1. Example(s)

The following example acquires the read-only mode of a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id         ! CDF identifier.
INTEGER*4 readonly   ! Read-only mode.
INTEGER*4 status     ! Returned status code.

.
.
CALL CDF_get_readonly_mode (id, readonly, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.18 CDF_get_stage_cachesize

SUBROUTINE CDF_get_stage_cachesize (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 num_buffers, ! out -- Number of cache buffers.
INTEGER*4 status) ! out -- Completion status

CDF_get_stage_cachesize inquires the number of cache buffers being used for the staging scratch file a CDF. Refer to the CDF User's Guide for the description of the caching scheme used by the CDF library.

The arguments to CDF_get_stage_cachesize are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
num_buffers	Number of cache buffers.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.18.1. Example(s)

The following example acquires the number of cache size buffers used for the staging scratch file for a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 num_buffers      ! Number of cache buffers.
.
.
CALL CDF_get_stage_cachesize (id, num_buffers, status)
```

```
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.19 CDF_get_validate

FUNCTION CDF_get_validate () ! out -- Validation indicator

CDF_get_validate returns the data validation mode. This information reflects whether when a CDF is open, its data is subjected to a validation process. 1 is returned if the data validation is to be performed, 0 otherwise.

The arguments to CDF_get_version are defined as follows:

N/A .

6.2.19.1. Example(s)

In the following example, it gets the data validation mode.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 validate          ! CDF file validation mode.
.
.
validate = CDF_get_validate ()
.
.
```

6.2.20 CDF_get_version

SUBROUTINE CDF_get_version (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 version, ! out -- CDF version number.
INTEGER*4 release, ! out -- CDF release number within the version.
INTEGER*4 increment, ! out -- CDF increment number within the release.
INTEGER*4 status) ! out -- Completion status

CDF_get_version inquires the version/release information for a CDF file. This information reflects the CDF library that was used to create the CDF file.

The arguments to CDF_get_version are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
version	CDF version number.
release	CDF release number within the version.
increment	CDF increment number within the release.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.20.1. Example(s)

In the following example, a CDF's version/release is acquired.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 version          ! CDF version number.
INTEGER*4 release          ! CDF release number.
INTEGER*4 increment        ! CDF increment number.
.
.
CALL CDF_get_version (id, version, release, increment, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.21 CDF_get_zmode

SUBROUTINE CDF_get_zmode (

```
INTEGER*4 id,              ! in  -- CDF identifier.
INTEGER*4 zmode,           ! out -- CDF zMode.
INTEGER*4 status)          ! out -- Completion status
```

CDF_get_zmode inquires the zMode for a CDF file. The zModes are described in Section 4.14.

The arguments to CDF_get_zmode are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
zmode	CDF zMode.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.21.1. Example(s)

In the following example, a CDF's zMode is acquired.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 zmode            ! CDF zMode.
.
.
CALL CDF_get_zmode (id, zmode, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.22 CDF_inquire_cdf

SUBROUTINE CDF_inquire_cdf (

```
INTEGER*4  id,                          ! in  -- CDF  identifier
INTEGER*4  num_dims,                    ! out -- Number of dimensions,  rVariables.
INTEGER*4  dim_sizes(CDF_MAX_DIMS),     ! out -- Dimension sizes,  rVariables.
INTEGER*4  encoding,                    ! out -- Data encoding.
INTEGER*4  majority,                    ! out -- Variable majority.
INTEGER*4  max_rrec,                    ! out -- Maximum record number in the CDF, rVariables.
INTEGER*4  num_rvars,                   ! out -- Number of rVariables in the CDF.
INTEGER*4  max_zrec,                    ! out -- Maximum record number in the CDF, zVariables.
INTEGER*4  num_zvars,                   ! out -- Number of zVariables in the CDF.
INTEGER*4  num_attrs,                   ! out -- Number of attributes in the CDF.
INTEGER*4  status)                      ! out -- Completion status
```

CDF_inquire_cdf inquires the basic characteristics of a CDF. This subroutine expands the original Standard Interface subroutine CDF_inquire by acquiring extra information regarding the zVariables. An application needs to know the number of rVariable dimensions and their sizes before it can access rVariable data. For zVariables, use CDF_get_zvar_numdims and CDF_get_zvar_dimsizes subroutines to acquire each individual zVariable's dimensions and its sizes. Knowing the variable majority can be used to optimize performance and is necessary to properly use the variable hyper functions (for both rVariables and zVariables).

The arguments to CDF_inquire_cdf are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
num_dims	The number of dimensions for the rVariables in the CDF.
dim_sizes	The dimension sizes of the rVariables in the CDF. dim_sizes is a 1-dimensional array containing one element per dimension. Each element of dim_sizes receives the

	corresponding dimension size. For 0-dimensional rVariables this argument is ignored (but must be present).
encoding	The encoding of the variable data and attribute entry data. The encodings are defined in Section 4.6.
majority	The majority of the variable data. The majorities are defined in Section 4.8.
max_rrec	The maximum record number written to an rVariable in the CDF. Note that the maximum record number written is also kept separately for each rVariable in the CDF. The value of max_rrec is the largest of these. Some rVariables may have fewer records actually written
num_rvars	The number of rVariables in the CDF.
max_zrec	The maximum record number written to a zVariable in the CDF. Note that the maximum record number written is also kept separately for each zVariable in the CDF. The value of max_zrec is the largest of these. Some zVariables may have fewer records actually written. CDF_get_zvar_maxwrittenrecnum (Section 6.3.23) can be used to inquire the maximum record written for an individual zVariable.
num_zvars	The number of zVariables in the CDF.
num_attrs	The number of attributes in the CDF.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.22.1. Example(s)

The following example inquires the basic information about a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                      ! CDF identifier.
INTEGER*4 status                  ! Returned status code.
INTEGER*4 num_dims                ! Number of dimensions, rVariables.
INTEGER*4 dim_sizes(CDF_MAX_DIMS)! Dimension sizes, rVariables
                                  ! (allocate to allow the maximum
                                  ! number of dimensions).
INTEGER*4 encoding                ! Data encoding.
INTEGER*4 majority                ! Variable majority.
INTEGER*4 max_rrec                ! Maximum record number among rVariables.
INTEGER*4 num_rvars               ! Number of rVariables in CDF.
INTEGER*4 max_zrec                ! Maximum record number among zVariables.
INTEGER*4 num_zvars               ! Number of zVariables in CDF.
INTEGER*4 num_attrs               ! Number of attributes in CDF.
.
.
CALL CDF_inquire_cdf (id, num_dims, dim_sizes, encoding, majority,
.                     max_rrec, num_rvars, max_zrec, num_zvars, num_attrs,
.                     status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
```

.

6.2.23 CDF_open_cdf

SUBROUTINE CDF_open_cdf (

```
CHARACTER   CDF_name*(*),       ! in  -- CDF file name.
INTEGER*4   id,                 ! out -- CDF  identifier.
INTEGER*4   status)             ! out -- Completion status
```

CDF_open_cdf opens an existing CDF. The CDF is initially opened with only read access. This allows multiple applications to read the same CDF simultaneously. When an attempt to modify the CDF is made, it is automatically closed and reopened with read/write access. (The function will fail if the application does not have or cannot get write access to the CDF.) This routine is identical to the original Standard Interface routine CDF_open.

The arguments to CDF_open_cdf are defined as follows:

CDF_name	The file name of the CDF to open. (Do not specify an extension.) This may be at most CDF_PATHNAME_LEN characters. A CDF file name may contain disk and directory specifications that conform to the conventions of the operating system being used (including logical names on VMS systems and environment variables on UNIX systems). **UNIX:** File names are case-sensitive.
id	The identifier for the opened CDF. This identifier must be used in all subsequent operations on the CDF.
status	The completion status code. Chapter 8 explains how to interpret status codes.

NOTE: CDF_close_cdf must be used to close the CDF before your application exits to ensure that the CDF will be correctly written to disk (see Section 6.2.1).

6.2.23.1. Example(s)

The following example will open a CDF named NOAA1.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 status                        ! Returned status code.
CHARACTER CDF_name*(CDF_PATHNAME_LEN)   ! File name of CDF.

DATA CDF_name/'NOAA1'/
.
.
CALL CDF_open_cdf (CDF_name, id, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
```

.
.

6.2.24 CDF_select_cdf

SUBROUTINE CDF_select_cdf (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 status) ! out -- Completion status

CDF_select_CDF selects an opened CDF as the current CDF. Only one CDF is allowed to be current. To access data from a CDF, that CDF must be selected as the current. This function is needed while operating multiple opened CDFs at the same time. It's not necessary to call this function if only one CDF is opened as it is always the current until the file is closed.

The arguments to CDF_select_cdf are defined as follows:

id	The identifier for the opened CDF. This identifier must be used in all subsequent operations on the CDF.
status	The completion status code. Chapter 8 explains how to interpret status codes.

NOTE: When a CDF is opened, it becomes the current. No CDF is current after CDF_close_CDF is called to close the file

6.2.24.1. Example(s)

The following example will select a CDF named "NOAA1.cdf" as the current CDF while another file "NOAA2.cdf" is also opened.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id1, id2                      ! CDF identifier.
INTEGER*4 status                        ! Returned status code.
CHARACTER CDF_name1*(CDF_PATHNAME_LEN)  ! File name of CDF.
CHARACTER CDF_name2*(CDF_PATHNAME_LEN)  ! File name of CDF.

DATA CDF_name1/'NOAA1'/,CDF_name2/'NOAA1'/
.
.
CALL CDF_open_cdf (CDF_name1, id1, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
CALL CDF_open_cdf (CDF_name2, id2, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
CDF_select_CDF(id1, status)
.
.
```

.

6.2.25 CDF_set_cachesize

SUBROUTINE CDF_set_cachesize (

```
INTEGER*4 id,                ! in  -- CDF identifier.
INTEGER*4 num_buffers,       ! in  -- Number of cache buffers.
INTEGER*4 status)            ! out -- Completion status
```

CDF_set_cachesize specifies the number of cache buffers being used for the dotCDF file when a CDF is open. Refer to the CDF User's Guide for the description of caching scheme used by the CDF library.

The arguments to CDF_set_cachesize are defined as follows:

id — The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

num_buffers — The number of cache buffers.

status — The completion status code. Chapter 8 explains how to interpret status codes.

6.2.25.1. Example(s)

The following example sets the number of cache buffers to 10 to be used for a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                          ! CDF identifier.
INTEGER*4 num_buffers                 ! Number of cache buffers.
INTEGER*4 status                      ! Returned status code.

.
.
num_buffers = 10
CALL CDF_set_cachesize (id, num_buffers, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.26 CDF_set_checksum

SUBROUTINE CDF_set_checksum (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4 checksum,           ! in  -- Checksum mode.
INTEGER*4  status)            ! out -- Completion status
```

CDF_set_checksum specifies the checksum mode of a CDF file. Refer to Section 4.19 for the description of checksum.

The arguments to CDF_set_checksum are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
checksum	The checksum mode.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.26.1. Example(s)

The following example sets checksum mode for a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                          ! CDF identifier.
INTEGER*4 checksum                    ! Checksum mode.
INTEGER*4 status                      ! Returned status code.

.
.
checksum = MD5_CHECKSUM
CALL CDF_set_checksum (id, checksum, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.27 CDF_set_compress_cachesize

SUBROUTINE CDF_set_compress_cachesize (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4  num_buffers,       ! in  -- Number of cache buffers.
INTEGER*4  status)            ! out -- Completion status
```

CDF_set_compress_cachesize specifies the number of cache buffers used for the compression scratch CDF file. Refer to the CDF User's Guide for the description of caching scheme used by the CDF library.

The arguments to CDF_set_compress_cachesize are defined as follows:

id The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

num_buffers The number of cache buffers.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.2.27.1. Example(s)

The following example sets the number of cache buffers to 10 to be used for the compression scratch CDF file.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 num_buffers                   ! Number of cache buffers.
INTEGER*4 status                        ! Returned status code.

.
.
num_buffers = 10
CALL CDF_set_compress_cachesize (id, num_buffers, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.28 CDF_set_compression

SUBROUTINE CDF_set_compression (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4  compress_type,     ! in  -- Compression type.
INTEGER*4  compress_parms(*), ! in  -- Compression parameters.
INTEGER*4  status)            ! out -- Completion status
```

CDF_set_compression specifies the compression information of the CDF. It returns the compression type (method) and, if compressed, the compression parameters and compression rate. CDF compression types/parameters are described in Section 4.10.

The arguments to CDF_set_compression are defined as follows:

id The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

compress_type The compression type.

compress_parms The compression parameters.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.2.28.1. Example(s)

The following example uses GZIP.6 compression for a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 compress_type                 ! Compression type.
INTEGER*4 compress_parms(CDF_MAX_DIMS) ! Compression parameters.
INTEGER*4 status                        ! Returned status code.

.
.
compress_type = GZIP_COMPRESSION
compress_parms(1) = 6
CALL CDF_set_compression (id, compress_type, compress_parms,
1                         status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.29 CDF_set_decoding

SUBROUTINE CDF_set_decoding (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 decoding, ! in -- CDF decoding.
INTEGER*4 status) ! out -- Completion status

CDF_set_decoding specifies the decoding for the data in a CDF. The decodings are described in Section 4.7.

The arguments to CDF_set_decoding are defined as follows:

id The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

decoding The decoding.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.2.29.1. Example(s)

The following example sets the decoding to NETWORK_DECODING for a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 decoding         ! Decoding.
INTEGER*4 status           ! Returned status code.

.
.
decoding = NETWORK_DECODING
CALL CDF_set_decoding (id, decoding, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.30 CDF_set_encoding

SUBROUTINE CDF_set_encoding (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 decoding, ! in -- CDF encoding.
INTEGER*4 status) ! out -- Completion status

CDF_set_encoding specifies the encoding code used for the data in a CDF. The encodings are described in Section 4.6.

The arguments to CDF_set_encoding are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
encoding	The encoding.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.30.1. Example(s)

The following example sets the encoding code to NETWORK_ENCODING to be used for a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 encoding         ! Encoding.
```

```
INTEGER*4 status           ! Returned status code.

.
.
encoding = NETWORK_ENCODING
CALL CDF_set_encoding (id, encoding, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.31 CDF_set_format

SUBROUTINE CDF_set_format (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 format, ! in -- CDF format.
INTEGER*4 status) ! out -- Completion status

CDF_set_format specifies the file format, single or multi-file, of the CDF. The formats are described in Section 4.4.

The arguments to CDF_set_format are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
format	The format.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.31.1. Example(s)

The following example sets the file format to MULTI_FILE_FORMAT for a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 format           ! Format.
INTEGER*4 status           ! Returned status code.

.
.
format = MULTI_FILE_FORMAT
CALL CDF_set_format (id, format, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.32 CDF_set_leapsecondlastupdated

SUBROUTINE CDF_set_leapsecondlastupdated (

```
INTEGER*4  id,              ! in --  CDF  identifier.
INTEGER*4  lastUpdated      ! in --  The date that the last leap second was added to the leap second table.
INTEGER*4  status)          ! out --  Completion status
```

CDF_set_leapsecondlastupdated resets the the eap second last updated date in the CDF. This value must be a valid entry in the currently used leap second table, or zero (0). This value is only relevant to TT2000 data. It is set normally for the older CDFs that have not had that field set.

The arguments to CDF_set_format are defined as follows:

id — The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

lastUpdated — The date that the new leap second was last added to the table.

status — The completion status code. Chapter 8 explains how to interpret status codes.

6.2.32.1. Example(s)

The following example sets the file's last leap second updated date.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 lastupdated      ! The last updated date.
INTEGER*4 status           ! Returned status code.

.
.
lastupdate = 20150701
CALL CDF_set_leapsecondlastupdated (id, lasupdated, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.33 CDF_set_majority

SUBROUTINE CDF_set_majority (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4  majority,          ! in  -- Variable  majority.
INTEGER*4  status)            ! out --  Completion status
```

CDF_set_majority specifies the variable majority, row or column-major, of the CDF. The majorities are described in Section 4.8.

The arguments to CDF_set_majority are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
majority	The variable majority of the CDF.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.33.1. Example(s)

The following example sets the variable majority to ROW_MAJOR for a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 majority    ! Variable majority.
INTEGER*4 status      ! Returned status code.

.
.
majority = ROW_MAJOR
CALL CDF_set_majority (id, majority, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.34 CDF_set_negtoposfp0_mode

SUBROUTINE CDF_set_negtoposfp0_mode (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4 negtoposfp0,        ! in  -- -0.0 to 0.0 mode.
INTEGER*4  status)            ! out --  Completion status
```

CDF_set_negtoposfp0_mode specifies –0.0 to 0.0 mode of the CDF. You can use CDF_get_negtoposfp0_mode subroutine to check the mode. The –0.0 to 0.0 modes are described in Section 4.15.

The arguments to CDF_set_negtoposfp0_mode are defined as follows:

id The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

negtoposfp0The –0.0 to 0.0 mode of the CDF.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.2.34.1. Example(s)

The following example sets the –0.0 to 0.0 mode to NEGtoPOSfp0off for a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 negtoposfp0      ! -0.0 to 0.0 mode.
INTEGER*4 status           ! Returned status code.

.
.
negtoposfp0 = NEGtoPOSfp0off
CALL CDF_set_negtoposfp0_mode (id, negtoposfp0, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.35 CDF_set_readonly_mode

SUBROUTINE CDF_set_readonly_mode (

```
INTEGER*4 id,              ! in  -- CDF identifier.
INTEGER*4 readonly,        ! in  -- Read-only mode of the CDF.
INTEGER*4 status)          ! out --  Completion status
```

CDF_set_readonly_mode specifies the read-only mode for a CDF. You can use CDF_get_readonly_mode to check the mode. The read-only modes are described in Section 4.13.

The arguments to CDF_set_readonly_mode are defined as follows:

id The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

readonly The read-only mode.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.2.35.1. Example(s)

The following example sets the read-only mode to READONLYoff (to allow read/write) for a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 readonly    ! Read-only mode.
INTEGER*4 status      ! Returned status code.

.
.
readonly = READONLYoff
CALL CDF_set_readonly_mode (id, readonly, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.36 CDF_set_stage_cachesize

SUBROUTINE CDF_set_stage_cachesize (

```
INTEGER*4 id,                ! in  -- CDF identifier.
INTEGER*4 num_buffers,       ! in  -- Number of cache buffers.
INTEGER*4 status)            ! out -- Completion status
```

CDF_set_stage_cachesize respecifies the number of cache buffers being used for the staging scratch file a CDF. Refer to the CDF User's Guide for the description of the caching scheme used by the CDF library.

The arguments to CDF_set_stage_cachesize are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
num_buffers	Number of cache buffers.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.36.1. Example(s)

The following example sets the number of stage cache buffers to 10 for a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id              ! CDF identifier.
```

```
INTEGER*4 status           ! Returned status code.
INTEGER*4 num_buffers      ! Number of cache buffers.
.
.
num_buffers = 10
CALL CDF_set_stage_cachesize (id, rec_number, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.2.37 CDF_set_validate

SUBROUTINE CDF_set_validate (

INTEGER*4 validate) ! in -- validate.

CDF_set_validate respecifies the data validation mode for any CDF files that are to be open. Data validation is described in Section 4.20..

The arguments to CDF_set_validate are defined as follows:

validate data validation mode.

6.2.37.1. Example(s)

The following example turns on the data validation when any following CDF files are open.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
.
.
CALL CDF_set_validate (VALIDATEFILEon)
.
.
```

6.2.38 CDF_set_zmode

SUBROUTINE CDF_set_zmode (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 zmode, ! in -- zMode.
INTEGER*4 status) ! out -- Completion status

CDF_set_zmode respecifies the zMode for a CDF file. The zModes are described in Section 4.14.

The arguments to CDF_set_zmode are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
zmode	CDF zMode.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.2.38.1. Example(s)

The following example sets zMode to zMODEon2, all rVariables are viewed as zVariables with NOVARY dimensions being eliminated, for a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
.
.
CALL CDF_set_zmode (id, zMODEon2, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3 Variable

This section provides the variable-specific functions. A variable is identified by its unique name in a CDF or a variable number in either rVariable or zVariable group. To operate a variable, the CDF it resides in must be open.

6.3.1 CDF_close_zvar

SUBROUTINE CDF_close_zvar (

```
INTEGER*4  id,              ! in  --  CDF  identifier.
INTEGER*4  var_num,         ! in  --  zVariable identifier.
INTEGER*4  status)          ! out --  Completion status
```

CDF_close_zvar closes the specified zVariable file from a multi-file format CDF. The variable's cache buffers are flushed before the variable's open file is closed. However, the CDF file is still open.

NOTE: You must close all open variable files to guarantee that all modifications you have made will actually be written to the CDF's file(s). If your program exits, normally or otherwise, without a successful call to CDF_close, the CDF's cache buffers are left unflushed.

The arguments to CDF_close_zvar are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The variable number for the open zVariable's file. This identifier must have been initialized by a call to CDF_create_zvar or CDF_get_var_num.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.1.1. Example(s)

The following example closes an open zVariable "MY_VAR" in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 var_num     ! Variable identifier.
INTEGER*4 status      ! Returned status code.
.
.
var_num = CDF_get_var_num(id, 'MY_VAR')
IF (var_num .LT. 0) CALL UserQuit(..)
.
.
CALL CDF_close_zvar (id, var_num, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.2 CDF_confirm_zvar_existence

INTEGER*4 FUNCTION CDF_confirm_zvar_existence (

```
INTEGER*4  id,                  ! in  -- CDF  identifier.
CHARACTER  var_name*(*))        ! in  -- Variable name.
```

CDF_ confirm_zvar_existence confirms the existence of a zVariable with the specified name in a CDF. If the zVariable does not exist, an error code will be returned.

The arguments to CDF_ confirm_zvar_existence are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

var_name The variable name.

6.3.2.1. Example(s)

The following example will check the existence of zVariable “MY_VAR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 status      ! Returned status code.
.
.
status = CDF_confirm_zvar_existence (id, 'MY_VAR')
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.3 CDF_confirm_zvar_padvalue_exist

INTEGER*4 FUNCTION CDF_confirm_zvar_padvalue_exist (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 var_num) ! in -- Variable number.

CDF_ confirm_zvar_padvalue_exist confirms the existence of an explicitly specified pad value for the specified zVariable in a CDF. If an explicit pad value has not been specified, the informational status code NO_PADVALUE_SPECIFIED will be returned.

The arguments to CDF_ confirm_zvar_padvalue_exist are defined as follows:

id The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

var_num The variable number.

6.3.3.1. Example(s)

The following example will check the existence of the pad value for zVariable “MY_VAR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
```

```
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 var_num     ! Variable number.
INTEGER*4 status      ! Returned status code.
.
.
var_num = CDF_get_var_num(id, 'MY_VAR')
IF (var_num .LT. 1) CALL UserQuit(…..)
Status = CDF_confirm_zvar_padvalue_exist (id, var_num)
IF (status .NE. NO_PADVALUE_SPECIFIED) THEN
   .
   .
END IF
.
.
```

6.3.4 CDF_create_zvar

SUBROUTINE CDF_create_zvar (

```
INTEGER*4   id,                 ! in  -- CDF identifier.
CHARACTER   var_name*(*),       ! in  -- zVariable name.
INTEGER*4   data_type,          ! in  -- Data type.
INTEGER*4   num_elements,       ! in  -- Number of elements (of the data type).
INTEGER*4   num_dims,           ! in  -- Number of dimensions.
INTEGER*4   dim_sizes(*),       ! in  -- Dimension sizes.
INTEGER*4   rec_variance,       ! in  -- Record variance.
INTEGER*4   dim_variances(*),   ! in  -- Dimension variances.
INTEGER*4   var_num,            ! out -- zVariable number.
INTEGER*4   status)             ! out -- Completion status
```

CDF_create_zvar is used to create a new zVariable in a CDF. A variable (rVariable or zVariable) with the same name must not already exist in the CDF.

The arguments to CDF_create_zvar are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_name	The name of the zVariable to create. This may be at most CDF_VAR_NAME_LEN256 characters. Variable names are case-sensitive.
data_type	The data type of the new zVariable. Specify one of the data types defined in Section 4.5.
num_elements	The number of elements of the data type at each value. For character data types (CDF_CHAR and CDF_UCHAR), this is the number of characters in the string (each value consists of the entire string). For all other data types this must always be one (1) - multiple elements at each value are not allowed for non-character data types.
num_dims	The zVariable's number of dimension.

dim_sizes	The zVariable's dimension sizes. Each element of dim_sizes specifies the number of values in corresponding dimension. For 0-dimensional zVariables this argument is ignored (but must be present).
rec_variance	The zVariable's record variance. Specify one of the variances defined in Section 4.9.
dim_variances	The zVariable's dimension variances. Each element of dim_variances specifies the corresponding dimension variance. For each dimension specify one of the variances defined in Section 4.9. For 0-dimensional zVariables this argument is ignored (but must be present).
var_num	The number assigned to the new zVariable. This number must be used in subsequent CDF function calls when referring to this zVariable. An existing zVariable's number may be determined with the CDF_get_var_num function.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.4.1. Example(s)

The following example will create several zVariables in a CDF. In this case, EPOCH is a 0-dimensional of CDF_EPOCH data type, LAT a 1-dimensional of 2 elements of CDF_INT2 data type, LON a 2-dimensional with 2 by 3 of CDF_INT2 data type and TMP a 2 dimensional with 2 by 3 of CDF_REAL4 data type.

```
      .
      .
      INCLUDE '<path>cdf.inc'
      .
      .
      INTEGER*4 id                    ! CDF identifier.
      INTEGER*4 status                ! Returned status code.

      INTEGER*4 EPOCH_rec_vary        ! EPOCH record variance.
      INTEGER*4 LAT_rec_vary          ! LAT record variance.
      INTEGER*4 LON_rec_vary          ! LON record variance.
      INTEGER*4 TMP_rec_vary          ! TMP record variance.
      INTEGER*4 EPOCH_dim_varys(2)    ! EPOCH dimension variances.
      INTEGER*4 LAT_dim_varys(2)      ! LAT dimension variances.
      INTEGER*4 LON_dim_varys(2)      ! LON dimension variances.
      INTEGER*4 TMP_dim_varys(2)      ! TMP dimension variances.
      INTEGER*4 EPOCH_var_num         ! EPOCH variable number.
      INTEGER*4 LAT_var_num           ! LAT zVariable number.
      INTEGER*4 LON_var_num           ! LON zVariable number.
      INTEGER*4 TMP_var_num           ! TMP zVariable number.
      INTEGER*4 num_dims_EPOCH, num_dims_LAT, num_dims_LON,
     1          num_dims_TEMP         ! Number of dimensions.
      INTEGER*4 dim_sizes_EPOCH(1), dim_sizes_LAT(1),
     1          dim_sizes_LON(2), dim_sizes_TEMP(2)
                                      ! Dimesion sizes.

      DATA num_dims_EPOCH/0/, num_dims_LAT/1/,
     1     num_dims_LON/2/, num_dims_TEMP/2/

      DATA dim_sizes_EPOCH/1/, dim_sizes_LAT/3/,
     1     dim_sizes_LON/2,3/, dim_sizes_TEMP/2,3/
```

```
 DATA EPOCH_rec_vary/VARY/, LAT_rec_vary/NOVARY/,
1     LON_rec_vary/NOVARY/, TMP_rec_vary/VARY/

DATA EPOCH_dim_varys/NOVARY/, LAT_dim_varys/VARY/,
1     LON_dim_varys/VARY,VARY/, TMP_dim_varys/VARY,VARY/
 .
 .
 CALL CDF_create_zvar (id, 'EPOCH', CDF_EPOCH, 1, num_dims_EPOCH,
1                      dim_sizes_EPOCH,
2                      EPOCH_rec_vary, EPOCH_dim_varys, POCH_var_num, status)
 IF (status .NE. CDF_OK) CALL UserStatusHandler (status)

 CALL CDF_create_zvar (id, 'LATITUDE', CDF_INT2, 1, num_dims_LAT,
1                      dim_sizes_LAT,
2                      LAT_rec_vary, LAT_dim_varys, LAT_var_num, status)
 IF (status .NE. CDF_OK) CALL UserStatusHandler (status)

 CALL CDF_create_zvar (id, 'LONGITUDE', CDF_INT2, 1, num_dims_LON,
1                      dim_sizes_LON,
2                      LON_rec_vary, LON_dim_varys, LON_var_num, status)
 IF (status .NE. CDF_OK) CALL UserStatusHandler (status)

 CALL CDF_create_zvar (id, 'TEMPERATURE', CDF_REAL4, 1, num_dims_TEMP,
1                      dim_sizes_TEMP,
2                      TMP_rec_vary, TMP_dim_varys, TMP_var_num, status)
 IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
 .
 .
```

6.3.5 CDF_delete_zvar

SUBROUTINE CDF_delete_zvar (

```
INTEGER*4 id,          ! in  -- CDF identifier.
INTEGER*4 var_num,     ! in  -- zVariable number.
INTEGER*4 status)      ! out -- Completion status
```

CDF_delete_zvar deletes the specified zVariable from a CDF

The arguments to CDF_delete_zvar are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.5.1. Example(s)

The following example will delete the zVariable “MY_VAR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 status                        ! Returned status code.

.
.
CALL CDF_delete_zvar (id, CDF_get_var_num(id, 'MY_VAR'), status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.6 CDF_delete_zvar_recs

SUBROUTINE CDF_delete_zvar_recs (

```
INTEGER*4  id,          ! in  -- CDF  identifier.
INTEGER*4  var_num,     ! in  -- zVariable number.
INTEGER*4  start_rec,   ! in  -- Starting record number.
INTEGER*4  end_rec,     ! in  -- Ending record number.
INTEGER*4  status)      ! out -- Completion status
```

CDF_delete_zvar_recs deletes a range of data records from the specified zVariable in a CDF. If this is a variable with sparse records, the remaining records after deletion will not be renumbered.[20]

The arguments to CDF_delete_zvar_recs are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
start_rec	The starting record number to delete.
end_rec	The ending record number to delete.
status	The completion status code. Chapter 8 explains how to interpret status codes.

[20] Normal variables without sparse records have contiguous physical records. Once a section of the records get deleted, the remaining ones automatically fill the gap.

6.3.6.1. Example(s)

The following example will delete 10 records (from record number 10 to 19) from the zVariable “MY_VAR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 status                        ! Returned status code.

.
.
CALL CDF_delete_zvar_recs (id, CDF_get_var_num(id, 'MY_VAR'), 10, 19, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.7 CDF_delete_zvar_recs_renumber

SUBROUTINE CDF_delete_zvar_recs_renumber (

```
INTEGER*4  id,          ! in  -- CDF  identifier.
INTEGER*4  var_num,     ! in  -- zVariable number.
INTEGER*4  start_rec,   ! in  -- Starting record number.
INTEGER*4  end_rec,     ! in  -- Ending record number.
INTEGER*4  status)      ! out -- Completion status
```

CDF_delete_zvar_recs_renumber deletes a range of data records from the specified zVariable in a CDF. If this is a variable with sparse records, the remaining records after deletion will be renumbered, just like non-sparse variable’s records.

The arguments to CDF_delete_zvar_recs_renumber are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
start_rec	The starting record number to delete.
end_rec	The ending record number to delete.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.7.1. Example(s)

The following example will delete 10 records (from record number 10 to 19) from the zVariable “MY_VAR” in a CDF. If the last record number is 100, then after the deletion, the record will be 89.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 status                        ! Returned status code.

.
.
CALL CDF_delete_zvar_recs_renumber (id, CDF_get_var_num(id, 'MY_VAR'), 10,
C                                   19, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.8 CDF_get_num_zvars

SUBROUTINE CDF_get_num_zvars (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 vars, ! out – Number of zVariables.
INTEGER*4 status) ! out -- Completion status

CDF_get_num_zvars acquires the total number of zVariables in a CDF.

The arguments to CDF_get_num_zvars are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
vars	The number of zVariables.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.8.1. Example(s)

The following example acquires the total number of zVariables in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
```

```
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 vars        ! zVariables.
INTEGER*4 status      ! Returned status code.

.
.
CALL CDF_get_num_zvars (id, vars, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.9 CDF_get_var_allrecords_varname

SUBROUTINE CDF_get_var_allrecords_varname (

```
INTEGER*4  id,                    ! in -- CDF  identifier.
CHARACTER var_name*(*),           ! in -- Variable name.
<type>     buffer,                ! in --  buffer (<type> is dependent on the data type of the zVariavle).
INTEGER*4  status)                ! out --  Completion status
```

CDF_get_var_allrecords_varname reads the whole records for the specified variable in a CDF. Make sure that the buffer is big enough to hold the returned data. Otherwise, a segmentation fault may happen. Since a variable name is unique in a CDF, this function can be called for either a rVariable or zVariable. For zVariables, this function is similar to CDF_get_zvar_allrecords_varid, only that function requires a variable id.

The arguments to CDF_get_var_allrecords_varname are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_name	The variable name.
buffer	The buffer holding the written record data.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.9.1. Example(s)

The following example reads the while records for zVariable “MY_VAR” in a CDF. Assuming there are 100 records, and each record is 1-dimension with 3 REAL*8 value.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
REAL*8 buffer(3,100)       ! Buffer holding the record data.
```

```
INTEGER*4 status           ! Returned status code.


CALL CDF_get_var_allrecords_varname (id, 'MY_VAR',
1                                    buffer, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.10 CDF_get_var_num

INTEGER*4 FUNCTION CDF_get_var_num (

INTEGER*4 id, ! in-- CDF identifier.
CHARACTER var_name*(*)); ! in-- Variable name.

CDF_get_var_num is used to determine the number associated with the specified variable name. If the Variable is found, CDF_get_var_num returns its number - which will be equal to or greater than one (1). If an error occurs (e.g., the Variable does not exist in the CDF), an error code (of type INTEGER*4) is returned. Error codes are less than zero (0).

Initially, this function can only handle rVariables. As the variable name is unique in a CDF file, no two variables, either rVariable or zVariable can have the same name. This function is now extended to include zVariable. The variable number it returns represents the number in either the rVariable group or zVariable group wherever the variable exists.

The arguments to CDF_get_var_num are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
varName	The name of the Variable for which to search. This may be at most CDF_VAR_NAME_LEN256 characters. Variable names are case-sensitive.

CDF_get_var_num may be used as an embedded function call when a Variable number is needed. CDF_get_var_num is declared in cdf.inc. (Fortran functions must be declared so that the returned value is interpreted correctly.)

6.3.10.1. Example(s)

In the following example CDF_get_var_num is used as an embedded function call when inquiring about an rVariable and a zVariable.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                          ! CDF identifier.
INTEGER*4 status                      ! Returned status code.
CHARACTER var_name1*(CDF_VAR_NAME_LEN256)   ! rVariable name.
CHARACTER var_name2*(CDF_VAR_NAME_LEN256)   ! zVariable name.
```

```
 INTEGER*4 data_type1, data_type1      ! Data type of the rVariable.
 INTEGER*4 num_elems1, num_elems2      ! Number of elements (of the
                                       ! data type).
 INTEGER*4 rec_vary1, rec_vary2        ! Record variance.
 INTEGER*4 num_dims2                   ! Number of dimensions
 INTEGER*4 dim_sizes2(CDF_MAX_DIMS)    ! Dimension sizes
 INTEGER*4 dim_variances1(CDF_MAX_DIMS)! Dimension variances.
 INTEGER*4 dim_variances2(CDF_MAX_DIMS)! Dimension variances..
 .
 CALL CDF_var_inquire (id, CDF_get_var_num(id,'LATITUDE'), var_name1,
1                      data_type1, num_elems1, rec_vary1, dim_variances1,
2                      status)
 IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
 CALL CDF_inquire_zvar (id, CDF_get_var_num(id,'LONGITUDE'), var_name1,
1                       data_type2, num_elems2, num_dims2, dim_sizes2,
2                       rec_vary2, dim_variances2, status)
 IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
 .
 .
```

In this example the rVariable named LATITUDE was inquired. Note that if LATITUDE did not exist in the CDF, the call to CDF_get_var_num would have returned an error code. Passing that error code to CDF_inquire_rvar as an rVariable number would have resulted in CDF_inquire_rvar also returning an error code. Also note that the name written into var_name is already known (LATITUDE). In some cases the rVariable names will be unknown – CDF_var_inquire would be used to determine them. CDF_var_inquire is described in Section 5.24.

6.3.11 CDF_get_var_rangerecords_name

SUBROUTINE CDF_get_var_rangerecords_name (

```
INTEGER*4  id,                  ! in -- CDF  identifier.
CHARACTER*256 var_name,         ! in -- Variable name.
INTEGER*4 num_recs,             ! in –  Total record number to write.
INTEGER*4 num_recs,             ! in –  Total record number to write.
<type>         buffer,          ! in --  buffer (<type> is dependent on the data type of the zVariavle).
INTEGER*4  status)              ! out --  Completion status
```

CDF_get_var_rangerecords_name reads a range of written records for the specified variable in a CDF. Make sure that the buffer is big enough to hold the returned data. Otherwise, a segmentation fault may occur. Since a variable name is unique in a CDF, this function can be called for either a rVariable or zVariable. For zVariables, this function is similar to CDF_get_zvar_rangerecords_varid, only that function requires a variable id.

The arguments to CDF_get_var_rangerecords_name are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_name	The variable name.
start_rec	The starting record number to read.

stop_rec The stopping record number to read.

buffer The buffer holding the returned record data.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.3.11.1. Example(s)

The following example reads 100 records, from record 10 to 109, for zVariable "MY_VAR" in a CDF. Assuming that each record is 1-dimension with 3 REAL*8 value.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
REAL*8 buffer(3,100)       ! Buffer holding the record data.
INTEGER*4 status           ! Returned status code.

.
CALL CDF_get_var_rangerecords_name (id, 'MY_VAR',
1                                   10, 109, buffer, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.12 CDF_get_vars_maxwrittenrecnums

SUBROUTINE CDF_get_vars_maxwrittenrecnums (

```
INTEGER*4 id,              ! in  -- CDF identifier.
INTEGER*4 rvars_maxrec,    ! out -- Maximum record number among rVariables.
INTEGER*4 zvars_maxrec,    ! out -- Maximum record number among zVariables.
INTEGER*4 status)          ! out -- Completion status
```

CDF_get_vars_maxwrittenrecnums inquires the maximum written record numbers among all rVariables and zVariables in a CDF.

The arguments to CDF_get_vars_maxwrittenrecnums are defined as follows:

id The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

rvars_maxrec Maximum record number among rVariables.

zvars_maxrec Maximum record number among zVariables.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.3.12.1. Example(s)

The following example acquires the maximum record numbers from all rVariables and zVariables in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 rvars_maxrec     ! Maximum record number among rVariables.
INTEGER*4 zvars_maxrec     ! Maximum record number among zVariables.
.
.
CALL CDF_get_vars_maxwrittenrecnums (id, rvars_maxrec, zvars_maxrec, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.13 CDF_get_zvar_allrecords_varid

SUBROUTINE CDF_get_zvar_allrecords_varid (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 var_num, ! in -- zVariable number.
<type> buffer, ! out -- buffer (<type> is dependent on the data type of the zVariavle).
INTEGER*4 status) ! out -- Completion status

CDF_get_zvar_allrecords_varid reads the total number of written records for the specified zVariable in a CDF. Make sure that the buffer is big enough to hold the all records. Otherwise, a segmentation fault can happen.

The arguments to CDF_get_zvar_allrecords_varid are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
buffer	The buffer holding the returned record data.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.13.1. Example(s)

The following example reads the whole record data for zVariable “MY_VAR” in a CDF. Assuming that there are 100 records, and each record is 1-dimension with 3 REAL*8 value.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
REAL*8 buffer(3,100)       ! Buffer holding the record data.
INTEGER*4 status           ! Returned status code.

.
.
CALL CDF_get_zvar_allrecords_varid (id, CDF_get_var_num(id, 'MY_VAR'),
1                                   buffer, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.14 CDF_get_zvar_allocrecs

SUBROUTINE CDF_get_zvar_allocrecs (

```
INTEGER*4  id,              ! in -- CDF  identifier.
INTEGER*4 var_num,          ! in -- zVariable number.
INTEGER*4 num_recs,         ! out -- Number of allocated records.
INTEGER*4  status)          ! out --  Completion status
```

CDF_get_zvar_allocrecs inquires the number of records allocated for the specified zVariable in a CDF. Refer to the CDF User's Guide for the description of allocating variable records in a single-file CDF.

The arguments to CDF_get_zvar_allocrecs are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
Num_recs	The number of records allocated for the variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.14.1. Example(s)

The following example acquires the number of records allocated for zVariable "MY_VAR" in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
```

```
   INTEGER*4 num_recs   ! Number of allocated records.
   INTEGER*4 status     ! Returned status code.

   .
   .
   CALL CDF_get_zvar_allocrecs (id, CDF_get_var_num(id, 'MY_VAR'),
  1                             num_recs, status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
   .
   .
```

6.3.15 CDF_get_zvar_blockingfactor

SUBROUTINE CDF_get_zvar_blockingfactor (

```
INTEGER*4  id,              ! in -- CDF  identifier.
INTEGER*4 var_num,          ! in --  zVariable number.
INTEGER*4 bf,               ! out --  Variable blocking factor.
INTEGER*4  status)          ! out --  Completion status
```

CDF_get_zvar_blockingfactor inquires the blocking factor for the specified zVariable in a CDF. Refer to the CDF User's Guide for the description of the blocking factor.

The arguments to CDF_get_zvar_blockingfactor are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
bf	The blocking factor of the variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.15.1. Example(s)

The following example acquires the blocking factor for zVariable "MY_VAR" in a CDF.

```
   .
   .
   INCLUDE '<path>cdf.inc'
   .
   .
   INTEGER*4 id         ! CDF identifier.
   INTEGER*4 bf         ! Blocking factor.
   INTEGER*4 status     ! Returned status code.

   .
   .
   CALL CDF_get_zvar_blockingfactor (id, CDF_get_var_num(id, 'MY_VAR'),
```

```
1                                    bf, status)
 IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
 .
 .
```

6.3.16 CDF_get_zvar_cachesize

SUBROUTINE CDF_get_zvar_cachesize (

```
INTEGER*4 id,           ! in -- CDF identifier.
INTEGER*4 var_num,      ! in -- zVariable number.
INTEGER*4 num_buffers,  ! out -- Variable number of cache buffers.
INTEGER*4 status)       ! out -- Completion status
```

CDF_get_zvar_cachesize inquires the number of cache buffers being for the specified zVariable in a CDF. This operation is not applicable to a single-file CDF. Refer to the CDF User's Guide for the description about caching scheme used by the CDF library.

The arguments to CDF_get_zvar_cachesize are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
num_buffers	The number of cache buffers.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.16.1. Example(s)

The following example acquires the number of cache buffers used for zVariable "MY_VAR" in a CDF.

```
 .
 .
 INCLUDE '<path>cdf.inc'
 .
 .
 INTEGER*4 id         ! CDF identifier.
 INTEGER*4 num_buffers! Number of cache buffers.
 INTEGER*4 status     ! Returned status code.

 .
 .
 CALL CDF_get_zvar_cachesize (id, CDF_get_var_num(id, 'MY_VAR'),
1                             num_buffers, status)
 IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
 .
 .
```

6.3.17 CDF_get_zvar_compression

SUBROUTINE CDF_get_zvar_compression (

```
INTEGER*4  id,                ! in -- CDF  identifier.
INTEGER*4 var_num,            ! in --  zVariable number.
INTEGER*4 compress_type,      ! out --  Compression type.
INTEGER*4 compress_parms,     ! out --  Compression parameters.
INTEGER*4 compress_percent,   ! out --  Compression percentage.
INTEGER*4  status)            ! out --  Completion status
```

CDF_get_zvar_compression inquires the compression type/parameters of the specified zVariable in a CDF. Refer to Section 4.10 for the description of the CDF supported compression types/parameters. The compression percentage is the result of the compressed size from all variable records divided by its original, uncompressed varible size.

The arguments to CDF_get_zvar_compression are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
compress_type	The compression type.
compress_parms	The compression parameters.
compress_percent	The compression percentage.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.17.1. Example(s)

The following example acquires the compression type/parameters for zVariable “MY_VAR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                    ! CDF identifier.
INTEGER*4 ctype                 ! Compression type.
INTEGER*4 cparms(CDF_MAX_DIMS)  ! Compression parameters.
INTEGER*4 cpercent              ! Compression percentage.
INTEGER*4 status                ! Returned status code.

.
.
CALL CDF_get_zvar_compression (id, CDF_get_var_num(id, 'MY_VAR'),
1                              ctype, cparms, cpercent, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
```

.
.

6.3.18 CDF_get_zvar_data

SUBROUTINE CDF_get_zvar_data (

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  var_num,         ! in  -- zVariable number.
INTEGER*4  rec_num,         ! in  -- Record number.
INTEGER*4  indices(*),      ! in  -- Dimension indices.
<type>     value,           ! out -- Value (<type> is dependent on the data type of the zVariable).
INTEGER*4  status)          ! out -- Completion status
```

CDF_get_zvar_data is used to read a single value from a zVariable. CDF_hyper_get_zvar_data may be used to read more than one zVariable values with a single call (see Section 6.3.38).

The arguments to CDF_get_zvar_data are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable from which to read. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
rec_num	The record number at which to read.
indices	The array indices within the specified record at which to read. Each element of indices specifies the corresponding dimension index. For 0-dimensional zVariables this argument is ignored (but must be present).
value	The value read. This buffer must be large enough to hold the value. CDF_inquire_zvar would be used to determine the zVariable's data type and number of elements (of that data type) at each value. The value is read from the CDF and placed at memory address value. **WARNING:** If the zVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the zVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.18.1. Example(s)

The following example reads and hold an entire record of data from zVariable “Temperature” in a CDF. This zVariable is 3-dimensional with sizes [180,91,10]. The record variance is VARY, the dimension variances are [VARY,VARY,VARY], and the data type is CDF_REAL4.

```
.
.
INCLUDE '<path>cdf.inc'
```

```
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
REAL*4 tmp(180,91,10)      ! Temperature values.
INTEGER*4 indices(3)       ! Dimension indices.
INTEGER*4 var_n            ! zVariable number.
INTEGER*4 rec_num          ! Record number.
INTEGER*4 d1, d2, d3       ! Dimension index values.
.
.
var_n = CDF_get_var_num (id, 'Temperature')
IF (var_n .LT. 1) CALL UserStatusHandler (var_n)   ! If less than one (1),
                                                   ! then it is actually a
                                                   ! warning/error code.
rec_num = 13

DO d1 = 1, 180
  indices(1) = d1
  DO d2 = 1, 91
     indices(2) = d2
     DO d3 = 1, 10
       indices(3) = d3
       CALL CDF_get_zvar_data (id, var_n, rec_num, indices, tmp(d1,d2,d3),
1                              status)
       IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
     END DO
  END DO
END DO
.
.
```

6.3.19 CDF_get_zvar_datatype

SUBROUTINE CDF_get_zvar_datatype (

```
INTEGER*4 id,              ! in  -- CDF identifier.
INTEGER*4 var_num,         ! in  -- zVariable number.
INTEGER*4 data_type,       ! out -- Data type.
INTEGER*4 status)          ! out -- Completion status
```

CDF_get_zvar_datatype is used to acquires the data type of the specified zVariable in a CDF. Refer to Section 4.5 for the description of the CDF data types.

The arguments to CDF_get_zvar_datatype are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable from which to read. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
data_type	The data type of the variable data.

status — The completion status code. Chapter 8 explains how to interpret status codes.

6.3.19.1. Example(s)

The following example acquires the data type of zVariable “Temperature” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 data_type        ! Data type.
.
.
CALL CDF_get_zvar_datatype (id, CDF_get_var_num (id, 'Temperature'),
1                           data_type, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.20 CDF_get_zvar_dimsizes

SUBROUTINE CDF_get_zvar_dimsizes (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4  var_num,           ! in  -- zVariable number.
INTEGER*4  dim_sizes(*),      ! out -- Dimension sizes.
INTEGER*4  status)            ! out -- Completion status
```

CDF_get_zvar_dimsizes acquires the size of each dimension for the specified zVariable in a CDF. For 0-dimensional zVariables, this operation is not applicable.

The arguments to CDF_get_zvar_dimsizes are defined as follows:

id — The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

var_num — zVariable number.

dim_sizes — Dimension sizes.

status — The completion status code. Chapter 8 explains how to interpret status codes.

6.3.20.1. Example(s)

The following example acquires the dimension sizes for zVariable “MY_VAR” in a CDF.

```
      .
      .
      INCLUDE '<path>cdf.inc'
      .
      .
      INTEGER*4 id                          ! CDF identifier.
      INTEGER*4 status                      ! Returned status code.
      INTEGER*4 dim_sizes(CDF_MAX_DIMS)     ! Dimension sizes.
      .
      .
      CALL CDF_get_zvar_dimsizes (id, CDF_get_var_num(id, 'MY_VAR'), dim_sizes,
     1                            status)
      IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
      .
      .
```

6.3.21 CDF_get_zvar_dimvariances

SUBROUTINE CDF_get_zvar_dimvariances (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4  var_num,           ! in  -- zVariable number.
INTEGER*4  dim_varys(*),      ! out -- Dimension variances.
INTEGER*4  status)            ! out -- Completion status
```

CDF_get_zvar_dimvariances acquires the dimension variances of the specified zVariable in a CDF. For 0-dimensional zVariable, this operation is not applicable. Refer to Section 4.9 for the description of the CDF variable's dimension variances.

The arguments to CDF_get_zvar_dimvariances are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable from which to read. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
dim_varys	The dimension variances.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.21.1. Example(s)

The following example acquires the dimension variances for zVariable "Temperature" in a CDF.

```
      .
      .
      INCLUDE '<path>cdf.inc'
      .
      .
```

```
   INTEGER*4 id                      ! CDF identifier.
   INTEGER*4 status                  ! Returned status code.
   INTEGER*4 dim_varys(CDF_MAX_DIMS)! Dimension variances.
   .
   .
   CALL CDF_get_zvar_dimvariances (id, CDF_get_var_num (id, 'Temperature'),
  1                                dim_varys, status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
   .
   .
```

6.3.22 CDF_get_zvar_maxallocrecnum

SUBROUTINE CDF_get_zvar_maxallocrecnum (

```
INTEGER*4 id,          ! in  -- CDF identifier.
INTEGER*4 var_num,     ! in  -- zVariable number.
INTEGER*4 rec_num,     ! out -- Maximum allocated record number.
INTEGER*4 status)      ! out -- Completion status
```

CDF_get_zvar_maxallocrecnum acquires the maximum record number allocated for the specified zVariable in a CDF.

The arguments to CDF_get_zvar_maxallocrecnum are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable from which to read. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
rec_num	The maximum record number allocated.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.22.1. Example(s)

The following example acquires the maximum record number allocated for zVariable “Temperature” in a CDF.

```
   .
   .
   INCLUDE '<path>cdf.inc'
   .
   .
   INTEGER*4 id               ! CDF identifier.
   INTEGER*4 status           ! Returned status code.
   INTEGER*4 rec_num          ! Maximum allocated record number.
   .
   .
   CALL CDF_get_zvar_maxallocrecnum (id, CDF_get_var_num (id, 'Temperature'),
  1                                  rec_num, status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
```

.
.

6.3.23 CDF_get_zvar_maxwrittenrecnum

SUBROUTINE CDF_get_zvar_maxwrittenrecnum (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4  var_num,           ! in  -- zVariable number.
INTEGER*4  rec_num,           ! out  --  Maximum written record number.
INTEGER*4  status)            ! out --  Completion status
```

CDF_get_zvar_maxwrittenrecnum acquires the maximum record number written for the specified zVariable in a CDF.

The arguments to CDF_get_zvar_maxwrittenrecnum are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable from which to read. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
rec_num	The maximum record number written.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.23.1. Example(s)

The following example acquires the maximum record number written for zVariable “Temperature” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 rec_num          ! Maximum written record number.
.
.
CALL CDF_get_zvar_maxwrittenrecnum (id, CDF_get_var_num (id, 'Temperature'),
1                                   rec_num, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.24 CDF_get_zvar_name

SUBROUTINE CDF_get_zvar_name (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4  var_num,           ! in  -- zVariable number.
CHARACTER  var_name*(*),      ! out -- zVariable name.
INTEGER*4  status)            ! out -- Completion status
```

CDF_get_zvar_name acquires the name of the specified zVariable, by its number, in a CDF.

The arguments to CDF_get_zvar_name are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable from which to read. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
var_name	The name of the variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.24.1. Example(s)

The following example acquires the name of the zVariable, numbered 2 in the zVariable group, in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                                  ! CDF identifier.
INTEGER*4 status                              ! Returned status code.
INTEGER*4 var_num                             ! zVariable number.
INTEGER*4 var_name*(CDF_VAR_NAME_LEN256)      ! zVariable name.
.
.
rec_num = 2
CALL CDF_get_zvar_name (id, var_num, var_name, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.25 CDF_get_zvar_numdims

SUBROUTINE CDF_get_zvar_numdims (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4  var_num,           ! in  -- zVariable number.
```

```
INTEGER*4  num_dims,          ! out  --  Number of dimensions.
INTEGER*4  status)            ! out --  Completion status
```

CDF_get_zvar_numdims acquires the number of dimensions for the specified zVariable in a CDF.

The arguments to CDF_get_zvar_numdims are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	zVariable number.
num_dims	Number of dimensions.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.25.1. Example(s)

The following example acquires the number of dimensions for zVariable “MY_VAR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 num_dims         ! Dimension sizes.
.
.
CALL CDF_get_zvar_numdims (id, CDF_get_var_num(id, 'MY_VAR'), num_dims,
1                          status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.26 CDF_get_zvar_numelems

SUBROUTINE CDF_get_zvar_numelems (

```
INTEGER*4  id,                ! in  --  CDF  identifier.
INTEGER*4  var_num,           ! in  --  zVariable number.
INTEGER*4  num_elems,         ! out  -- Number of elements.
INTEGER*4  status)            ! out --  Completion status
```

CDF_get_zvar_numelems acquires the number of elements for each data value of the specified zVariable in a CDF. For character data type (CDF_CHAR and CDF_UCHAR), the number of elements is the number of characters in the string. (Each value consists of the entire string.) For other data types, the number of elements will always be one (1).

The arguments to CDF_get_zvar_numelems are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable from which to read. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
num_elems	The number of elements.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.26.1. Example(s)

The following example acquires the number of elements for the data values for zVariable “Temperature” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 num_elems        ! Number of elements.
.
.
CALL CDF_get_zvar_numelems (id, CDF_get_var_num (id, 'Temperature'),
1                           num_elems, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.27 CDF_get_zvar_numrecs_written

SUBROUTINE CDF_get_zvar_numrecs (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4  var_num,           ! in  -- zVariable number.
INTEGER*4  num_records,       ! out -- Number of written records.
INTEGER*4  status)            ! out -- Completion status
```

CDF_get_zvar_numrecs_written acquires the number of records written for the specified zVariable in a CDF. This number may not correspond to the maximum record written if the zVariable has sparse records.

The arguments to CDF_get_zvar_numrecs_written are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable from which to read. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
num_records	The number of written records.

status — The completion status code. Chapter 8 explains how to interpret status codes.

6.3.27.1. Example(s)

The following example acquires the number of written records for zVariable “Temperature” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 num_records      ! Number of written records.
.
.
CALL CDF_get_zvar_numrecs_written (id, CDF_get_var_num (id, 'Temperature'),
1                                  num_records, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.28 CDF_get_zvar_padvalue

SUBROUTINE CDF_get_zvar_padvalue (

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  var_num,         ! in  -- zVariable number.
<type>  pad_value,          ! out -- Pad value.
INTEGER*4  status)          ! out -- Completion status
```

CDF_get_zvar_padvalue acquires the pad value of the specified zVariable in a CDF. If a pad value has not been explicitly specified for the zVariable through CDF_set_zvar_padvalue or something similar from the Internal Interface function, the informational status code NO_PADVALUE_SPECIFIED will be returned and the default pad value for the variable’s data type will be placed in the pad value buffer provided.

The arguments to CDF_get_zvar_padvalue are defined as follows:

id — The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

var_num — The number of the zVariable from which to read. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).

pad_value — The pad value.

status — The completion status code. Chapter 8 explains how to interpret status codes.

6.3.28.1. Example(s)

The following example acquires acquire the pad value from zVariable “MY_VAR”, a CDF_INT4 type variable in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 pad_value        ! Pad value.
.
.
CALL CDF_get_zvar_padvalue (id, CDF_get_var_num (id, 'MY_VAR'),
1                           pad_value, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.29 CDF_get_zvar_rangerecords_varid

SUBROUTINE CDF_get_zvar_arangerecords_varid (

```
INTEGER*4  id,              ! in -- CDF  identifier.
INTEGER*4 var_num,          ! in -- zVariable number.
INTEGER*4 start_rec,        ! in – Starting record number.
INTEGER*4 stop_rec,         ! in – Stopping record number.
<type>         buffer,      ! out --  buffer (<type> is dependent on the data type of the zVariavle).
INTEGER*4  status)          ! out --  Completion status
```

CDF_get_zvar_rangercords_varid reads a range of the written records for the specified zVariable in a CDF. Make sure that the buffer is big enough to hold the all records. Otherwise, a segmentation fault can happen.

The arguments to CDF_get_zvar_rangerecords_varid are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
start_rec	The starting record number.
stop_rec	The stopping record number.
buffer	The buffer holding the returned record data.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.29.1. Example(s)

The following example reads 100 records, from record number 10 to 109, for zVariable "MY_VAR" in a CDF. Assuming that there are 100 records, and each record is 1-dimension with 3 REAL*8 value.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
REAL*8 buffer(3,100)       ! Buffer holding the record data.
INTEGER*4 status           ! Returned status code.

.
.
CALL CDF_get_zvar_rangerecords_varid (id, CDF_get_var_num(id, 'MY_VAR'),
1                                     10, 109, buffer, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.30 CDF_get_zvar_recorddata

SUBROUTINE CDF_get_zvar_recorddata (

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  var_num,         ! in  -- zVariable number.
INTEGER*4  rec_num,         ! in  -- Record number.
<type>  buffer,             ! out -- Record data buffer.
INTEGER*4  status)          ! out -- Completion status
```

CDF_get_zvar_recorddata acquires an entire record at a given record number for the specified zVariable in a CDF. The buffer should be large enough to hold the entire data values for the variable. The retrieved data values in the buffer are in the order that corresponds to the variable majority defined for the CDF.

The arguments to CDF_get_zvar_recorddata are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable from which to read. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
rec_num	The record number of the zVariable from which to read.
buffer	The record buffer to hold the data values from an entire record.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.30.1. Example(s)

The following example acquires an entire record, at numbered 5, for zVariable “MY_VAR”, a 2-dimensional variable (2 by 3) of CDF_INT4 data type, in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 buffer(2,3)      ! Record buffer.
.
.
CALL CDF_get_zvar_recorddata (id, CDF_get_var_num (id, 'MY_VAR'), 5,
1                              buffer, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.31 CDF_get_zvar_recvariance

SUBROUTINE CDF_get_zvar_recvariance (

```
INTEGER*4  id,                ! in  --  CDF  identifier.
INTEGER*4  var_num,           ! in  --  zVariable number.
INTEGER*4  rec_vary,          ! out --  Record variance.
INTEGER*4  status)            ! out --  Completion status
```

CDF_get_zvar_recvariance acquires the record variance of the specified zVariable in a CDF. Refer to Section 4.9 for the description of the CDF variable’s record variance.

The arguments to CDF_get_zvar_recvariance are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable from which to read. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
rec_vary	The record variance.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.31.1. Example(s)

The following example acquires the record variance for zVariable “Temperature” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 rec_vary         ! Record variance.
.
.
CALL CDF_get_zvar_recvariance (id, CDF_get_var_num (id, 'Temperature'),
1                               rec_vary, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.32 CDF_get_zvar_reservepercent

SUBROUTINE CDF_get_zvar_reservepercent (

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  var_num,         ! in  -- zVariable number.
INTEGER*4  res_percent,     ! out  -- Reserve percentage.
INTEGER*4  status)          ! out -- Completion status
```

CDF_get_zvar_reservepercent acquires the reserve percentage being used for the specified zVariable in a CDF. This operation only applies to compressed zVariables. Refer to the CDF User's Guide for the description of the reserve scheme used by the CDF library.

The arguments to CDF_get_zvar_reservepercent are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable from which to read. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
res_percent	The reserve percentage.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.32.1. Example(s)

The following example acquires the reserve percentage for the compressed zVariable "Temperature" in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
```

```
INTEGER*4 status           ! Returned status code.
INTEGER*4 res_percent      ! Reserve percentage.
.
.
CALL CDF_get_zvar_reservepercent (id, CDF_get_var_num (id, 'Temperature'),
1                                  res_percent, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.33 CDF_get_zvar_seqdata

SUBROUTINE CDF_get_zvar_seqdata (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 var_num, ! in -- zVariable number.
<type> value, ! out -- Data value.
INTEGER*4 status) ! out -- Completion status

CDF_get_zvar_seqdata reads one data value at the current sequential value for the specified zVariable in a CDF. After the read, the current sequential value is automatically incremented to the next value. An error is returned if the current sequential value is past the last record of the zVariable. Use CDF_set_zvar_seqpos and CDF_get_zvar_seqpos subroutine calls to set and get the current sequential value (position) for the variable.

The arguments to CDF_get_zvar_seqdata are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
value	The data value buffer.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.33.1. Example(s)

The following example reads two data values from the beginning of record (numbered 2) from a zVariable, a 2-dimensional CDF_INT4 type variable, in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 var_num          ! Variable number.
INTEGER*4 value1, value2   ! Variable data values.
INTEGER*4 rec_num          ! Record number.
INTEGER*4 indices(2)       ! Dimension indices.
```

```
.
.
rec_num = 2
indices(1) = 0
indices(2) = 0
CALL CDF_set_zvar_seqpos (id, var_num, rec_num, indices, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
CALL CDF_get_zvar_seqdata (id, var_num, value1, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
CALL CDF_get_zvar_seqdata (id, var_num, value2, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.34 CDF_get_zvar_seqpos

SUBROUTINE CDF_get_zvar_seqpos (

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  var_num,         ! in  -- zVariable number.
INTEGER*4  rec_num,         ! out  --  Record number.
INTEGER*4  indices(*),      ! out  --  Indices in a record.
INTEGER*4  status)          ! out --  Completion status
```

CDF_get_zvar_seqpos acquires the current sequential value (position) for sequential access for the specified zVariable in a CDF. Note that a current sequential value is maintained for each zVariable individually. Use CDF_get_zvar_seqdata subroutine to get the data value.

The arguments to CDF_get_zvar_seqpos are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
rec_num	The record number.
Indices	The dimension indices. Each element of indices receives the corresponding dimension index. For 0-dimensional zVariable, this argument is ignored, but must be presented.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.34.1. Example(s)

The following example inquires the location for the current sequential value, the record number and indices within it, from a 2-dimensional zVariable “MY_VAR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
```

```
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.

INTEGER*4 rec_num          ! Record number.
INTEGER*4 indices(2)       ! Dimension indices.
.
.
CALL CDF_get_zvar_seqpos (id, CDF_get_var_num(id, 'MY_VAR'), rec_num,
1                         indices, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.35 CDF_get_zvars_maxwrittenrecnum

SUBROUTINE CDF_get_zvars_maxwrittenrecnum (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 rec_num, ! out -- Maximum record number.
INTEGER*4 status) ! out -- Completion status

CDF_get_zvars_maxwrittenrecnum acquires the maximum written record number among all of the zVariables in a CDF. A value of zero (0) indicates that zVariables contain no records. The maximum record number for an individual zVariable may be acquired using the CDF_get_zvar_maxwrittenrecnum function call.

The arguments to CDF_get_zvars_maxwrittenrecnum are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
rec_num	The maximum record number among all zVariables.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.35.1. Example(s)

The following example acquires the maximum written record number among all zVariables in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 rec_num          ! Record number.
.
.
CALL CDF_get_zvars_maxwrittenrecnum (id, rec_num, status)
```

```
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.36 CDF_get_zvar_sparserecords

SUBROUTINE CDF_get_zvar_sparserecords (

```
INTEGER*4 id,                ! in  -- CDF identifier.
INTEGER*4 var_num,           ! in  -- zVariable number.
INTEGER*4 srecords_type,     ! out -- Sparse records type.
INTEGER*4 status)            ! out -- Completion status
```

CDF_get_zvar_sparserecords acquires the sparse records type of the specified zVariable in a CDF. Refer to Section 4.11 for the description of the sparse records.

The arguments to CDF_get_zvar_sparserecords are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	zVariable number.
srecords_type	Sparse records type.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.36.1. Example(s)

The following example inquires the sparse records type for zVariable 'MY_VAR" in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                          ! CDF identifier.
INTEGER*4 srecords_type               ! Sparse records type.
 INTEGER*4 num_dims                   ! Dimension sizes.
.
.
CALL CDF_get_zvar_sparserecrods (id, CDF_get_var_num(id, "MY_VAR"),
1                                srecords_type, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.37 CDF_get_zvars_recorddata

SUBROUTINE CDF_get_zvars_recorddata(

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4  num_var,           ! in  -- Number of zVariables.
INTEGER*4  var_nums(*),       ! in  -- zVariable numbers.
INTEGER*4  rec_num,           ! in  -- Record number.
<type>  buffer,               ! out  -- First variable buffer in a common block (<type> depends
                              !         on the data type of the zVariable).
INTEGER*4  status             ! out  -- Completion status.
```

CDF_get_zvars_recorddata is used to read a full record data at a specific record number for a selected group of zVariables in a CDF. It expects that the data buffer for each zVariable is big enough to hold a full physical record[21] data and properly put in a common block. No space is needed for each zVariable's non-variant dimensional elements. Retrieved record data from the variable group is filled into respective zVariable's buffer.

The arguments to CDF_get_zvars_recorddata are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDFcreate, Cdf_open or a similar CDF creation or opening functionality from the Internal Interface.
num_vars	The number of the zVariables in the group involved this read operation.
var_nums	The numbers of the zVariables involved for which to read a whole record data.
rec_num	The record number at which to read the whole record data for the group of zVariables.
buffer	The first variable buffer to read in a common block. The number of buffers should match to the num_var argument. Each buffer should hold a full physical record data.

6.3.37.1. Example(s)

The following example will read an entire single record data for a group of zVariables. The zVariables involved in the read are **Time**, **Longitude**, **Delta**, **Temperature** and **NAME**. The record to read is **4**. Since **Temperature** is 0-dimensional with **CDF_FLOAT** data type, a scalar variable of REAL*4 is allocated. For **Longitude**, a 1-dimensional array of INTEGER*2 (size **[3]**) is given for its dimension variance **[VARY]** and data type **CDF_INT2**. Similar data variables are provided for **Longitude** and **Time**. They both are 2-dimensional array of INTEGER*4 (sizes **[3,2]**) for their dimension variances **[VARY,VARY]** and data type either **CDF_INT4** or **CDF_UINT4**. For **NAME**, a 1-dimensional array of CHARACTER*10 (size **[2]**) is allocated due to its **[VARY]** dimension variance and **CDF_CHAR** data type with the number of element 10.

```
INCLUDE '<path>cdf.inc'
 .
.
INTEGER*4      id              ! CDF identifier.
INTEGER*4      status          ! Returned status code.
INTEGER*4      num_var         ! Number of zVariables.
INTEGER*4      var_nums(5)     ! zVariable numbers in CDF.
INTEGER*4      rec_num         ! Record number to write.
```

[21] Physical record is explained in the Primer chapter in the CDF User's Guide.

```
INTEGER*4       time(3,2)          ! Datatype: UINT4.
                                   ! Rec/dim variances: T/TT.
INTEGER*4       delta(3,2)         ! Datatype: INT4 .
                                   ! Rec/dim variances: T/TT.
INTEGER*2       longitude(3)       ! Datatype: INT2.
                                   ! Rec/dim variances: T/T.
REAL*4          temperature        ! Datatype: FLOAT.
                                   ! Rec/dim variances: T/.
CHARACTER*10 name(2)               ! Datatype: CHAR/10.
                                   ! Rec/dim variances: T/T.
COMMON /BLK/delta, time, temperature, longitude, name
.
.
num_var = 5                        ! Number of zVariables
rec_num = 4                        ! Record number to read

status = CDF_LIB (GET_, zVAR_NUMBER_, 'Delta', var_nums(1),
1                  NULL_, status)                  ! zVariable number
IF (var_nums(1) .LT. 1)            ! If less than one (1),
x  CALL UserStatusHandler (var_nums(1))  ! then it is actually a
                                         ! warning/error code.

status = CDF_LIB (GET_, zVAR_NUMBER_, 'Time', var_nums(2),
1                  NULL_, status)
IF (var_nums(2) .LT. 1) CALL UserStatusHandler (var_nums(2))

status = CDF_LIB (GET_, zVAR_NUMBER_, 'Longitude', var_nums(3),
1                  NULL_, status)
IF (var_nums(3) .LT. 1) CALL UserStatusHandler (var_nums(3))

status = CDF_LIB (GET_, zVAR_NUMBER_, 'Temperature', var_nums(4),
1                  NULL_, status)
IF (var_nums(4) .LT. 1) CALL UserStatusHandler (var_nums(4))

status = CDF_LIB (GET_, zVAR_NUMBER_, 'NAME', var_nums(5),
1                  NULL_, status)
IF (var_nums(5) .LT. 1) CALL UserStatusHandler (var_nums(5))

CALL CDF_get_zvars_recorddata (id, num_var, var_nums, rec_num,
1                              time, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
  .
  .
```

Note that the ordering of the variable data buffer in the COMMON block BLK is very important. Always arrange data buffer in the order in such way that the variables with the bigger data types come in front of the variables with the smaller data types. They should be in this ordering: 8-byte, 4-byte, 2-byte, and 1-byte. Unexpected results may return if such ordering is not followed. This function can be a replacement for the similar functionality provided from the Internal Interface as <GET_, zVARs_RECDATA_>.

6.3.38 CDF_hyper_get_zvar_data

```
SUBROUTINE CDF_hyper_get_zvar_data (

INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  var_num,         ! in  -- zVariable number.
INTEGER*4  rec_start,       ! in  -- Starting record number.
INTEGER*4  rec_count,       ! in  -- Number of records.
INTEGER*4  rec_interval,    ! in  -- Subsampling interval between records.
INTEGER*4  indices(*),      ! in  -- Dimension indices of starting value.
INTEGER*4  counts(*),       ! in  -- Number of values along each dimension.
INTEGER*4  intervals(*),    ! in  -- Subsampling intervals along each dimension.
<type>     buffer,          ! in  -- Buffer of values (<type> is dependent on the data type of the zVariable).
INTEGER*4  status)          ! out -- Completion status
```

CDF_hyper_get_zvar_data is used to read a buffer of one or more values from a zVariable. It is important to know the variable majority of the CDF before using CDF_hyper_get_zvar_data because the values placed into the buffer will be in that majority. CDF_inquire can be used to determine the default variable majority of a CDF distribution. The Concepts chapter in the CDF User's Guide describes the variable majorities.

The arguments to CDF_hyper_get_zvar_data are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable from which to read. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
rec_start	The record number at which to start reading.
rec_count	The number of records to read.
rec_interval	The interval between records for subsampling (e.g., an interval of 2 means read every other record).
indices	The indices (within each record) at which to start reading. Each element of indices specifies the corresponding dimension index. If there are zero (0) dimensions, this argument is ignored (but must be present).
counts	The number of values along each dimension to read. Each element of counts specifies the corresponding dimension count. For 0-dimensional zVariables this argument is ignored (but must be present).
intervals	For each dimension, the interval between values for subsampling (e.g., an interval of 2 means read every other value). Each element of intervals specifies the corresponding dimension interval. For 0-dimensional zVariables, this argument is ignored (but must be present).
buffer	The buffer of values read. The majority of the values in this buffer will be the same as that of the CDF. This buffer must be large to hold the values. CDF_var_inquire would be used to determine the zVariable's data type and number of elements (of that data type) at each value. The values are read from the CDF and placed into memory starting at address buffer. **WARNING:** If the zVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the zVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.38.1. Example(s)

The following example reads an entire record of data from zVariable “Temperature” in a CDF. This zVariable is 3-dimensional with sizes [180,91,10] and CDF’s variable majority is ROW_MAJOR. The record variance is VARY, the dimension variances are [VARY,VARY,VARY], and the data type is CDF_REAL4. This example is similar to the example in Section 6.3.38 except that it uses a single call to CDF_hyper_get_zvar_data rather than numerous calls to CDF_get_zvar_data.

```
      .
      .
      INCLUDE '<path>cdf.inc'
      .
      .
      INTEGER*4 id              ! CDF identifier.
      INTEGER*4 status          ! Returned status code.
      REAL*4 tmp(180,91,10)     ! Temperature values.
      INTEGER*4 var_n           ! rVariable number.
      INTEGER*4 rec_start       ! Record number.
      INTEGER*4 rec_count       ! Record counts.
      INTEGER*4 rec_interval    ! Record interval.
      INTEGER*4 indices(3)            ! Dimension indices.
      INTEGER*4 counts(3)       ! Dimension counts.
      INTEGER*4 intervals(3)    ! Dimension intervals.

      DATA rec_start/13/, rec_count/1/, rec_interval/1/,
     1     indices/1,1,1/, counts/180,91,10/, intervals/1,1,1/
      .
      .
      var_n = CDF_get_var_num (id, 'Temperature')
      IF (var_n .LT. 1) CALL UserStatusHandler (var_n)  ! If less than one (1),
                                                        ! then it is actually a
                                                        ! warning/error code.

      CALL CDF_hyper_get_zvar_data (id, var_n, rec_start, rec_count, rec_interval,
     1                              indices, counts, intervals, tmp, status)
      IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
      .
      .
```

Note that if the CDF's variable majority had been ROW_MAJOR, the tmp array would have been declared REAL*4 tmp[10][91][180] for proper indexing.

6.3.39 CDF_hyper_put_zvar_data

SUBROUTINE CDF_hyper_put_zvar_data (

```
INTEGER*4 id,              ! in  -- CDF identifier.
INTEGER*4 var_num,         ! in  -- zVariable number.
INTEGER*4 rec_start,       ! in  -- Starting record number.
INTEGER*4 rec_count,       ! in  -- Number of records.
INTEGER*4 rec_interval,    ! in  -- Interval between records.
INTEGER*4 indices(*),      ! in  -- Dimension indices of starting value.
```

```
INTEGER*4  counts(*),        ! in  -- Number of values along  each dimension.
INTEGER*4  intervals(*),     ! in  -- Interval between values along  each dimension.
<type>     buffer,           ! in  -- Buffer of values (<type> is dependent on the data type of the zVariable).
INTEGER*4  status)           ! out -- Completion status
```

CDF_hyper_put_zvar_data is used to write a buffer of one or more values to a zVariable. It is important to know the variable majority of the CDF before using CDF_hyper_put_zvar_data because the values in the buffer to be written must be in the same majority. CDF_inquire can be used to determine the default variable majority of a CDF distribution. The Concepts chapter in the CDF User's Guide describes the variable majorities.

The arguments to CDF_hyper_put_zvar_data are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable to which to write. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
rec_start	The record number at which to start writing.
rec_count	The number of records to write.
rec_interval	The interval between records for subsampling[22] (e.g., An interval of 2 means write to every other record).
indices	The indices (within each record) at which to start writing. Each element of indices specifies the corresponding dimension index. If there are zero (0) dimensions, this argument is ignored (but must be present).
counts	The number of values along each dimension to write. Each element of count specifies the corresponding dimension count. For 0-dimensional zVariables this argument is ignored (but must be present).
intervals	For each dimension the interval between values for subsampling[23] (e.g., an interval of 2 means write to every other value). intervals is a 1-dimensional array containing one element per zVariable dimension. Each element of intervals specifies the corresponding dimension interval. For 0-dimensional zVariables this argument is ignored (but a place holder is necessary).
buffer	The buffer of values to write. The majority of the values in this buffer must be the same as that of the CDF. The values starting at memory address buffer are written to the CDF. **WARNING:** If the zVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the entry does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.39.1. Example(s)

[22] "Subsampling" is not the best term to use when writing data, but you should know what we mean.
[23] Again, not the best term.

The following example writes values to the zVariable LATITUDE of a CDF. This zVariable is 2-dimensional with dimension sizes [360,181]. The record variance is NOVARY, the dimension variances are [NOVARY,VARY], and the data type is CDF_INT2. This example is similar to the example in Section 6.3.39
except that it uses a single call to CDF_hyper_put_zvar_data rather than numerous calls to CDF_put_zvar_data.

```
      .
      .
      INCLUDE '<path>cdf.inc'
      .
      .
      INTEGER*4 id              ! CDF identifier.
      INTEGER*4 status          ! Returned status code.
      INTEGER*2 lat             ! Latitude value.
      INTEGER*2 lats(181)       ! Buffer of latitude values.
      INTEGER*4 var_n           ! zVariable number.
      INTEGER*4 rec_start       ! Record number.
      INTEGER*4 rec_count       ! Record counts.
      INTEGER*4 rec_interval    ! Record interval.
      INTEGER*4 indices(2)      ! Dimension indices.
      INTEGER*4 counts(2)       ! Dimension counts.
      INTEGER*4 intervals(2)    ! Dimension intervals.

      DATA rec_start/1/, rec_count/1/, rec_interval/1/,
     1    indices/1,1/, counts/1,181/, intervals/1,1/
      .
      .
      var_n = CDF_get_var_num (id, 'LATITUDE')
      IF (var_n .LT. 1) CALL UserStatusHandler (var_n)  ! If less than one (1),
                                                        ! then not a zVariable
                                                        ! number but rather a
                                                        ! warning/error code
      DO lat = -90, 90
        lats(91+lat) = lat
      END DO

      CALL CDF_hyper_put_zvar_data (id, var_n, rec_start, rec_count, rec_interval,
     1                              indices, counts, intervals, lats, status)
      IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
      .
      .
```

6.3.40 CDF_inquire_zvar

SUBROUTINE CDF_inquire_zvar (

```
INTEGER*4    id,                                  ! in  -- CDF identifier.
INTEGER*4    var_num,                             ! in  -- zVariable number.
CHARACTER    var_name*(CDF_VAR_NAME_LEN256),      ! out -- zVariable name.
INTEGER*4    data_type,                 ! out -- Data type.
INTEGER*4    num_elements,                        ! out -- Number of elements (of the data type).
INTEGER*4    num_dims,                            ! out -- Number of dimensions.
INTEGER*4    dim_sizes(CDF_MAX_DIMS),             ! out -- Dimension sizes.
INTEGER*4    rec_variance,                        ! out -- Record variance.
```

```
INTEGER*4    dim_variances(CDF_MAX_DIMS),        ! out -- Dimension variances.
INTEGER*4    status)                             ! out -- Completion status
```

CDF_inquire_zvar is used to inquire about the specified zVariable. This subroutine would normally be used before reading zVariable values (with CDF_get_zvar_data or CDF_hyper_get_zvar_data) to determine the data type and number of elements (of that data type).

The arguments to CDF_inquire_zvar are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open.
var_num	The number of the zVariable to inquire. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
var_name	The zVariable's name. This character string must be large enough to hold CDF_VAR_NAME_LEN256 characters and will be blank padded if necessary.
data_type	The data type of the zVariable. The data types are defined in Section 4.5.
num_elements	The number of elements of the data type at each zVariable value. For character data types (CDF_CHAR and CDF_UCHAR), this is the number of characters in the string. (Each value consists of the entire string.) For all other data types, this will always be one (1) - multiple elements at each value are not allowed for non-character data types.
num_dims	The number of dimensions.
dim_sizes	The dimension sizes. It is a 1-dimensional array, containing one element per dimension. Each element of dimSizes receives the corresponding dimension size. For 0-dimensional zVariable this argument is ignored (but must be present).
rec_variance	The record variance. The record variances are defined in Section 4.9.
dim_variances	The dimension variances. Each element of dim_variances receives the corresponding dimension variance. The dimension variances are defined in Section 4.9. For 0-dimensional zVariable this argument is ignored (but must be present).
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.40.1. Example(s)

The following example inquires about a zVariable named HEAT_FLUX in a CDF. Note that the zVariable name returned by CDF_inquire_zvar will be the same as that passed in to CDF_get_var_num.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                          ! CDF identifier.
INTEGER*4 status                      ! Returned status code.
CHARACTER var_name*(CDF_VAR_NAME_LEN256)    ! zVariable name.
INTEGER*4 data_type                   ! Data type.
INTEGER*4 num_elems                   ! Number of elements (of data type).
INTEGER*4 rec_vary                    ! Record variance.
```

```
 INTEGER*4 dim_varys(CDF_MAX_DIMS)      ! Dimension variances (allocate to
                                        ! allow the maximum number of
                                        ! dimensions).
 INTEGER*4 num_dims                     ! Number of dimensions.
 INTEGER*4 dim_sizes(CDF_MAX_DIMS)      ! Dimension sizes (allocate to
                                        ! allow the maximum number of
                                        ! dimensions).
 .
 .
 CALL CDF_inquire_zvar (id, CDF_get_var_num(id,'HEAT_FLUX'), var_name,
1                       data_type, num_elems, rec_vary, dim_varys,
2                       num_dims, dim_sizes, status)
 IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
 .
 .
```

6.3.41 CDF_put_var_allrecords_varname

SUBROUTINE CDF_put_var_allrecords_varname (

INTEGER*4 id,	! in -- CDF identifier.
CHARACTER*256 var_name,	! in -- Variable name.
INTEGER*4 num_recs,	! in – Total record number to write.
<type> buffer,	! in -- buffer (<type> is dependent on the data type of the zVariavle).
INTEGER*4 status)	! out -- Completion status

CDF_put_var_allrecords_varname writes/updates[24] the whole records for the specified variable in a CDF. Make sure that the buffer has the enough data to cover the records to be written. Since a variable name is unique in a CDF, this function can be called for either a rVariable or zVariable. For zVariables, this function is similar to CDF_put_zvar_allrecords_varid, only that function requires a variable id.

The arguments to CDF_put_var_allrecords_varname are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_name	The variable name.
num_recs	The total record number to write.
buffer	The buffer holding the written record data.
status	The completion status code. Chapter 8 explains how to interpret status codes.

[24] If the variable already has more records than the total number indicated in this function call, records out of the range will stay and not be deleted. If those records are not needed, you can delete all the records before calling this function.

6.3.41.1. Example(s)

The following example writes 100 records for zVariable “MY_VAR” in a CDF. Assuming that each record is 1-dimension with 3 REAL*8 value.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
REAL*8 buffer(3,100)       ! Buffer holding the record data.
INTEGER*4 status           ! Returned status code.

.fill the buffer
.
CALL CDF_put_var_allrecords_varname (id, 'MY_VAR',
1                                    100, buffer, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.42 CDF_put_var_rangerecords_name

SUBROUTINE CDF_put_var_rangerecords_name (

INTEGER*4 id,	! in -- CDF identifier.
CHARACTER*256 var_name,	! in -- Variable name.
INTEGER*4 start_rec,	! in – Starting record number.
INTEGER*4 stop_rec,	! in – Stopping record number.
<type> buffer,	! in -- buffer (<type> is dependent on the data type of the zVariavle).
INTEGER*4 status)	! out -- Completion status

CDF_put_var_rangerecords_name writes/updates a range of the records for the specified variable in a CDF. Make sure that the buffer has the enough data to cover the records to be written. Since a variable name is unique in a CDF, this function can be called for either a rVariable or zVariable. For zVariables, this function is similar to CDF_put_zvar_rangerecords_varid, only that function requires a variable id.

The arguments to CDF_put_var_rangerecords_name are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_name	The variable name.
start_rec	The starting record number.
stop_rec	The stopping record number.
buffer	The buffer holding the written record data.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.42.1. Example(s)

The following example writes 100 records, from record number 10 to 109, for zVariable "MY_VAR" in a CDF. Assuming that there are 100 records, and each record is 1-dimension with 3 REAL*8 value.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
REAL*8 buffer(3,100)       ! Buffer holding the record data.
INTEGER*4 status           ! Returned status code.

.fill the buffer
.
CALL CDF_put_var_rangerecords_name (id, 'MY_VAR',
1                                   10, 109, buffer, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.43 CDF_put_zvar_allrecords_varid

SUBROUTINE CDF_put_zvar_allrecords_varid (

```
INTEGER*4  id,              ! in -- CDF  identifier.
INTEGER*4 var_num,          ! in -- zVariable number.
INTEGER*4 num_recs,         ! in – Total record number to write.
<type>        buffer,       ! out --  buffer (<type> is dependent on the data type of the zVariavle).
INTEGER*4  status)          ! out --  Completion status
```

CDF_put_zvar_allrecords_varid writes/updates[25] the whole records for the specified zVariable in a CDF. Make sure that the buffer has all the data to be written.

The arguments to CDF_put_zvar_allrecords_varid are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
num_recs	The total record number.
buffer	The buffer holding the writen record data.

[25] If the variable already has more records than the total number indicated in this function call, records out of the range will stay and not be deleted. If those records are not needed, you can delete all the records before calling this function.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.3.43.1. Example(s)

The following example writes out a total of 100 records for zVariable “MY_VAR” in a CDF. Assuming that there are 100 records, and each record is 1-dimension with 3 REAL*8 value.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
REAL*8 buffer(3,100)       ! Buffer holding the record data.
INTEGER*4 status           ! Returned status code.

.fill the buffer
.
CALL CDF_put_zvar_allrecords_varid (id, CDF_get_var_num(id, 'MY_VAR'),
1                                   100, buffer, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.44 CDF_put_zvar_data

SUBROUTINE CDF_put_zvar_data (

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  var_num,         ! in  -- zVariable number.
INTEGER*4  rec_num,         ! in  -- Record number.
INTEGER*4  indices(*),      ! in  -- Dimension indices.
<type>     value,           ! in  -- Value (<type> is dependent on the data type of the zVariable).
INTEGER*4  status)          ! out -- Completion status
```

CDF_put_zvar_data is used to write a single value for a zVariable. CDF_hyper_put_zvar_data may be used to write more than one zVariable values with a single call (see Section 6.3.39).

The arguments to CDF_put_zvar_data are defined as follows:

id The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

var_num The number of the zVariable to which to write. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).

rec_num The record number at which to write.

indices	The array indices within the specified record at which to write. Each element of indices specifies the corresponding dimension index. For 0-dimensional zVariables this argument is ignored (but must be present).
value	The value to write. This buffer must be large enough to hold the value. CDF_inquire_zvar would be used to determine the zVariable's data type and number of elements (of that data type) at each value. The value is written to the CDF. **WARNING:** If the zVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the zVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.44.1. Example(s)

The following example writes an entire record of data to zVariable “Temperature”. This zVariable is 3-dimensional with sizes [180,91,10]. The record variance is VARY, the dimension variances are [VARY,VARY,VARY], and the data type is CDF_REAL4.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
REAL*4 tmp(180,91,10)      ! Temperature values.
INTEGER*4 indices(3)       ! Dimension indices.
INTEGER*4 var_n            ! zVariable number.
INTEGER*4 rec_num          ! Record number.
INTEGER*4 d1, d2, d3       ! Dimension index values.
.
.
var_n = CDF_get_var_num (id, 'Temperature')
IF (var_n .LT. 1) CALL UserStatusHandler (var_n)    ! If less than one (1),
                                                    ! then it is actually a
                                                    ! warning/error code.
rec_num = 13
. filled tmp array
.
DO d1 = 1, 180
  indices(1) = d1
  DO d2 = 1, 91
     indices(2) = d2
     DO d3 = 1, 10
       indices(3) = d3
       CALL CDF_put_zvar_data (id, var_n, rec_num, indices, tmp(d1,d2,d3),
1                              status)
       IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
     END DO
  END DO
END DO
.
```

.

6.3.45 CDF_put_zvar_rangerecords_varid

SUBROUTINE CDF_put_zvar_rangerecords_varid (

```
INTEGER*4  id,              ! in -- CDF  identifier.
INTEGER*4 var_num,          ! in -- zVariable number.
INTEGER*4 start_rec,        ! in – Starting record number.
INTEGER*4 stop_rec,         ! in – Stopping record number.
<type>         buffer,      ! in --  buffer (<type> is dependent on the data type of the zVariavle).
INTEGER*4  status)          ! out --  Completion status
```

CDF_put_zvar_rangerecords_varid writes/updates a range of the records for the specified zVariable in a CDF. Make sure that the buffer has the enough data to cover the records to be written.

The arguments to CDF_put_zvar_rangerecords_varid are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
start_rec	The starting record number.
stop_rec	The stopping record number.
buffer	The buffer holding the written record data.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.45.1. Example(s)

The following example writes 100 records, from record number 10 to 109, for zVariable “MY_VAR” in a CDF. Assuming that there are 100 records, and each record is 1-dimension with 3 REAL*8 value.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                ! CDF identifier.
REAL*8 buffer(3,100)        ! Buffer holding the record data.
INTEGER*4 status            ! Returned status code.

.fill the buffer
.
CALL CDF_put_zvar_rangerecords_varid (id, CDF_get_var_num(id, 'MY_VAR'),
1                                     10, 109, buffer, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
```

.
.

6.3.46 CDF_put_zvar_recorddata

SUBROUTINE CDF_put_zvar_recorddata (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4  var_num,           ! in  -- zVariable number.
INTEGER*4  rec_num,           ! in  -- Record number.
<type>  buffer,               ! in  -- Record data buffer.
INTEGER*4  status)            ! out --  Completion status
```

CDF_put_zvar_recorddata writes an entire record at a given record number for the specified zVariable in a CDF. The buffer should be large enough to hold the entire data values for the variable. The written data values in the buffer are in the order that corresponds to the variable majority defined for the CDF.

The arguments to CDF_put_zvar_recorddata are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable to which to write. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
rec_num	The record number of the zVariable to which to write.
buffer	The record buffer to hold the data values for an entire record.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.46.1. Example(s)

The following example writes an entire record (numbered 5) for zVariable “MY_VAR”, a 2-dimensional variable (2 by 3) of CDF_INT4 data type, in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 buffer(2,3)      ! Record buffer.
.
. fill buffer array
CALL CDF_put_zvar_recorddata (id, CDF_get_var_num (id, 'MY_VAR'), 5,
1                             buffer, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.47 CDF_put_zvar_seqdata

SUBROUTINE CDF_put_zvar_seqdata (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4  var_num,           ! in  -- zVariable number.
<type>  value,                ! in  -- Data value.
INTEGER*4  status)            ! out -- Completion status
```

CDF_put_zvar_seqdata writes one data value at the current sequential value for the specified zVariable in a CDF. After the read, the current sequential value is automatically incremented to the next value. An error is returned if the current sequential value is past the last record of the zVariable. Use CDF_get_zvar_seqpos and CDF_set_zvar_seqpos subroutine calls to get and set the current sequential value (position) for the variable.

The arguments to CDF_put_zvar_seqdata are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
value	The data value.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.47.1. Example(s)

The following example writes two data values from the beginning of record (numbered 2) to a zVariable, a 2-dimensional CDF_INT4 type variable, in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 var_num          ! Variable number.
INTEGER*4 value1, value2   ! Variable data values.
INTEGER*4 rec_num          ! Record number.
INTEGER*4 indices(2)       ! Dimension indices.
.
.
rec_num = 2
indices(1) = 0
indices(2) = 0
CALL CDF_set_zvar_seqpos (id, var_num, rec_num, indices, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
value1 = 10
value2 = 20
```

```
CALL CDF_put_zvar_seqdata (id, var_num, value1, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
CALL CDF_put_zvar_seqdata (id, var_num, value2, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.48 CDF_put_zvars_recorddata

SUBROUTINE CDF_put_zvars_recorddata(

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  num_var,         ! in  -- Number of zVariables.
INTEGER*4  var_nums(*),     ! in  -- zVariable numbers.
INTEGER*4  rec_num,         ! in  -- Record number.
<type>  buffer,             ! in  -- First variable buffer in a common block (<type> depends
                            !        on the data type of the zVariable).
INTEGER*4  status)          ! out  -- Completion status.
```

CDF_put_zvars_recorddata is used to write a full record data at a specific record number for a selected group of zVariables in a CDF. It expects that the data buffer for each zVariable is big enough to contain a full physical record data and properly put in a common block. No space is expected for each zVariable's non-variant dimensional elements. Record data from each buffer is written to its respective zVariable.

The arguments to CDF_put_zvars_recorddata are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDFcreate, Cdf_open or a similar CDF creation or opening functionality from the Internal Interface.
num_vars	The number of the zVariables in the group involved this write operation.
var_nums	The numbers of the zVariables involved for which to write a whole record data.
rec_num	The record number at which to write the whole record data for the group of zVariables.
buffer	The first variable buffer to write in a common block. The number of buffers should match to the num_var argument. Each buffer should hold a full physical record data.

6.3.48.1. Example(s)

The following example will write an entire single record data for a group of zVariables. The zVariables involved in the write are **Time**, **Longitude**, **Delta**, **Temperature** and **NAME**. The record to write is **4**. Since **Temperature** is 0-dimensional with **CDF_FLOAT** data type, a scalar variable of REAL*4 is allocated. For **Longitude**, a 1-dimensional array of INTEGER*2 (size **[3]**) is given for its dimension variance **[VARY]** and data type **CDF_INT2**. Similar data variables are provided for **Longitude** and **Time**. They both are 2-dimensional array of INTEGER*4 (sizes **[3,2]**) for their dimension variances **[VARY,VARY]** and data type either **CDF_INT4** or **CDF_UINT4**. For **NAME**, a 1-dimensional array of CHARACTER*10 (size **[2]**) is allocated due to its **[VARY]** dimension variance and **CDF_CHAR** data type with the number of element 10.

```
INCLUDE '<path>cdf.inc'
 .
.
INTEGER*4       id                  ! CDF identifier.
INTEGER*4       status              ! Returned status code.
INTEGER*4       num_var             ! Number of zVariables.
INTEGER*4       var_nums(5)         ! zVariable numbers in CDF.
INTEGER*4       rec_num             ! Record number to write.
INTEGER*4       time(3,2)           ! Datatype: UINT4.
1                 /10, 20,          ! Rec/dim variances: T/TT.
2                  30, 40,
3                  50, 60/
INTEGER*4       delta(3,2)          ! Datatype: INT4 .
1                 /1, 2,            ! Rec/dim variances: T/TT.
2                  5, 6,
3                  9, 10/
INTEGER*2       longitude(3)        ! Datatype: INT2.
1                 /10, 20, 30/      ! Rec/dim variances: T/T.
REAL*4          temperature         ! Datatype: FLOAT.
1                 /1234.56/         ! Rec/dim variances: T/.
CHARACTER*10 name(2)                ! Datatype: CHAR/10.
1                 /'ABCDEFGHIJ',          ! Rec/dim variances: T/T.
2                 '12345678'/

COMMON /BLK/delta, time, temperature, longitude, name
.
.
num_var = 5                         ! Number of zVariables
rec_num = 4                         ! Record number to write

status = CDF_LIB (GET_, zVAR_NUMBER_, 'Delta', var_nums(1),
1                 NULL_, status)                    ! zVariable number
IF (var_nums(1) .LT. 1)             ! If less than one (1),
x  CALL UserStatusHandler (var_nums(1))  ! then it is actually a
                                         ! warning/error code.

status = CDF_LIB (GET_, zVAR_NUMBER_, 'Time', var_nums(2),
1                 NULL_, status)
IF (var_nums(2) .LT. 1) CALL UserStatusHandler (var_nums(2))

status = CDF_LIB (GET_, zVAR_NUMBER_, 'Longitude', var_nums(3),
1                 NULL_, status)
IF (var_nums(3) .LT. 1) CALL UserStatusHandler (var_nums(3))

status = CDF_LIB (GET_, zVAR_NUMBER_, 'Temperature', var_nums(4),
1                 NULL_, status)
IF (var_nums(4) .LT. 1) CALL UserStatusHandler (var_nums(4))

status = CDF_LIB (GET_, zVAR_NUMBER_, 'NAME', var_nums(5),
1                 NULL_, status)
IF (var_nums(5) .LT. 1) CALL UserStatusHandler (var_nums(5))

CALL CDF_put_zvars_recorddata (id, num_var, var_nums, rec_num,
1                              time, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
  .
```

.

Note that the ordering of the variable data buffer in the COMMON block BLK is very important. Always arrange data buffer in the order in such way that the variables with the bigger data types come in front of the variables with the smaller data types. They should be in this ordering: 8-byte, 4-byte, 2-byte, and 1-byte. Unexpected results may return if such ordering is not followed. This function can be a replacement for the similar functionality provided from the Internal Interface as <PUT_, zVARs_RECDATA_>.

6.3.49 CDF_rename_zvar

SUBROUTINE CDF_rename_zvar (

```
INTEGER*4    id,                ! in  -- CDF identifier.
INTEGER*4    var_num,           ! in  -- zVariable number.
CHARACTER    var_name*(*),      ! in  -- New name.
INTEGER*4    status)            ! out -- Completion status
```

CDF_rename_zvar is used to rename an existing zVariable. A variable (rVariable or zVariable) with the same name must not already exist in the CDF.

The arguments to CDF_rename_zvar are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable to rename. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
var_name	The new zVariable name. This may be at most CDF_VAR_NAME_LEN256 characters. Variable names are case-sensitive.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.49.1. Example(s)

In the following example the zVariable named TEMPERATURE is renamed to TMP (if it exists). Note that if CDF_get_var_num returns a value less than one (1) then that value is not a zVariable number but rather a warning/error code.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 status      ! Returned status code.
INTEGER*4 var_num     ! zVariable number.
.
.
var_num = CDF_get_var_num (id, 'TEMPERATURE')
IF (var_num .LT. 1) THEN
```

```
   IF (var_num .NE. NO_SUCH_VAR) CALL UserStatusHandler (var_num)
ELSE
   CALL CDF_rename_zvar (id, var_num, 'TMP', status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
END IF
.
.
```

6.3.50 CDF_set_zvar_allocblockrecs

SUBROUTINE CDF_set_zvar_allocblockrecs (

```
INTEGER*4  id,              ! in -- CDF  identifier.
INTEGER*4 var_num,          ! in -- zVariable number.
INTEGER*4 first_rec,        ! in -- First record number to allocate.
INTEGER*4 last_rec,         ! in  -- Last record number to allocate.
INTEGER*4  status)          ! out --  Completion status
```

CDF_set_zvar_allocblockrecs specifies a range records to allocate for the specified zVariable in a CDF. This operation is only applicable to uncompressed variables in single-file CDFs. Refer to the CDF User's Guide for the description of allocations of variable records.

The arguments to CDF_set_zvar_allocblockrecs are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
first_rec	The first record number to allocate.
last_rec	The last record number to allocate.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.50.1. Example(s)

The following example allocates 100 records, from record number 21 to 120, for zVariable "MY_VAR" in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 first_rec   ! Starting record number to allocate.
INTEGER*4 last_rec    ! Ending record number to allocate.
INTEGER*4 status      ! Returned status code.

.
```

```
.
first_rec = 21
last_rec = 120
CALL CDF_set_zvar_allocblockrecs (id, CDF_get_var_num(id, 'MY_VAR'),
1                                  first_rec, last_rec, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.51 CDF_set_zvar_allocrecs

SUBROUTINE CDF_set_zvar_allocrecs (

```
INTEGER*4  id,          ! in -- CDF  identifier.
INTEGER*4 var_num,      ! in -- zVariable number.
INTEGER*4 num_recs,     ! in -- Number of allocated records.
INTEGER*4  status)      ! out --  Completion status
```

CDF_set_zvar_allocrecs specifies the number of records allocated for the specified zVariable in a CDF. The records are allocated beginning at record number one (1). This operation is only applicable to uncompressed variables in single-file CDFs. Refer to the CDF User's Guide for the description of allocating variable records in a single-file CDF.

The arguments to CDF_set_zvar_allocrecs are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
num_recs	The number of records allocated for the variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.51.1. Example(s)

The following example allocates 100 records (record number 1 to 100) for zVariable "MY_VAR" in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 num_recs    ! Number of allocated records.
INTEGER*4 status      ! Returned status code.

.
.
num_recs = 100
CALL CDF_set_zvar_allocrecs (id, CDF_get_var_num(id, 'MY_VAR'),
```

```
1                               num_recs, status)
 IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
 .
 .
```

6.3.52 CDF_set_zvar_blockingfactor

SUBROUTINE CDF_set_zvar_blockingfactor (

```
INTEGER*4  id,                ! in --  CDF  identifier.
INTEGER*4 var_num,            ! in --  zVariable number.
INTEGER*4 bf,                 ! in --  Variable blocking factor.
INTEGER*4  status)            ! out --  Completion status
```

CDF_set_zvar_blockingfactor respecifies the blocking factor for the specified zVariable in a CDF. Refer to the CDF User's Guide for the description of a variable's blocking factor.

The arguments to CDF_set_zvar_blockingfactor are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
bf	The blocking factor of the variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.52.1. Example(s)

The following example sets the blocking factor to 100 records for zVariable "MY_VAR" in a CDF.

```
 .
 .
 INCLUDE '<path>cdf.inc'
 .
 .
 INTEGER*4 id          ! CDF identifier.
 INTEGER*4 bf          ! Blocking factor.
 INTEGER*4 status      ! Returned status code.

 .
 .
 bf = 100
 CALL CDF_set_zvar_blockingfactor (id, CDF_get_var_num(id, 'MY_VAR'),
1                                  bf, status)
 IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
 .
 .
```

6.3.53 CDF_set_zvar_cachesize

SUBROUTINE CDF_set_zvar_cachesize (

```
INTEGER*4  id,                ! in -- CDF  identifier.
INTEGER*4 var_num,            ! in --  zVariable number.
INTEGER*4 num_buffers,        ! in -- Number of cache buffers.
INTEGER*4  status)            ! out --  Completion status
```

CDF_set_zvar_cachesize specifies the number of cache buffers being for the specified zVariable in a CDF. This operation is not applicable to a single-file CDF. Refer to the CDF User's Guide for the description about caching scheme used by the CDF library.

The arguments to CDF_set_zvar_cachesize are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
num_buffers	The number of cache buffers.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.53.1. Example(s)

The following example sets the number of cache buffers to 10 to be used for zVariable "MY_VAR" in a multi-file CDF.

```
   .
   .
   INCLUDE '<path>cdf.inc'
   .
   .
   INTEGER*4 id          ! CDF identifier.
   INTEGER*4 num_buffers! Number of cache buffers.
   INTEGER*4 status      ! Returned status code.

   .
   .
   num_buffers = 10
   CALL CDF_set_zvar_cachesize (id, CDF_get_var_num(id, 'MY_VAR'),
  1                             num_buffers, status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
   .
   .
```

6.3.54 CDF_set_zvar_compression

SUBROUTINE CDF_set_zvar_compression (

```
INTEGER*4  id,                ! in -- CDF  identifier.
INTEGER*4 var_num,            ! in --  zVariable number.
INTEGER*4 compress_type,      ! in --  Compression type.
INTEGER*4 compress_parms,     ! in --  Compression parameters.
INTEGER*4  status)            ! out --  Completion status
```

CDF_set_zvar_compression respecifies the compression type/parameters of the specified zVariable in a CDF. Refer to Section 4.10 for the description of the CDF supported compression types/parameters.

The arguments to CDF_set_zvar_compression are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
compress_type	The compression type.
compress_parms	The compression parameters.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.54.1. Example(s)

The following example uses GZIP.6 compression for zVariable “MY_VAR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                      ! CDF identifier.
INTEGER*4 ctype                   ! Compression type.
INTEGER*4 cparms(CDF_MAX_DIMS)    ! Compression parameters.
INTEGER*4 status                  ! Returned status code.

.
.
ctype = GZIP_COMPRESSION
cparms(1) = 6
CALL CDF_set_zvar_compression (id, CDF_get_var_num(id, 'MY_VAR'),
1                              ctype, cparms, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.55 CDF_set_zvar_dataspec

SUBROUTINE CDF_set_zvar_dataspec (

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  var_num,         ! in  -- zVariable number.
INTEGER*4  data_type,       ! in  -- Data type.
INTEGER*4  status)          ! out -- Completion status
```

CDF_set_zvar_dataspec is used to respecify the data specification (data type and number of elements) of the specified zVariable in a CDF. A zVariable's data specification may not be changed if the new data specification is not equivalent to the old one and any values, including pad value, have been written. Data specifications are considered equivalent if the data types are equivalent and the number of elements are the same. Refer to Section 4.5 for the description of the CDF data types.

The arguments to CDF_set_zvar_dataspec are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable to which to set. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
data_type	The data type of the variable data.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.55.1. Example(s)

The following example respecifies the data type of zVariable "Temperature" to CDF_UINT2, from its original CDF_INT2, in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 data_type        ! Data type.
.
.
data_type = CDF_UINT2
CALL CDF_set_zvar_dataspec (id, CDF_get_var_num (id, 'Temperature'),
1                           data_type, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.56 CDF_set_zvar_dimvariances

SUBROUTINE CDF_set_zvar_dimvariances (

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  var_num,         ! in  -- zVariable number.
INTEGER*4  dim_varys(*),    ! in  -- Dimension variances.
INTEGER*4  status)          ! out -- Completion status
```

CDF_set_zvar_dimvariances respecifies the dimension variances of the specified zVariable in a CDF. For 0-dimensional zVariable, this operation is not applicable. Refer to Section 4.9 for the description of the CDF variable's dimension variances.

The arguments to CDF_set_zvar_dimvariances are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable to which to set. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
dim_varys	The dimension variances.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.56.1. Example(s)

The following example sets the dimension variances to VARY and VARY for zVariable "Temperature", a 2-dimensional variable, in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 status                        ! Returned status code.
INTEGER*4 dim_varys(CDF_MAX_DIMS)       ! Dimension variances.
.
.
dim_varys(1) = VARY
dim_varys(2) = VARY
CALL CDF_set_zvar_dimvariances (id, CDF_get_var_num (id, 'Temperature'),
1                               dim_varys, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.57 CDF_set_zvar_initialrecs

SUBROUTINE CDF_set_zvar_initialrecs (

```
INTEGER*4  id,                ! in -- CDF  identifier.
INTEGER*4 var_num,            ! in -- zVariable number.
INTEGER*4 num_recs,           ! in -- Number of written records.
INTEGER*4  status)            ! out --  Completion status
```

CDF_set_zvar_initialrecs specifies the number of records initially written for the specified zVariable in a CDF. The records are written beginning at record number one (1). This may be specified only once per variable and before any other records have been written to that variable. If a pad value has not yet been specified, the default value is used. If a pad value has been explicitly specified, that value is written to the records. Refer to the CDF User's Guide for the description of initial variable records.

The arguments to CDF_set_zvar_initialrecs are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
num_recs	The number of records to be written for the variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.57.1. Example(s)

The following example writes initially 100 records (record number 1 to 100) for zVariable "MY_VAR" in a CDF.

```
  .
  .
  INCLUDE '<path>cdf.inc'
  .
  .
  INTEGER*4 id          ! CDF identifier.
  INTEGER*4 num_recs    ! Number of initially written records.
  INTEGER*4 status      ! Returned status code.

  .
  .
  num_recs = 100
  CALL CDF_set_zvar_initialrecs (id, CDF_get_var_num(id, 'MY_VAR'),
 1                               num_recs, status)
  IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
  .
  .
```

6.3.58 CDF_set_zvar_padvalue

SUBROUTINE CDF_set_zvar_padvalue (

```
INTEGER*4 id,                ! in  -- CDF identifier.
INTEGER*4 var_num,           ! in  -- zVariable number.
<type> pad_value,            ! in  -- Pad value.
INTEGER*4 status)            ! out -- Completion status
```

CDF_set_zvar_padvalue respecifies the pad value for the specified zVariable in a CDF. A zVariable's pad value may be specified (or respecified) at any time without affecting already written values (including where pad values were used). The Concepts chapter in the CDF User's Guide describes variable pad values.

The arguments to CDF_set_zvar_padvalue are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable to which to set. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
pad_value	The pad value.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.58.1. Example(s)

The following example sets the pad value to –999 for zVariable “MY_VAR”, a CDF_INT4 type variable, in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 pad_value        ! Pad value.
.
.
pad_value = -999
CALL CDF_set_zvar_padvalue (id, CDF_get_var_num (id, 'MY_VAR'),
1                           pad_value, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.59 CDF_set_zvar_recvariance

SUBROUTINE CDF_set_zvar_recvariance (

```
INTEGER*4 id,                ! in  -- CDF identifier.
INTEGER*4 var_num,           ! in  -- zVariable number.
INTEGER*4 rec_vary,          ! in  -- Record variance.
INTEGER*4 status)            ! out -- Completion status
```

CDF_set_zvar_recvariance respecifies the record variance for the specified zVariable in a CDF. Refer to Section 4.9 for the description of the CDF variable's record variance.

The arguments to CDF_set_zvar_recvariance are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The number of the zVariable to which to set. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).
rec_vary	The record variance.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.59.1. Example(s)

The following example sets the record variance to VARY for zVariable "Temperature" in a CDF.

```
   .
   .
   INCLUDE '<path>cdf.inc'
   .
   .
   INTEGER*4 id               ! CDF identifier.
   INTEGER*4 status           ! Returned status code.
   INTEGER*4 rec_vary         ! Record variance.
   .
   .
   rec_vary = VARY
   CALL CDF_set_zvar_recvariance (id, CDF_get_var_num (id, 'Temperature'),
  1                               rec_vary, status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
   .
   .
```

6.3.60 CDF_set_zvar_reservepercent

SUBROUTINE CDF_set_zvar_reservepercent (

```
INTEGER*4  id,              ! in  --  CDF  identifier.
INTEGER*4  var_num,         ! in  --  zVariable number.
INTEGER*4  res_percent,     ! in  --  Reserve percentage.
INTEGER*4  status)          ! out --  Completion status
```

CDF_set_zvar_reservepercent respecifies the reserve percentage being used for the specified zVariable in a CDF. This operation only applies to compressed zVariables. Refer to the CDF User's Guide for the description of the reserve scheme used by the CDF library.

The arguments to CDF_set_zvar_reservepercent are defined as follows:

id — The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

var_num — The number of the zVariable from which to read. This number may be determined with a call to CDF_get_var_num (see Section 6.3.9).

res_percent — The reserve percentage.

status — The completion status code. Chapter 8 explains how to interpret status codes.

6.3.60.1. Example(s)

The following example sets the reserve percentage to 15 for the compressed zVariable “Temperature” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
INTEGER*4 res_percent      ! Reserve percentage.
.
.
res_percent = 15
CALL CDF_set_zvar_reservepercent (id, CDF_get_var_num (id, 'Temperature'),
1                                 res_percent, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.61 CDF_set_zvars_cachesize

SUBROUTINE CDF_set_zvars_cachesize (

```
INTEGER*4  id,              ! in -- CDF  identifier.
INTEGER*4 num_buffers,      ! in --  zVariables's number of cache buffers.
INTEGER*4  status)          ! out --  Completion status
```

CDF_set_zvars_cachesize respecifies the number of cache buffers being used for all zVariables in a CDF. This operation is not applicable to a single-file CDF. Refer to the CDF User’s Guide for the description about caching scheme used by the CDF library.

The arguments to CDF_set_zvars_cachesize are defined as follows:

id — The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

num_buffers — The number of cache buffers.

status — The completion status code. Chapter 8 explains how to interpret status codes.

6.3.61.1. Example(s)

The following example sets the number of cache buffers to 10 for all zVariables in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 num_buffers! Number of cache buffers.
INTEGER*4 status      ! Returned status code.

.
.
num_buffers = 10
CALL CDF_set_zvars_cachesize (id, num_buffers, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.62 CDF_set_zvar_seqpos

SUBROUTINE CDF_set_zvar_seqpos (

```
INTEGER*4  id,              ! in  --  CDF  identifier.
INTEGER*4  var_num,         ! in  --  zVariable number.
INTEGER*4  rec_num,         ! in  --  Record number.
INTEGER*4  indices(*),      ! in  --  Indices in a record.
INTEGER*4  status)          ! out --  Completion status
```

CDF_set_zvar_seqpos specifies the current sequential value (position) for sequential access for the specified zVariable in a CDF. Note that a current sequential value is maintained for each zVariable individually. Use CDF_get_zvar_seqdata subroutine to get the data value.

The arguments to CDF_set_zvar_seqpos are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	The zVariable number.
rec_num	The record number.
indices	The dimension indices. Each element of indices receives the corresponding dimension index. For 0-dimensional zVariable, this argument is ignored, but must be presented.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.62.1. Example(s)

The following example sets the current sequential value to the first value element in record number 2 for zVariable "MY_VAR", a 2-dimensional variable, in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.

INTEGER*4 rec_num          ! Record number.
INTEGER*4 indices(2)       ! Dimension indices.
.
.
rec_num = 2
indices(1) = 0
indices(2) = 0
CALL CDF_set_zvar_seqpos (id, CDF_get_var_num(id, 'MY_VAR'), rec_num,
1                         indices, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.3.63 CDF_set_zvar_sparserecords

SUBROUTINE CDF_set_zvar_sparserecords (

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  var_num,         ! in  -- zVariable number.
INTEGER*4  srecords_type,   ! in  -- Sparse records type.
INTEGER*4  status)          ! out -- Completion status
```

CDF_set_zvar_sparserecords respecifies the sparse records type for the specified zVariable in a CDF. Refer to Section 4.11 for the description of the sparse records.

The arguments to CDF_set_zvar_sparserecords are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
var_num	zVariable number.
srecords_type	Sparse records type.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.3.63.1. Example(s)

The following example sets the sparse records type to PAD_SPARSERECORDS from its original type for zVariable "MY_VAR" in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 srecords_type                 ! Sparse records type.
 INTEGER*4 num_dims                     ! Dimension sizes.
.
.
srecords_type = PAD_SPARSERECORDS
CALL CDF_set_zvar_sparserecords (id, CDF_get_var_num(id, "MY_VAR"),
1                                srecords_type, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4 Attributes/Entries

This section provides the functions related to attributes or entries in an attribute. An attribute is identified by its name or an number in the CDF. To operate an attribute or entry, the CDF it resides in must be open.

6.4.1 CDF_confirm_attr_existence

INTEGER*4 FUNCTION CDF_confirm_attr_existence (

INTEGER*4 id, ! in -- CDF identifier.
CHARACTER attr_name*(*)) ! in -- Attribute name.

CDF_ confirm_attr_existence confirms whether the specified name is an existing attribute in a CDF. It returns CDF_OK if the attribute exists.

The arguments to CDF_ confirm_attr_existence are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_name	Checks if an attribute with the given name exists in the CDF.

6.4.1.1. Example(s)

The following example checks whether the attribute by the name of “ATTR_NAME1” is in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 status      ! Returned status code.
.
.
status = CDF_confirm_attr_existence (id, “ATTR_NAME1”, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.2 CDF_confirm_gentry_existence

INTEGER*4 FUNCTION CDF_confirm_gentry_existence (

```
INTEGER*4  id,              ! in  --  CDF  identifier.
INTEGER*4  attr_num,        ! in  --  Global attribute identifier.
INTEGER*4  entry_num)       ! in  --  gEntry number.
```

CDF_ confirm_gentry_existence confirms the existence of the specified gEntry in an (global) attribute of a CDF. If the gEntry does not exist, NO_SUCH_ENTRY will be returned.

The arguments to CDF_ confirm_gentry_existence are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The (global) attribute number.
entry_num	The gEntry number.

6.4.2.1. Example(s)

The following example will check the existence of gEntry numbered 1 for attribute “MY_ATTR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 attr_num    ! Attribute number.
```

```
INTEGER*4 status     ! Returned status code.
.
.
attr_num = CDF_get_attr_num(id, 'MY_ATTR')
IF (attr_num .LT. 1) CALL UserQuit(…..)
status = CDF_confirm_gentry_existence (id, attr_num, 1)
IF (status .EQ. NO_SUCH_ENTRY) CALL UserStatusHandler (status)
.
.
```

6.4.3 CDF_confirm_rentry_existence

INTEGER*4 FUNCTION CDF_confirm_rentry_existence (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 attr_num, ! in -- Variable attribute identifier.
INTEGER*4 entry_num) ! in -- rEntry number.

CDF_ confirm_rentry_existence confirms the existence of the specified rEntry, corresponding to an rVariable, in an (variable) attribute of a CDF. If the rEntry does not exist, NO_SUCH_ENTRY will be returned.

The arguments to CDF_ confirm_rentry_existence are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The (variable) attribute number.
entry_num	The rEntry number.

6.4.3.1. Example(s)

The following example will check the existence of the rEntry corresponding to rVariable "MY_VAR" for attribute "MY_ATTR" in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id         ! CDF identifier.
INTEGER*4 attr_num   ! Attribute number.
INTEGER*4 entry_num  ! rEntry number.
INTEGER*4 status     ! Returned status code.
.
.
attr_num = CDF_get_attr_num(id, 'MY_ATTR')
IF (attr_num .LT. 1) CALL UserQuit(…..)
entry_num = CDF_get_var_num(id, 'MY_VAR')
IF (entry_num .LT. 1) CALL UserQuit(…..)
```

```
status = CDF_confirm_rentry_existence (id, attr_num, entry_num, status)
IF (status .EQ. NO_SUCH_ENTRY) CALL UserStatusHandler (status)
.
.
```

6.4.4 CDF_confirm_zentry_existence

INTEGER*4 FUNCTION CDF_confirm_zentry_existence (

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  attr_num,        ! in  -- Variable attribute identifier.
INTEGER*4  entry_num)       ! in  -- zEntry number.
```

CDF_ confirm_zentry_existence confirms the existence of the specified zEntry, corresponding to a zVariable, in an (variable) attribute of a CDF. If the zEntry does not exist, NO_SUCH_ENTRY will be returned.

The arguments to CDF_ confirm_zentry_existence are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The (variable) attribute number.
entry_num	The zEntry number.

6.4.4.1. Example(s)

The following example will check the existence of the zEntry corresponding to zVariable “MY_VAR” for attribute “MY_ATTR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 attr_num    ! Attribute number.
INTEGER*4 entry_num   ! zEntry number.
INTEGER*4 status      ! Returned status code.
.
.
attr_num = CDF_get_attr_num(id, 'MY_ATTR')
IF (attr_num .LT. 1) CALL UserQuit(…..)
entry_num = CDF_get_var_num(id, 'MY_VAR')
IF (entry_num .LT. 1) CALL UserQuit(…..)
Status = CDF_confirm_zentry_existence (id, attr_num, entry_num, status)
IF (status .EQ. NO_SUCH_ENTRY) CALL UserStatusHandler (status)
.
.
```

6.4.5 CDF_ create_attr

SUBROUTINE CDF_ create_attr (

```
INTEGER*4    id,                ! in  -- CDF  identifier.
CHARACTER    attr_name*(*),     ! in  -- Attribute name.
INTEGER*4    attr_scope,        ! in  -- Scope of attribute.
INTEGER*4    attr_num,          ! out -- Attribute number.
INTEGER*4    status)            ! out -- Completion status
```

CDF_create_attr creates an attribute in the specified CDF. An attribute with the same name must not already exist in the CDF.

The arguments to CDF_create_attr are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_name	The name of the attribute to create. This may be at most CDF_ATTR_NAME_LEN256 characters. Attribute names are case-sensitive.
attr_scope	The scope of the new attribute. Specify one of the scopes described in Section 4.12.
attr_num	The number assigned to the new attribute. This number must be used in subsequent CDF subroutine calls when referring to this attribute. An existing attribute's number may be determined with the CDF_get_attr_num function.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.5.1. Example(s)

The following example creates two attributes. The TITLE attribute is created with global scope - it applies to the entire CDF (most likely the title of the data set stored in the CDF). The Units attribute is created with variable scope - each entry describes some property of the corresponding variable (in this case the units for the data).

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                    ! CDF identifier.
INTEGER*4 status                ! Returned status code.
CHARACTER UNITS_attr_name*5     ! Name of "Units" attribute.

INTEGER*4 UNITS_attr_num        ! "Units" attribute number.
INTEGER*4 TITLE_attr_num        ! "TITLE" attribute number.
INTEGER*4 TITLE_attr_scope      ! "TITLE" attribute scope.

DATA UNITS_attr_name/'Units'/, TITLE_attr_scope/GLOBAL_SCOPE/
.
.
```

```
CALL CDF_create_attr (id, 'TITLE', TITLE_attr_scope, TITLE_attr_num, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
CALL CDF_create_attr (id, UNITS_attr_name, VARIABLE_SCOPE, UNITS_attr_num,
1                     status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.6 CDF_delete_attr

SUBROUTINE CDF_delete_attr (

```
INTEGER*4 id,          ! in  -- CDF identifier.
INTEGER*4 attr_num,    ! in  -- Attribute number.
INTEGER*4 status)      ! out -- Completion status
```

CDF_delete_attr deletes the specified attribute from a CDF.

The arguments to CDF_delete_attr are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The attribute number to be deleted.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.6.1. Example(s)

The following example will delete attribute “MY_ATTR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                          ! CDF identifier.
INTEGER*4 status                      ! Returned status code.

.
.
CALL CDF_delete_attr (id, CDF_get_attr_num(id, 'MY_ATTR'), status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.7 CDF_delete_attr_gentry

SUBROUTINE CDF_delete_attr_gentry (

```
INTEGER*4  id,          ! in  -- CDF  identifier.
INTEGER*4  attr_num,    ! in  -- Global attribute number.
INTEGER*4  entry_num,   ! in  -- gEntry number.
INTEGER*4  status)      ! out -- Completion status
```

CDF_delete_attr_gentry deletes the specified gEntry in an (global) attribute from a CDF

The arguments to CDF_delete_attr_gentry are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The global attribute number.
entry_num	The gEntry number to be deleted.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.7.1. Example(s)

The following example will delete gEntry numbered 2 from the global attribute “MY_ATTR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 status                        ! Returned status code.

.
.
CALL CDF_delete_attr_gentry (id, CDF_get_attr_num(id, 'MY_ATTR'), 2, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.8 CDF_delete_attr_rentry

SUBROUTINE CDF_delete_attr_rentry (

```
INTEGER*4  id,          ! in  -- CDF  identifier.
INTEGER*4  attr_num,    ! in  -- Variable attribute number.
INTEGER*4  entry_num,   ! in  -- rEntry number.
INTEGER*4  status)      ! out -- Completion status
```

CDF_delete_attr_rentry deletes the specified rEntry, corresponding to an rVariable, in an (variable) attribute from a CDF

The arguments to CDF_delete_attr_rentry are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The variable attribute number.
entry_num	The rEntry number to be deleted.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.8.1. Example(s)

The following example will delete the entry for rVariable “MY_VAR” from the variable attribute “MY_ATTR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 entry_num                     ! rVariable number.
INTEGER*4 status                        ! Returned status code.

.
.
entry_num = CDF_get_var_num(id, 'MY_VAR')
IF (entry_num .LT. 1) CALL UserQuit(……)
CALL CDF_delete_attr_rentry (id, CDF_get_attr_num(id, 'MY_ATTR'), entry_num,
1                            status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.9 CDF_delete_attr_zentry

SUBROUTINE CDF_delete_attr_zentry (

```
INTEGER*4  id,          ! in  -- CDF  identifier.
INTEGER*4  attr_num,    ! in  -- Variable attribute number.
INTEGER*4  entry_num,   ! in  -- zEntry number.
INTEGER*4  status)      ! out -- Completion status
```

CDF_delete_attr_zentry deletes the specified rEntry, corresponding to a zVariable, in an (variable) attribute from a CDF

The arguments to CDF_delete_attr_zentry are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The variable attribute number.
entry_num	The zEntry number to be deleted.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.9.1. Example(s)

The following example will delete the entry for zVariable “MY_VAR” from the variable attribute “MY_ATTR” in a CDF.

```
   .
   .
   INCLUDE '<path>cdf.inc'
   .
   .
   INTEGER*4 id                          ! CDF identifier.
   INTEGER*4 entry_num                   ! zVariable number.
   INTEGER*4 status                      ! Returned status code.

   .
   .
   entry_num = CDF_get_var_num(id, “MY_VAR”)
   IF (entry_num .LT. 1) CALL UserQuit(……)
   CALL CDF_delete_attr_zentry (id, CDF_get_attr_num(id, ‘MY_ATTR’), entry_num,
  1                             status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
   .
   .
```

6.4.10 CDF_get_attr_gentry

SUBROUTINE CDF_get_attr_gentry (

```
INTEGER*4  id,          ! in  -- CDF  identifier.
INTEGER*4  attr_num,    ! in  -- Global attribute number.
INTEGER*4  entry_num,   ! in  -- Entry number.
<type>     value,       ! out -- Value (<type> is dependent on the data type of the enrty).
INTEGER*4  status)      ! out -- Completion status
```

CDF_get_attr_gentry is used to read a global attribute’s entry from a CDF. In most cases it will be necessary to call CDF_inquire_attr_gentry before calling CDF_get_attr_gentry in order to determine the data type and number of elements (of that data type) for the entry.

The arguments to CDF_get_attr_gentry are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The global attribute number. This number may be determined with a call to CDF_get_attr_num (see Section 6.4.17).
entry_num	The entry number. This is the gEntry number and has meaning only to the application.
value	The value read. This buffer must be large enough to hold the value. The subroutine CDF_attr_entry_inquire would be used to determine the entry data type and number of elements (of that data type). The value is read from the CDF and placed into memory at address value. **WARNING:** If the entry has one of the character data types (CDF_CHARor CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the entry does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.10.1. Example(s)

The following example displays the value of the global attribute UNITS for the gEntry numbered 2 (but only if the data type is CDF_CHAR).

```
   .
   .
   INCLUDE '<path>cdf.inc'
   .
   .
   INTEGER*4 id               ! CDF identifier.
   INTEGER*4 status           ! Returned status code.
   INTEGER*4 attr_n           ! Attribute number.
   INTEGER*4 data_type        ! Data type.
   INTEGER*4 num_elems        ! Number of elements (of data type).
   CHARACTER buffer*100       ! Buffer to receive value (in this case it is
                              ! assumed that 100 characters is enough).
   .
   .
   attr_n = CDF_get_attr_num (id, 'UNITS')
   IF (attr_n .LT. 0) CALL UserStatusHandler (attr_n) ! If less than one (1),
                                                      ! then it must be a
                                                      ! warning/error code.

   CALL CDF_inquire_attr_gentry (id, attr_n, 2, data_type, num_elems,
  1                              status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)

   IF (data_type .EQ. CDF_CHAR) THEN
       CALL CDF_get_attr_gentry (id, attr_n, 2, buffer, status)
       IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
       WRITE (6,10) buffer(1:num_elems)
10     FORMAT (' ',A)
```

```
END IF
.
.
```

6.4.11 CDF_get_attr_gentry_datatype

SUBROUTINE CDF_get_attr_gentry_datatype (

```
INTEGER*4 id,          ! in  -- CDF identifier.
INTEGER*4 attr_num,    ! in  -- Attribute number.
INTEGER*4 entry_num,   ! in  -- Entry number.
INTEGER*4 data_type,   ! out -- Data type of the entry.
INTEGER*4 status)      ! out -- Completion status
```

CDF_get_attr_gentry_datatype acquires the data type of the specified gEntry from an (global) attribute in a CDF

The arguments to CDF_get_attr_gentry_datatype are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The attribute number.
entry_num	The gEntry number.
data_type	The data type of the entry.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.11.1. Example(s)

The following example acquires the data type for gEntry numbered 5 in the global attribute “MY_ATTR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                          ! CDF identifier.
INTEGER*4 data_type                   ! Data type.
INTEGER*4 status                      ! Returned status code.

.
.
CALL CDF_get_attr_gentry_datatype (id, CDF_get_attr_num(id, 'MY_ATTR'), 5,
1                                  data_type, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.12 CDF_get_attr_gentry_numelems

SUBROUTINE CDF_get_attr_gentry_numelems (

```
INTEGER*4  id,          ! in  -- CDF  identifier.
INTEGER*4  attr_num,    ! in  -- Attribute number.
INTEGER*4  entry_num,   ! in  -- Entry number.
INTEGER*4  num_elems,   ! out -- Number of elements of the entry.
INTEGER*4  status)      ! out -- Completion status
```

CDF_get_attr_gentry_numelems acquires the number of elements of the specified gEntry from an (global) attribute in a CDF

The arguments to CDF_get_attr_gentry_numelems are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The attribute number.
entry_num	The gEntry number.
num_elems	The number of elements of the gEntry.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.12.1. Example(s)

The following example acquires the number of elements for gEntry numbered 5 in the global attribute “MY_ATTR” in a CDF.

```
   .
   .
   INCLUDE '<path>cdf.inc'
   .
   .
   INTEGER*4 id                            ! CDF identifier.
   INTEGER*4 num_elements                  ! Number of elements.
   INTEGER*4 status                        ! Returned status code.

   .
   .
   CALL CDF_get_attr_gentry_numelems (id, CDF_get_attr_num(id, 'MY_ATTR'), 5,
  1                                   num_elems, status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
   .
   .
```

6.4.13 CDF_get_attr_max_gentry

SUBROUTINE CDF_get_attr_max_gentry (

```
INTEGER*4 id,          ! in  -- CDF identifier.
INTEGER*4 attr_num,    ! in  -- Attribute number.
INTEGER*4 entry_num,   ! out -- Entry number.
INTEGER*4 status)      ! out -- Completion status
```

CDF_get_attr_max_gentry acquires the last gEntry number from an (global) attribute in a CDF.

The arguments to CDF_get_attr_max_gentry are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The attribute number.
entry_num	The last gEntry number.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.13.1. Example(s)

The following example acquires the last gEntry number from the global attribute “MY_ATTR” in a CDF.

```
   .
   .
   INCLUDE '<path>cdf.inc'
   .
   .
   INTEGER*4 id                          ! CDF identifier.
   INTEGER*4 entry_num                   ! The last gEntry number.
   INTEGER*4 status                      ! Returned status code.

   .
   .
   CALL CDF_get_attr_max_gentry (id, CDF_get_attr_num(id, 'MY_ATTR'),
  1                              entry_num, status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
   .
   .
```

6.4.14 CDF_get_attr_max_rentry

SUBROUTINE CDF_get_attr_max_rentry (

```
INTEGER*4 id,          ! in  -- CDF identifier.
INTEGER*4 attr_num,    ! in  -- Attribute number.
```

```
INTEGER*4  entry_num,  ! out --  Entry number.
INTEGER*4  status)     ! out --  Completion status
```

CDF_get_attr_max_rentry acquires the last rEntry number from an (variable) attribute in a CDF.

The arguments to CDF_get_attr_max_rentry are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The attribute number.
entry_num	The last rEntry number.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.14.1. Example(s)

The following example acquires the last rEntry number from the variable attribute “MY_ATTR” in a CDF.

```
   .
   .
   INCLUDE '<path>cdf.inc'
   .
   .
   INTEGER*4 id                          ! CDF identifier.
   INTEGER*4 entry_num                   ! The last rEntry number.
   INTEGER*4 status                      ! Returned status code.

   .
   .
   CALL CDF_get_attr_max_gentry (id, CDF_get_attr_num(id, 'MY_ATTR'),
  1                              entry_num, status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
   .
   .
```

6.4.15 CDF_get_attr_max_zentry

SUBROUTINE CDF_get_attr_max_zentry (

```
INTEGER*4  id,          ! in  --  CDF  identifier.
INTEGER*4  attr_num,    ! in  --  Attribute number.
INTEGER*4  entry_num,   ! out --  Entry number.
INTEGER*4  status)      ! out --  Completion status
```

CDF_get_attr_max_zentry acquires the last zEntry number from an (variable) attribute in a CDF.

The arguments to CDF_get_attr_max_zentry are defined as follows:

id — The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

attr_num — The attribute number.

entry_num — The last zEntry number.

status — The completion status code. Chapter 8 explains how to interpret status codes.

6.4.15.1. Example(s)

The following example acquires the last zEntry number from the variable attribute “MY_ATTR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 entry_num                     ! The last zEntry number.
INTEGER*4 status                        ! Returned status code.

.
.
CALL CDF_get_attr_max_gentry (id, CDF_get_attr_num(id, 'MY_ATTR'),
1                              entry_num, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.16 CDF_get_attr_name

SUBROUTINE CDF_get_attr_name (

```
INTEGER*4  id,                  ! in  -- CDF  identifier.
INTEGER*4  attr_num,            ! in  -- Attribute number.
CHARACTER attr_name*(*),        ! out -- Attribute name.
INTEGER*4  status)              ! out -- Completion status
```

CDF_get_attr_name acquires the name of the specified attribute (by its number) in a CDF.

The arguments to CDF_get_attr_name are defined as follows:

id — The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

attr_num — The attribute number.

attr_name — The attribute name.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.4.16.1. Example(s)

The following example acquires the name of the attribute number 2 in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                                  ! CDF identifier.
CHARACTER attr_name*(CDF_ATTR_NAME_LEN256 )   ! The last rEntry number.
INTEGER*4 status                              ! Returned status code.

.
.
CALL CDF_get_attr_name (id, 2, attr_name, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.17 CDF_get_attr_num

INTEGER*4 FUNCTION CDF_get_attr_num (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
CHARACTER  attr_name*(*),     ! in  -- Attribute name.
INTEGER*4  status)            ! out -- Completion status
```

CDF_get_attr_num is used to determine the attribute number associated with a given attribute name. If the attribute is found, CDF_get_attr_num returns its number - which will be equal to or greater than one (1). If an error occurs (e.g., the attribute name does not exist in the CDF), an error code (of type INTEGER*4) is returned. Error codes are less than zero (0).

The arguments to CDF_get_attr_num are defined as follows:

id The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

attr_name The name of the attribute for which to search. This may be at most CDF_ATTR_NAME_LEN256 characters. Attribute names are case-sensitive.

CDF_attr_num may be used as an embedded function call when an attribute number is needed. CDF attr num is declared in cdf.inc. (Fortran functions must be declared so that the returned value is interpreted correctly.)

6.4.17.1. Example(s)

In the following example the attribute named pressure will be renamed to PRESSURE with CDF_attr_num being used as an embedded function call. Note that if the attribute pressure did not exist in the CDF, the call to CDF_get_attr_num would have returned an error code. Passing that error code to CDF_rename_attr as an attribute number would have resulted in CDF_rename_attr also returning an error code. CDF_rename_attr is described in Section 6.4.38.

```
   .
   .
   INCLUDE '<path>cdf.inc'
   .
   .
   INTEGER*4 id          ! CDF identifier.
   INTEGER*4 status      ! Returned status code.
   .
   .
   CALL CDF_rename_attr (id, CDF_get_attr_num(id,'pressure'), 'PRESSURE',
  1                      status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
   .
   .
```

6.4.18 CDF_get_attr_num_gentries

SUBROUTINE CDF_get_attr_num_gentries (

```
INTEGER*4  id,          ! in  -- CDF  identifier.
INTEGER*4  attr_num,    ! in  -- Attribute number.
INTEGER*4  entries,     ! out -- Total entries.
INTEGER*4  status)      ! out -- Completion status
```

CDF_get_attr_num_gentries acquires the total number of entries (gEntries) in the specified (global) attribute of a CDF.

The arguments to CDF_get_attr_num_gentries are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The attribute number.
entries	Total gEntries.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.18.1. Example(s)

The following example acquires the total number of entries (gEntries) in the global attribute “MY_ATTR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 entries                       ! Total entries.
INTEGER*4 status                        ! Returned status code.

.
.
CALL CDF_get_attr_num_gentries (id, CDF_get_attr_num(id, 'MY_ATTR'),
1                                entries, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.19 CDF_get_attr_num_rentries

SUBROUTINE CDF_get_attr_num_rentries (

```
INTEGER*4  id,          ! in  -- CDF  identifier.
INTEGER*4  attr_num,    ! in  -- Attribute number.
INTEGER*4  entries,     ! out -- Total entries.
INTEGER*4  status)      ! out -- Completion status
```

CDF_get_attr_num_rentries acquires the total number of entries for the rVariables (rEntries) in the specified (variable) attribute of a CDF.

The arguments to CDF_get_attr_num_rentries are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The attribute number.
entries	Total rEntries.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.19.1. Example(s)

The following example acquires the total number of entries (rEntries) in the variable attribute “MY_ATTR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 entries                       ! Total entries.
```

```
 INTEGER*4 status                        ! Returned status code.

 .
 .
 CALL CDF_get_attr_num_rentries (id, CDF_get_attr_num(id, 'MY_ATTR'),
1                                entries, status)
 IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
 .
 .
```

6.4.20 CDF_get_attr_num_zentries

SUBROUTINE CDF_get_attr_num_zentries (

```
INTEGER*4 id,          ! in  -- CDF identifier.
INTEGER*4 attr_num,    ! in  -- Attribute number.
INTEGER*4 entries,     ! out -- Total entries.
INTEGER*4 status)      ! out -- Completion status
```

CDF_get_attr_num_zentries acquires the total number of entries for the zVariable (zEntries) in the specified (variable) attribute of a CDF.

The arguments to CDF_get_attr_num_zentries are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The attribute number.
entries	Total zEntries.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.20.1. Example(s)

The following example acquires the total number of entries (zEntries) in the variable attribute “MY_ATTR” in a CDF.

```
 .
 .
 INCLUDE '<path>cdf.inc'
 .
 .
 INTEGER*4 id                            ! CDF identifier.
 INTEGER*4 entries                       ! Total entries.
 INTEGER*4 status                        ! Returned status code.

 .
 .
 CALL CDF_get_attr_num_zentries (id, CDF_get_attr_num(id, 'MY_ATTR'),
1                                entries, status)
```

```
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.21 CDF_get_attr_rentry

SUBROUTINE CDF_get_attr_rentry (

```
INTEGER*4  id,          ! in  -- CDF  identifier.
INTEGER*4  attr_num,    ! in  -- Variable attribute number.
INTEGER*4  entry_num,   ! in  -- Entry number.
<type>     value,       ! out -- Value (<type> is dependent on the data type of the enrty).
INTEGER*4  status)      ! out -- Completion status
```

CDF_get_attr_rentry is used to read a variable attribute's entry corresponding to an rVariable (rEntry) from a CDF. In most cases it will be necessary to call CDF_inquire_attr_rentry before calling CDF_get_attr_rentry in order to determine the data type and number of elements (of that data type) for the entry.

The arguments to CDF_get_attr_rentry are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The variable attribute number. This number may be determined with a call to CDF_get_attr_num (see Section 6.4.17).
entry_num	The entry number. This is the number of the associated rVariable (the rVariable being described in some way by the rEntry).
value	The value read. This buffer must be large enough to hold the value. The subroutine CDF_attr_entry_inquire would be used to determine the entry data type and number of elements (of that data type). The value is read from the CDF and placed into memory at address value. **WARNING:** If the entry has one of the character data types (CDF_CHARor CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the entry does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.21.1. Example(s)

The following example displays the value of the variable attribute UNITS for the rEntry corresponding to the PRES_LVL rVariable (but only if the data type is CDF_CHAR).

```
.
.
INCLUDE '<path>cdf.inc'
.
.
```

```
   INTEGER*4 id               ! CDF identifier.
   INTEGER*4 status           ! Returned status code.
   INTEGER*4 attr_n           ! Attribute number.
   INTEGER*4 entryN           ! Entry number.
   INTEGER*4 data_type        ! Data type.
   INTEGER*4 num_elems        ! Number of elements (of data type).
   CHARACTER buffer*100       ! Buffer to receive value (in this case it is
                              ! assumed that 100 characters is enough).
   .
   .
   attr_n = CDF_get_attr_num (id, 'UNITS')
   IF (attr_n .LT. 0) CALL UserStatusHandler (attr_n) ! If less than one (1),
                                                      ! then it must be a
                                                      ! warning/error code.

   entryN = CDF_get_var_num (id, 'PRES_LVL')          ! The rEntry number is
                                                      ! the rVariable number.

   IF (entryN .LT. 0) CALL UserStatusHandler (entryN) ! If less than one (1),
                                                      ! then it must be a
                                                      ! warning/error code.

   CALL CDF_inquire_attr_rentry (id, attr_n, entryN, data_type, num_elems,
  1                              status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)

   IF (data_type .EQ. CDF_CHAR) THEN
       CALL CDF_get_attr_rentry (id, attr_n, entryN, buffer, status)
       IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
       WRITE (6,10) buffer(1:num_elems)
10     FORMAT (' ',A)
   END IF
   .
   .
```

6.4.22 CDF_get_attr_rentry_datatype

SUBROUTINE CDF_get_attr_rentry_datatype (

```
INTEGER*4 id,          ! in  -- CDF identifier.
INTEGER*4 attr_num,    ! in  -- Attribute number.
INTEGER*4 entry_num,   ! in  -- Entry number.
INTEGER*4 data_type,   ! out -- Data type of the entry.
INTEGER*4 status)      ! out -- Completion status
```

CDF_get_attr_rentry_datatype acquires the data type of the specified rEntry, corresponding to an rVariable, from an (variable) attribute in a CDF.

The arguments to CDF_get_attr_rentry_datatype are defined as follows:

id — The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

attr_num The attribute number.

entry_num The rEntry number.

data_type The data type of the entry.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.4.22.1. Example(s)

The following example acquires the data type for rEntry, corresponding to rVariable “MY_VAR” in the variable attribute “MY_ATTR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 data_type                     ! Data type.
INTEGER*4 status                        ! Returned status code.

.
.
CALL CDF_get_attr_rentry_datatype (id, CDF_get_attr_num(id, 'MY_ATTR'),
1                                  CDF_get_var_num(id, "MY_VAR"), data_type,
2                                  status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.23 CDF_get_attr_rentry_numelems

SUBROUTINE CDF_get_attr_rentry_numelems (

```
INTEGER*4  id,          ! in  -- CDF  identifier.
INTEGER*4  attr_num,    ! in  -- Attribute number.
INTEGER*4  entry_num,   ! in  -- Entry number.
INTEGER*4  num_elems,   ! out -- Number of elements of the entry.
INTEGER*4  status)      ! out -- Completion status
```

CDF_get_attr_rentry_numelems acquires the number of elements of the specified rEntry, corresponding to an rVariable, from an (variable) attribute in a CDF.

The arguments to CDF_get_attr_rentry_numelems are defined as follows:

id The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

attr_num The attribute number.

entry_num The rEntry number.

num_elems The number of elements of the rEntry.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.4.23.1. Example(s)

The following example acquires the number of elements for rEntry, corresponding to rVariable “MY_VAR”, in the variable attribute “MY_ATTR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 num_elements                  ! Number of elements.
INTEGER*4 status                        ! Returned status code.

.
.
CALL CDF_get_attr_rentry_numelems (id, CDF_get_attr_num(id, 'MY_ATTR'),
1                                  CDF_get_var_num(id, "MY_VAR"), num_elems,
2                                  status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.24 CDF_get_attr_scope

SUBROUTINE CDF_get_attr_scope (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 attr_num, ! in -- Attribute number.
INTEGER*4 scope, ! out -- Attribute scope.
INTEGER*4 status) ! out -- Completion status

CDF_get_attr_scope acquires the scope, either GLOBAL_SCOPE or VARIABLE_SCOPE, of the specified attribute in a CDF.

The arguments to CDF_get_attr_scope are defined as follows:

id The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

attr_num The attribute number.

scope The attribute scope.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.4.24.1. Example(s)

The following example acquires the scope for the attribute “MY_ATTR” in a CDF.

```
      .
      .
      INCLUDE '<path>cdf.inc'
      .
      .
      INTEGER*4 id                          ! CDF identifier.
      INTEGER*4 scope                       ! Attribute scope.
      INTEGER*4 status                      ! Returned status code.

      .
      .
      CALL CDF_get_attr_scope (id, CDF_get_attr_num(id, 'MY_ATTR'), scope,
     1                         status)
      IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
      .
      .
```

6.4.25 CDF_get_attr_zentry

SUBROUTINE CDF_get_attr_zentry (

```
INTEGER*4  id,          ! in  -- CDF  identifier.
INTEGER*4  attr_num,    ! in  -- variable attribute number.
INTEGER*4  entry_num,   ! in  -- Entry number.
<type>     value,       ! out -- Value (<type> is dependent on the data type of the enrty).
INTEGER*4  status)      ! out -- Completion status
```

CDF_get_attr_zentry is used to read a variable attribute’s entry, corresponding to a zVariable, (zEntry) in a CDF. In most cases it will be necessary to call CDF_inquire_attr_zentry before calling CDF_get_attr_zentry in order to determine the data type and number of elements (of that data type) for the entry.

The arguments to CDF_get_attr_zentry are defined as follows:

id The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

attr_num The variable attribute number. This number may be determined with a call to CDF_get_attr_num (see Section 6.4.17).

entry_num The entry number. This is the number of the associated zVariable (the zVariable being described in some way by the zEntry).

value — The value read. This buffer must be large enough to hold the value. The subroutine CDF_inquire_attr_zentry would be used to determine the entry data type and number of elements (of that data type). The value is read from the CDF and placed into memory at address value.

WARNING: If the entry has one of the character data types (CDF_CHARor CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the entry does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

status — The completion status code. Chapter 8 explains how to interpret status codes.

6.4.25.1. Example(s)

The following example displays the value of the UNITS attribute for the zEntry corresponding to the PRES_LVL zVariable (but only if the data type is CDF_CHAR).

```
   .
   .
   INCLUDE '<path>cdf.inc'
   .
   .
   INTEGER*4 id               ! CDF identifier.
   INTEGER*4 status           ! Returned status code.
   INTEGER*4 attr_n           ! Attribute number.
   INTEGER*4 entryN           ! Entry number.
   INTEGER*4 data_type        ! Data type.
   INTEGER*4 num_elems        ! Number of elements (of data type).
   CHARACTER buffer*100       ! Buffer to receive value (in this case it is
                              ! assumed that 100 characters is enough).
   .
   .
   attr_n = CDF_get_attr_num (id, 'UNITS')
   IF (attr_n .LT. 0) CALL UserStatusHandler (attr_n) ! If less than one (1),
                                                      ! then it must be a
                                                      ! warning/error code.

   entryN = CDF_get_var_num (id, 'PRES_LVL')          ! The zEntry number is
                                                      ! the zVariable number.

   IF (entryN .LT. 0) CALL UserStatusHandler (entryN) ! If less than one (1),
                                                      ! then it must be a
                                                      ! warning/error code.

   CALL CDF_inquire_attr_zentry (id, attr_n, entryN, data_type, num_elems,
   1                             status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)

   IF (data_type .EQ. CDF_CHAR) THEN
       CALL CDF_get_attr_zentry (id, attr_n, entryN, buffer, status)
       IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
       WRITE (6,10) buffer(1:num_elems)
10     FORMAT (' ',A)
   END IF
   .
```

.

6.4.26 CDF_get_attr_zentry_datatype

SUBROUTINE CDF_get_attr_zentry_datatype (

```
INTEGER*4 id,          ! in  -- CDF identifier.
INTEGER*4 attr_num,    ! in  -- Attribute number.
INTEGER*4 entry_num,   ! in  -- Entry number.
INTEGER*4 data_type,   ! out -- Data type of the entry.
INTEGER*4 status)      ! out -- Completion status
```

CDF_get_attr_zentry_datatype acquires the data type of the specified zEntry, corresponding to a zVariable, from an (variable) attribute in a CDF.

The arguments to CDF_get_attr_zentry_datatype are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The attribute number.
entry_num	The zEntry number.
data_type	The data type of the entry.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.26.1. Example(s)

The following example acquires the data type for zEntry, corresponding to zVariable “MY_VAR” in the variable attribute “MY_ATTR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                          ! CDF identifier.
INTEGER*4 data_type                   ! Data type.
INTEGER*4 status                      ! Returned status code.

.
.
CALL CDF_get_attr_zentry_datatype (id, CDF_get_attr_num(id, 'MY_ATTR'),
1                                  CDF_get_var_num(id, 'MY_VAR'), data_type,
2                                  Status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.27 CDF_get_attr_zentry_numelems

SUBROUTINE CDF_get_attr_rentry_numelems (

```
INTEGER*4 id,          ! in  -- CDF identifier.
INTEGER*4 attr_num,    ! in  -- Attribute number.
INTEGER*4 entry_num,   ! in  -- Entry number.
INTEGER*4 num_elems,   ! out -- Number of elements of the entry.
INTEGER*4 status)      ! out -- Completion status
```

CDF_get_attr_zentry_numelems acquires the number of elements of the specified zEntry, corresponding to a zVariable, from an (variable) attribute in a CDF.

The arguments to CDF_get_attr_zentry_numelems are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The attribute number.
entry_num	The zEntry number.
num_elems	The number of elements of the zEntry.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.27.1. Example(s)

The following example acquires the number of elements for zEntry corresponding to zVariable “MY_VAR” in the variable attribute “MY_ATTR” in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                            ! CDF identifier.
INTEGER*4 num_elements                  ! Number of elements.
INTEGER*4 status                        ! Returned status code.

.
.
CALL CDF_get_attr_zentry_numelems (id, CDF_get_attr_num(id, 'MY_ATTR'),
1                                  CDF_get_var_num(id, 'MY_VAR'), num_elems,
2                                  status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.28 CDF_get_num_attrs

SUBROUTINE CDF_get_num_attrs (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4 num_attrs,          ! out -- Number of attributes.
INTEGER*4  status)            ! out --  Completion status
```

CDF_get_num_attrs acquires the total number of (global and variable) attributes in a CDF.

The arguments to CDF_get_num_attrs are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
num_attrs	The number of attributes.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.28.1. Example(s)

The following example acquires the total number of attributes in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 attrs       ! Attributes.
INTEGER*4 status      ! Returned status code.

.
.
CALL CDF_get_num_attrs (id, attrs, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.29 CDF_get_num_gattrs

SUBROUTINE CDF_get_num_gattrs (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4 attrs,              ! out -- Number of attributes.
INTEGER*4  status)            ! out --  Completion status
```

CDF_get_num_gattrs acquires the total number of global attributes in a CDF.

The arguments to CDF_get_num_gattrs are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attrs	The number of global attributes.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.29.1. Example(s)

The following example acquires the total number of global attributes in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 attrs       ! Attributes.
INTEGER*4 status      ! Returned status code.

.
.
CALL CDF_get_num_gattrs (id, attrs, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.30 CDF_get_num_vattrs

SUBROUTINE CDF_get_num_vattrs (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 attrs, ! out -- Number of attributes.
INTEGER*4 status) ! out -- Completion status

CDF_get_num_vattrs acquires the total number of variable attributes in a CDF.

The arguments to CDF_get_num_vattrs are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attrs	The number of variable attributes.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.30.1. Example(s)

The following example acquires the total number of variable attributes in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 attrs       ! Attributes.
INTEGER*4 status      ! Returned status code.

.
.
CALL CDF_get_num_vattrs (id, attrs, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.31 CDF_inquire_attr

SUBROUTINE CDF_inquire_attr (

```
INTEGER*4   id,                                    ! in  -- CDF  identifier.
INTEGER*4   attr_num,                              ! in  -- Attribute number.
CHARACTER   attr_name*(CDF_ATTR_NAME_LEN256),      ! out -- Attribute name.
INTEGER*4   attr_scope,                            ! out -- Attribute scope.
INTEGER*4   max_gentry,                            ! out -- Maximum gEntry number if global attribute.
INTEGER*4   max_rentry,                            ! out -- Maximum rEntry number if variable attribute.
INTEGER*4   max_zentry,                            ! out -- Maximum zEntry number if variable attribute.
INTEGER*4   status)                                ! out -- Completion status
```

CDF_inquire_attr is used to inquire about the specified attribute. This subroutine expands the original Standard Interface subroutine CDF_attr_inquire (Section 5.4) by including an extra information about zEntry if variable attribute is involved. To inquire about a specific attribute entry, use CDF_inquire_attr_gentry (Section 6.4.32), CDF_inquire_attr_rentry (Section 6.4.33) or CDF_inquire_attr_zentry (Section 6.4.34).

The arguments to CDF_inquire_attr are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The number of the attribute to inquire. This number may be determined with a call to CDF_get_attr_num (see Section 6.4.17).
attr_name	The attribute's name. This character string must be large enough to hold CDF_ATTR_NAME_LEN256 characters and will be blank padded if necessary.

attr_scope	The scope of the attribute. Attribute scopes are defined in Section 4.12.
max_gentry	For gAttributes this is the maximum gEntry number used. This may not correspond with the number of entries (if some entry numbers were not used). The number of entries actually used may be inquired with CDF_get_attr_num_gentries (see Section 6.4.18). If no entries exist for the attribute, then a value of zero (0) will be passed back.
max_rentry	For vAttributes this is the maximum rEntry number used. This may not correspond with the number of entries (if some entry numbers were not used). The number of entries actually used may be inquired with CDF_get_attr_num_rentries (see Section 6.4.19). If no entries exist for the attribute, then a value of zero (0) will be passed back.
max_zentry	For vAttributes, this is the maximum zEntry number used. This may not correspond with the number of entries (if some entry numbers were not used). The number of entries actually used may be inquired with the CDF_get_attr_num_zentries subroutine (see Section 6.4.20). If no entries exist for the attribute, such as for gAttributes, then a value of zero (0) will be passed back.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.31.1. Example(s)

The following example displays the name of each attribute in a CDF. The number of attributes in the CDF is first determined using the subroutine CDF_inquire. Only variable attributes may return non-zero maximum zEntry number. Note that attribute numbers start at one (1) and are consecutive.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                                  ! CDF identifier.
INTEGER*4 status                              ! Returned status code.
INTEGER*4 num_dims                            ! Number of dimensions.
INTEGER*4 dim_sizes(CDF_MAX_DIMS)             ! Dimension sizes (allocate to
                                              ! allow the maximum number of
                                              ! dimensions).
INTEGER*4 encoding                            ! Data encoding.
INTEGER*4 majority                            ! Variable majority.
INTEGER*4 max_rec                             ! Maximum record number in CDF.
INTEGER*4 num_vars                            ! Number of variables in CDF.
INTEGER*4 num_attrs                           ! Number of attributes in CDF.
INTEGER*4 attr_n                              ! Attribute number.
CHARACTER attr_name*(CDF_ATTR_NAME_LEN256)    ! Attribute name.
INTEGER*4 attr_scope                          ! Attribute scope.
INTEGER*4 max_gentry                          ! Maximum gEntry number.
INTEGER*4 max_rentry                          ! Maximum rEntry number.
INTEGER*4 max_zentry                          ! Maximum zEntry number.
.
CALL CDF_inquire (id, num_dims, dim_sizes, encoding, majority,
1                 max_rec, num_vars, num_attrs, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
DO attr_n = 1, num_attrs
   CALL CDF_inquire_attr (id, attr_n, attr_name, attr_scope, max_gentry,
1                         max_rentry, max_zentry, status)
```

```
      IF (status .LT. CDF_OK) THEN        ! INFO status codes ignored.
          CALL UserStatusHandler (status)
      ELSE
          WRITE (6,10) attr_name
10        FORMAT (' ',A)
      END IF
   END DO
   .
   .
```

6.4.32 CDF_inquire_attr_gentry

SUBROUTINE CDF_inquire_attr_gentry (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4 attr_num,           ! in  -- Global attribute number.
INTEGER*4 entry_num,          ! in  -- Entry number.
INTEGER*4  data_type,         ! out -- Data type.
INTEGER*4  num_elements,      ! out -- Number of elements  (of the data type).
INTEGER*4  status)            ! out -- Completion status
```

CDF_inquire_attr_gentry is used to inquire about a specific global attribute's entry. To inquire about the attribute in general, use CDF_inquire_attr (see Section 6.4.31). CDF_inquire_attr_gentry would normally be called before calling CDF_get_attr_gentry in order to determine the data type and number of elements (of that data type) for an entry. This would be necessary to correctly allocate enough memory to receive the value read by CDF_attr_get.

The arguments to CDF_attr_entry_inquire are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The global attribute number for which to inquire an entry. This number may be determined with a call to CDF_get_attr_num (see Section 6.4.17).
entry_num	The entry number to inquire. This is simply the gEntry number and has meaning only to the application.
data_type	The data type of the specified entry. The data types are defined in Section 4.5.
num_elements	The number of elements of the data type. For character data types (CDF_CHAR and CDF_UCHAR), this is the number of characters in the string (an array of characters). For all other data types this is the number of elements in an array of that data type.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.32.1. Example(s)

The following example inquires each entry for a global attribute. Note that entry numbers need not be consecutive - not every entry number between one (1) and the maximum entry number must exist. For this reason NO_SUCH_ENTRY is an expected error code.

```
   .
   .
   INCLUDE '<path>cdf.inc'
   .
   .
   INTEGER*4 id                                    ! CDF identifier.
   INTEGER*4 status                                ! Returned status code.
   INTEGER*4 attr_n                                ! Attribute number.
   INTEGER*4 entryN                                ! Entry number.
   CHARACTER attr_name*(CDF_ATTR_NAME_LEN256)      ! Attribute name.
   INTEGER*4 attr_scope                            ! Attribute scope.
   INTEGER*4 max_gentry                            ! Maximum gEntry number used.
   INTEGER*4 max_rentry                            ! Maximum rEntry number used.
   INTEGER*4 max_zentry                            ! Maximum zEntry number used.
   INTEGER*4 data_type                             ! Data type.
   INTEGER*4 num_elems                             ! Number of elements (of the
                                                   ! data type).
   .
   .
   attr_n = CDF_get_attr_num (id, 'TMP')
   IF (attr_n .LT. 1) CALL UserStatusHandler (attr_n) ! If less than one (1),
                                                      ! then it must be a
                                                      ! warning/error code.
   CALL CDF_inquire_attr (id, attr_n, attr_name, attr_scope, max_gentry,
  1                       max_rentry, max_zentry, status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
   DO entryN = 1, max_gentry
      CALL CDF_inquire_attr_gentry (id, attr_n, entryN, data_type, num_elems,
      1                             status)
      IF (status .LT. CDF_OK) THEN
          IF (status .NE. NO_SUCH_ENTRY) CALL UserStatusHandler (status)
      ELSE
C        (process entries)
         .
         .
      END IF
   END DO
```

6.4.33 CDF_inquire_attr_rentry

SUBROUTINE CDF_inquire_attr_rentry (

```
INTEGER*4  id,                  ! in  -- CDF  identifier.
INTEGER*4 attr_num,             ! in  -- Variable attribute number.
INTEGER*4 entry_num,            ! in  -- Entry number.
INTEGER*4  data_type,           ! out -- Data type.
INTEGER*4  num_elements,        ! out -- Number of elements  (of the data type).
INTEGER*4  status)              ! out -- Completion status
```

CDF_inquire_attr_rentry is used to inquire about a specific entry, corresponding to an rVariable, in a variable attribute, (rEntry). To inquire about the attribute in general, use CDF_inquire_attr (see Section 6.4.31). CDF_inquire_attr_rentry would normally be called before calling CDF_get_attr_rentry in order to determine the data type and number of

elements (of that data type) for an entry. This would be necessary to correctly allocate enough memory to receive the value read by CDF_get_attr_zentry.

The arguments to CDF_inquire_attr_rentry are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The attribute number for which to inquire an entry. This number may be determined with a call to CDF_get_attr_num (see Section 6.4.17).
entry_num	The entry number to inquire. The attribute must be variable in scope. This is the number of the associated rVariable (the rVariable being described in some way by the zEntry).
data_type	The data type of the specified entry. The data types are defined in Section 4.5.
num_elements	The number of elements of the data type. For character data types (CDF_CHAR and CDF_UCHAR), this is the number of characters in the string (an array of characters). For all other data types this is the number of elements in an array of that data type.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.33.1. Example(s)

The following example inquires each rEntry for variable attribute “TMP” in a CDF. Note that entry numbers need not be consecutive - not every entry number between one (1) and the maximum entry number must exist. For this reason NO_SUCH_ENTRY is an expected error code.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                                  ! CDF identifier.
INTEGER*4 status                              ! Returned status code.
INTEGER*4 attr_n                              ! Attribute number.
INTEGER*4 entryN                              ! Entry number.
CHARACTER attr_name*(CDF_ATTR_NAME_LEN256)    ! Attribute name.
INTEGER*4 attr_scope                          ! Attribute scope.
INTEGER*4 max_gentry                          ! Maximum gEntry number used.
INTEGER*4 max_rentry                          ! Maximum rEntry number used.
INTEGER*4 max_zentry                          ! Maximum zEntry number used.
INTEGER*4 data_type                           ! Data type.
INTEGER*4 num_elems                           ! Number of elements (of the
                                              ! data type).
.
.
attr_n = CDF_get_attr_num (id, 'TMP')
IF (attr_n .LT. 1) CALL UserStatusHandler (attr_n) ! If less than one (1),
                                                   ! then it must be a
                                                   ! warning/error code.
CALL CDF_inquire_attr (id, attr_n, attr_name, attr_scope, max_gentry,
1                       max_rentry, max_zentry, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
DO entryN = 1, max_rentry
```

```
      CALL CDF_inquire_attr_rentry (id, attr_n, entryN, data_type, num_elems,
  1                                 status)
      IF (status .LT. CDF_OK) THEN
          IF (status .NE. NO_SUCH_ENTRY) CALL UserStatusHandler (status)
      ELSE
C        (process entries)
         .
         .
      END IF
   END DO
```

6.4.34 CDF_inquire_attr_zentry

SUBROUTINE CDF_inquire_attr_zentry (

```
INTEGER*4  id,                  ! in  -- CDF  identifier.
INTEGER*4 attr_num,             ! in  -- Variable attribute number.
INTEGER*4 entry_num,            ! in  -- Entry number.
INTEGER*4  data_type,           ! out -- Data type.
INTEGER*4  num_elements,        ! out -- Number of elements  (of the data type).
INTEGER*4  status)              ! out -- Completion status
```

CDF_inquire_attr_zentry is used to inquire about a specific entry, corresponding to a zVariable, in a variable attribute, (zEntry). To inquire about the attribute in general, use CDF_inquire_attr (see Section 6.4.31). CDF_inquire_attr_zentry would normally be called before calling CDF_get_attr_zentry in order to determine the data type and number of elements (of that data type) for an entry. This would be necessary to correctly allocate enough memory to receive the value read by CDF_get_attr_zentry.

The arguments to CDF_inquire_attr_zentry are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The attribute number for which to inquire an entry. This number may be determined with a call to CDF_get_attr_num (see Section 6.4.17).
entry_num	The entry number to inquire. The attribute must be variable in scope. This is the number of the associated zVariable (the zVariable being described in some way by the zEntry).
data_type	The data type of the specified entry. The data types are defined in Section .
num_elements	The number of elements of the data type. For character data types (CDF_CHAR and CDF_UCHAR), this is the number of characters in the string (an array of characters). For all other data types this is the number of elements in an array of that data type.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.34.1. Example(s)

The following example inquires each zEntry for variable attribute “TMP” in a CDF. Note that entry numbers need not be consecutive - not every entry number between one (1) and the maximum entry number must exist. For this reason NO_SUCH_ENTRY is an expected error code.

```
   .
   .
   INCLUDE '<path>cdf.inc'
   .
   .
   INTEGER*4 id                                  ! CDF identifier.
   INTEGER*4 status                              ! Returned status code.
   INTEGER*4 attr_n                              ! Attribute number.
   INTEGER*4 entryN                              ! Entry number.
   CHARACTER attr_name*(CDF_ATTR_NAME_LEN256)    ! Attribute name.
   INTEGER*4 attr_scope                          ! Attribute scope.
   INTEGER*4 max_gentry                          ! Maximum gEntry number used.
   INTEGER*4 max_rentry                          ! Maximum rEntry number used.
   INTEGER*4 max_zentry                          ! Maximum zEntry number used.
   INTEGER*4 data_type                           ! Data type.
   INTEGER*4 num_elems                           ! Number of elements (of the
                                                 ! data type).
   .
   .
   attr_n = CDF_get_attr_num (id, 'TMP')
   IF (attr_n .LT. 1) CALL UserStatusHandler (attr_n) ! If less than one (1),
                                                      ! then it must be a
                                                      ! warning/error code.
   CALL CDF_inquire_attr (id, attr_n, attr_name, attr_scope, max_gentry,
  1                       max_rentry, max_zentry, status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
   DO entryN = 1, max_zentry
      CALL CDF_inquire_attr_zentry (id, attr_n, entryN, data_type, num_elems,
  1                                 status)
      IF (status .LT. CDF_OK) THEN
          IF (status .NE. NO_SUCH_ENTRY) CALL UserStatusHandler (status)
      ELSE
C        (process entries)
         .
         .
      END IF
   END DO
```

6.4.35 CDF_put_attr_gentry

SUBROUTINE CDF_put_attr_gentry (

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  attr_num,        ! in  -- Global attribute number.
INTEGER*4  entry_num,       ! in  -- Entry number.
INTEGER*4  data_type,       ! in  -- Data type of this entry.
INTEGER*4  num_elements,    ! in  -- Number of elements  (of the data type).
<type>     value,           ! in  -- Value (<type> is dependent on the data type of the enrty).
INTEGER*4  status)          ! out -- Completion status
```

CDF_put_attr_gentry is used to write an gentry to a variable attribute in a CDF. The entry may or may not already exist. If it does exist, it is overwritten. The data type and number of elements (of that data type) may be changed when overwriting an existing entry.

The arguments to CDF_put_attr_gentry are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The global attribute number. This number may be determined with a call to CDF_get_attr_num (see Section 6.4.17).
entry_num	The entry number. The attribute must be global in scope.
data_type	The data type of the specified entry. Specify one of the data types defined in Section 4.5.
num_elements	The number of elements of the data type. For character data types (CDF_CHAR and CDF_UCHAR), this is the number of characters in the string (an array of characters). For all other data types this is the number of elements in an array of that data type.
value	The value(s) to write. The entry value is written to the CDF from memory address value. **WARNING:** If the entry has one of the character data types (CDF_CHARor CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the entry does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.35.1. Example(s)

The following example writes one global attribute's gEntry. It is to the global scope attribute VALIDs for gEntry numbered 2. This entry is of CDF_INT2 type.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                    ! CDF identifier.
INTEGER*4 status                ! Returned status code.
INTEGER*4 num_elements          ! Number of elements (of data type).
INTEGER*2 TMPvalid              ! Value of VALIDs attribute.

DATA TMPvalids/15/
.
.
num_elements = 1
CALL CDF_put_attr_gentry (id, CDF_get_attr_num(id,'VALIDs'), 2,
1                         CDF_INT2, num_elements, TMPvalid, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
```

.
.

6.4.36 CDF_put_attr_rentry

SUBROUTINE CDF_put_attr_rentry (

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  attr_num,        ! in  -- Variable attribute number.
INTEGER*4  entry_num,       ! in  -- Entry number.
INTEGER*4  data_type,       ! in  -- Data type of this entry.
INTEGER*4  num_elements,    ! in  -- Number of elements  (of the data type).
<type>     value,           ! in  -- Value (<type> is dependent on the data type of the enrty).
INTEGER*4  status)          ! out -- Completion status
```

CDF_put_attr_rentry is used to write an entry, corresponding to an rVariable, (rEntry) to a variable attribute in a CDF. The entry may or may not already exist. If it does exist, it is overwritten. The data type and number of elements (of that data type) may be changed when overwriting an existing entry.

The arguments to CDF_put_attr_rentry are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The attribute number. This number may be determined with a call to CDF_get_attr_num (see Section 6.4.17).
entry_num	The entry number. The attribute must be variable in scope. This is the number of the associated rVariable (the rVariable being described in some way by the zEntry).
data_type	The data type of the specified entry. Specify one of the data types defined in Section 4.5.
num_elements	The number of elements of the data type. For character data types (CDF_CHAR and CDF_UCHAR), this is the number of characters in the string (an array of characters). For all other data types this is the number of elements in an array of that data type.
value	The value(s) to write. The entry value is written to the CDF from memory address value. **WARNING:** If the entry has one of the character data types (CDF_CHARor CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the entry does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.36.1. Example(s)

The following example writes one variable attribute's rEntry. It is to the variable scope attribute VALIDs for the rEntry that corresponds to the zVariable TMP. This entry has two (2) elements, each one is of CDF_INT2 type.

```
   .
   .
   INCLUDE '<path>cdf.inc'
   .
   .
   INTEGER*4 id                     ! CDF identifier.
   INTEGER*4 status                 ! Returned status code.
   INTEGER*4 num_elements           ! Number of elements (of data type).
   INTEGER*2 TMPvalids(2)           ! Value(s) of VALIDs attribute,

   DATA TMPvalids/15,30/
   .
   .
   num_elements = 2
   CALL CDF_put_attr_rentry (id, CDF_get_attr_num(id,'VALIDs'),
  1                          CDF_get_var_num(id,'TMP'),
  2                          CDF_INT2, num_elements, TMPvalids, status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
   .
   .
```

6.4.37 CDF_put_attr_zentry

SUBROUTINE CDF_put_attr_zentry (

```
INTEGER*4  id,              ! in  -- CDF  identifier.
INTEGER*4  attr_num,        ! in  -- Variable attribute number.
INTEGER*4  entry_num,       ! in  -- Entry number.
INTEGER*4  data_type,       ! in  -- Data type of this entry.
INTEGER*4  num_elements,    ! in  -- Number of elements  (of the data type).
<type>     value,           ! in  -- Value (<type> is dependent on the data type of the enrty).
INTEGER*4  status)          ! out -- Completion status
```

CDF_put_attr_zentry is used to write an entry, corresponding to a zVariable, (zEntry) to a variable attribute in a CDF. The entry may or may not already exist. If it does exist, it is overwritten. The data type and number of elements (of that data type) may be changed when overwriting an existing entry.

The arguments to CDF_put_attr_zentry are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The attribute number. This number may be determined with a call to CDF_get_attr_num (see Section 6.4.17).
entry_num	The entry number. The attribute must be variable in scope. This is the number of the associated zVariable (the zVariable being described in some way by the zEntry).

data_type	The data type of the specified entry. Specify one of the data types defined in Section 4.5.
num_elements	The number of elements of the data type. For character data types (CDF_CHAR and CDF_UCHAR), this is the number of characters in the string (an array of characters). For all other data types this is the number of elements in an array of that data type.
value	The value(s) to write. The entry value is written to the CDF from memory address value. **WARNING:** If the entry has one of the character data types (CDF_CHARor CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the entry does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.37.1. Example(s)

The following example writes one variable attribute's zEntry. It is to the variable scope attribute VALIDs for the zEntry that corresponds to the zVariable TMP. This entry has two (2) elements, each one is of CDF_INT2 type.

```
   .
   .
   INCLUDE '<path>cdf.inc'
   .
   .
   INTEGER*4 id                      ! CDF identifier.
   INTEGER*4 status                  ! Returned status code.
   INTEGER*4 num_elements            ! Number of elements (of data type).
   INTEGER*2 TMPvalids(2)            ! Value(s) of VALIDs attribute,

   DATA TMPvalids/15,30/
   .
   .
   num_elements = 2
   CALL CDF_put_attr_zentry (id, CDF_get_attr_num(id,'VALIDs'),
  1                          CDF_get_var_num(id,'TMP'),
  2                          CDF_INT2, num_elements, TMPvalids, status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
   .
   .
```

6.4.38 CDF_rename_attr

SUBROUTINE CDF_rename_attr (

```
INTEGER*4  id,                ! in  -- CDF  identifier.
INTEGER*4  num_attr,          ! in  -- Attribute number.
CHARACTER  attr_name*(*),     ! in  -- New attribute name.
```

INTEGER*4 status) ! out -- Completion status.

CDF_rename_attr is used to rename an existing attribute. An attribute with the new name must not already exist in the CDF.

The arguments to CDF_rename_attr are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The number of the attribute to rename. This number may be determined with a call to CDF_get_attr_num (see Section 6.4.17).
attr_name	The new attribute name. This may be at most CDF_ATTR_NAME_LEN256 characters. Attribute names are case-sensitive.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.38.1. Example(s)

In the following example the attribute named LAT is renamed to LATITUDE.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id          ! CDF identifier.
INTEGER*4 status      ! Returned status code.
.
.
CALL CDF_rename_attr (id, CDF_get_attr_num(id,'LAT'), 'LATITUDE', status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.39 CDF_set_attr_gentry_dataspec

SUBROUTINE CDF_set_attr_gentry_dataspec (

INTEGER*4 id, ! in -- CDF identifier.
INTEGER*4 attr_num, ! in -- Global attribute number.
INTEGER*4 entry_num, ! in -- gEntry number.
INTEGER*4 data_type, ! in -- Data type.
INTEGER*4 status) ! out -- Completion status

CDF_set_attr_gentry_dataspec respecifies the data specification (data type and number of elements) of a gEntry of a global attribute in a CDF. The only part of the data specification that can be changed is the data type. However, the new and old data type must be equivalent. Refer to the CDF User's Guide for the descriptions of equivalent data types.

The arguments to CDF_set_attr_gentry_dataspec are defined as follows:

id	The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.
attr_num	The (global) attribute number.
entry_num	The gEntry number.
data_type	The data type.
status	The completion status code. Chapter 8 explains how to interpret status codes.

6.4.39.1. Example(s)

The following example modifies a gEntry's (numbered 2) data specification in the global attribute "MY_ATTR" in a CDF. It will change its original data type from CDF_INT2 to CDF_UINT2.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id                ! CDF identifier.
INTEGER*4 entry_num         ! gEntry number.
INTEGER*4 status            ! Returned status code.

.
.
entry_num = 2
CALL CDF_set_attr_gentry_dataspec (id, CDF_get_attr_num(id, 'MY_ATTR'),
1                                  entry_num, CDF_UINT2, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.40 CDF_set_attr_rentry_dataspec

SUBROUTINE CDF_set_attr_rentry_dataspec (

```
INTEGER*4  id,              ! in --  CDF  identifier.
INTEGER*4  attr_num,        ! in -- Variable attribute number.
INTEGER*4  entry_num,       ! in -- rEntry number.
INTEGER*4  data_type,       ! in -- Data type.
INTEGER*4  status)          ! out --  Completion status
```

CDF_set_attr_rentry_dataspec respecifies the data specification (data type and number of elements) of an rEntry, corresponding to an rVariable, of a variable attribute in a CDF. The only part of the data specification that can be changed is the data type. However, the new and old data type must be equivalent. Refer to the CDF User's Guide for the descriptions of equivalent data types.

The arguments to CDF_set_attr_rentry_dataspec are defined as follows:

id The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

attr_num The (variable) attribute number.

entry_num The rEntry number.

data_type The data type.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.4.40.1. Example(s)

The following example modifies an rEntry's (corresponding to rVariable "MY_VAR") data specification in the variable attribute "MY_ATTR" in a CDF. It will change its original data type from CDF_INT2 to CDF_UINT2.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.

.
.
CALL CDF_set_attr_rentry_dataspec (id, CDF_get_attr_num(id, 'MY_ATTR'),
1                                  CDF_get_var_num(id, 'MY_VAR'),
2                                  CDF_UINT2, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.41 CDF_set_attr_scope

SUBROUTINE CDF_set_attr_scope (

```
INTEGER*4  id,             ! in --  CDF  identifier.
INTEGER*4  attr_num,       ! in -- Attribute number.
INTEGER*4  scope,          ! in -- Attribute scope.
INTEGER*4  status)         ! out --  Completion status
```

CDF_set_attr_scope respecifies the scope of an attribute in a CDF. Specify one of the scopes described in Section 4.12. Global-scoped attributes will contain only gEntries, while variable-scoped attributes can hold rEntries and zEntries.

The arguments to CDF_set_attr_scope are defined as follows:

id The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

attr_num The attribute number.

scope The attribute scope.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.4.41.1. Example(s)

The following example respecifies the scope to VARIABLE_SCOPE (from its original GLOBAL_SCOPE) for attribute "MY_ATTR" in a CDF.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.

.
.
CALL CDF_set_attr_scope (id, CDF_get_attr_num(id, 'MY_ATTR'), VARIABLE_SCOPE,
1                        status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

6.4.42 CDF_set_attr_zentry_dataspec

SUBROUTINE CDF_set_attr_zentry_dataspec (

```
INTEGER*4  id,              ! in --  CDF  identifier.
INTEGER*4  attr_num,        ! in --  Variable attribute number.
INTEGER*4  entry_num,       ! in -- zEntry number.
INTEGER*4  data_type,       ! in -- Data type.
INTEGER*4  status)          ! out --  Completion status
```

CDF_set_attr_zentry_dataspec respecifies the data specification (data type and number of elements) of a zEntry, corresponding to a zVariable, of a variable attribute in a CDF. The only part of the data specification that can be changed is the data type. However, the new and old data type must be equivalent. Refer to the CDF User's Guide for the descriptions of equivalent data types.

The arguments to CDF_set_attr_zentry_dataspec are defined as follows:

id The identifier of the CDF. This identifier must have been initialized by a call to CDF_create_cdf or CDF_open_cdf.

attr_num The (variable) attribute number.

entry_num The zEntry number.

data_type The data type.

num_elems The number of elements.

status The completion status code. Chapter 8 explains how to interpret status codes.

6.4.42.1. Example(s)

The following example modifies a zEntry's (corresponding to zVariable "MY_VAR") data specification in the variable attribute "MY_ATTR" in a CDF. It will change its original data type from CDF_INT2 to CDF_UINT2.

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.

.
.
CALL CDF_set_attr_zentry_dataspec (id, CDF_get_attr_num(id, 'MY_ATTR'),
1                                  CDF_get_var_num(id, 'MY_VAR'),
2                                  CDF_UINT2, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

Chapter 7

7 Internal Interface – CDF_lib

The Internal interface consists of only one routine, CDF_lib.[26] CDF_lib can be used to perform all possible operations on a CDF. In fact, all of the Standard Interface functions are implemented using the Internal Interface. CDF_lib must be used to perform operations not possible with the Standard Interface functions. These operations would involve CDF features added after the Standard Interface functions had been defined (e.g., specifying a single-file format for a CDF, accessing zVariables, or specifying a pad value for an rVariable or zVariable). Note that CDF_lib can also be used to perform certain operations more efficiently than with the Standard Interface functions.

CDF_lib takes a variable number of arguments that specify one or more operations to be performed (e.g., opening a CDF, creating an attribute, or writing a variable value). The operations are performed according to the order of the arguments. Each operation consists of a function being performed on an item. An item may be either an object (e.g., a CDF, variable, or attribute) or a state (e.g., a CDF's format, a variable's data specification, or a CDF's current attribute). The possible functions and corresponding items (on which to perform those functions) are described in Section 7.6.

7.1 Example(s)

The easiest way to explain how to use CDF_lib would be to start with a few examples. The following example shows how a CDF would be created with the single-file format (assuming multi-file is the default).

```
.
.
INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 id               ! CDF identifier.
INTEGER*4 status           ! Returned status code.
CHARACTER CDF_name*5       ! Name of the CDF.
INTEGER*4 num_dims         ! Number of dimensions.
INTEGER*4 dim_sizes(1)     ! Dimension sizes.
INTEGER*4 format           ! Format of CDF.

DATA CDF_name/'test1'/, num_dims/0/, dim_sizes/0/,
```

[26] See section 6.5.1 for an ugly exception to this.

```
1    format/SINGLE_FILE/
.
.
CALL CDF_create_cdf (CDF_name, id, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)

status = CDF_lib (PUT_, CDF_FORMAT_, format,
2                 NULL_, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

The call to CDF_create created the CDF as expected but with a format of multi-file (assuming that is the default). The call to CDF_lib is then used to change the format to single-file (which must be done before any variables are created in the CDF).

The arguments to CDF_lib in this example are explained as follows:

PUT_	The first function to be performed. in this case An item is going to be put to the "current" CDF (a new format). PUT_ is defined in cdf.inc (as are all CDF constants). It was not necessary to select a current CDF since the call to CDF_create implicitly selected the CDF created as the current CDF.[27] This is the case since all of the Standard Interface functions actually call the Internal Interface to perform their operations.
CDF_FORMAT	The item to be put. In this case it is the CDF's format.
format	The actual format for the CDF. Depending on the item being put, one or more arguments would have been necessary. In this case only one argument is necessary.
NULL_	This argument could have been one of two things. It could have been another item to put (followed by the arguments required for that item) or it could have been a new function to perform. In this case it is a new function to perform - the NULL_function. NULL_ indicates the end of the call to CDF_lib. Specifying NULL_ at the end of the argument list is required because not all compilers/operating systems provide the ability for a called function to determine how many arguments were passed in by the calling function.
status	The completion status code. Note that CDF_lib also returns the completion status code.[28] Chapter 8 explains how to interpret status codes.

The next example shows how the same CDF could have been created using only one call to CDF_lib. (The declarations would be the same.)

```
.
.
status = CDF_lib (CREATE_, CDF_, CDF_name, num_dims, dim_sizes, id,
1                 PUT_, CDF_FORMAT_, format,
2                 NULL_, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

[27] In previous releases of CDF, it was required that the current CDF be selected in each call to CDF_lib. That requirement has been eliminated. The CDF library now maintains the current CDF from one call to the next of CDF_lib.

[28] Section 6.5 explains why it does both.

The purpose of each argument is as follows:

CREATE_	The first function to be performed. In this case something will be created.
CDF_	The item to be created - a CDF in this case. There are four required arguments that must follow. When a CDF is created (with CDF_lib), the format, encoding, and majority default to values specified when your CDF distribution was built and installed. Consult your system manager for these defaults.
CDF_name	The file name of the CDF.
num_dims	The number of dimensions in the CDF.
dim_sizes	The dimension sizes.
id	The identifier to be used when referencing the created CDF in subsequent operations.
PUT_	This argument could have been one of two things. Another item to create or a new function to perform. In this case it is another function to perform - something will be put to the CDF.
CDF_FORMAT_	Once again this argument could have been either another item to put or a new function to perform. It is another item to put - the CDF's format.
format	The format to be put to the CDF.
NULL_	This argument could have been either another item to put or a new function to perform. Here it is another function to perform - the NULL_function that ends the call to CDF_lib.
status	The completion status code. Note that CDF_lib also returns the completion status code. Chapter 8 explains how to interpret status codes.

Note that the operations are performed in the order that they appear in the argument list. The CDF had to be created before the encoding, majority, and format could be specified (put).

7.2 Current Objects/States (Items)

The use of CDF_lib requires that an application be aware of the current objects/states maintained by the CDF library. The following current objects/states are used by the CDF library when performing operations.

CDF (object)

A CDF operation is always performed on the current CDF. The current CDF is implicitly selected whenever a CDF is opened or created. The current CDF may be explicitly selected using the <SELECT_,CDF_>[29] operation. There is no current CDF until one is opened or created (which implicitly selects it) or until one is explicitly selected.[30]

[29] This notation is used to specify a function to be performed on an item. The syntax is <function_,item_>.

[30] In previous releases of CDF, it was required that the current CDF be selected in each call to CDF_lib. That requirement no longer exists. The CDF library now maintains the current CDF from one call to the next of CDF_lib.

rVariable (object)

An rVariable operation is always performed on the current rVariable in the current CDF. For each open CDF a current rVariable is maintained. This current rVariable is implicitly selected when an rVariable is created (in the current CDF) or it may be explicitly selected with the <SELECT_,rVAR_> or <SELECT_,rVAR_NAME_> operations. There is no current rVariable in a CDF until one is created (which implicitly selects it) or until one is explicitly selected.

zVariable (object)

A zVariable operation is always performed on the current zVariable in the current CDF. For each open CDF a current zVariable is maintained. This current zVariable is implicitly selected when a zVariable is created (in the current CDF) or it may be explicitly selected with the <SELECT_,zVAR_> or <SELECT_,zVAR_NAME_> operations. There is no current zVariable in a CDF until one is created (which implicitly selects it) or until one is explicitly selected.

attribute (object)

An attribute operation is always performed on the current attribute in the current CDF. For each open CDF a current attribute is maintained. This current attribute is implicitly selected when an attribute is created (in the current CDF) or it may be explicitly selected with the <SELECT_,ATTR_> or <SELECT_,ATTR_NAME_> operations. There is no current attribute in a CDF until one is created (which implicitly selects it) or until one is explicitly selected.

gEntry number (state)

A gAttribute gEntry operation is always performed on the current gEntry number in the current CDF for the current attribute in that CDF. For each open CDF a current gEntry number is maintained. This current gEntry number must be explicitly selected with the <SELECT_,gENTRY_> operation. (There is no implicit or default selection of the current gEntry number for a CDF.) Note that the current gEntry number is maintained for the CDF (not each attribute) - it applies to all of the attributes in that CDF.

rEntry number (state)

A vAttribute rEntry operation is always performed on the current rEntry number in the current CDF for the current attribute in that CDF. For each open CDF a current rEntry number is maintained. This current rEntry number must be explicitly selected with the <SELECT_,rENTRY_> operation. (There is no implicit or default selection of the current rEntry number for a CDF.) Note that the current rEntry number is maintained for the CDF (not each attribute) - it applies to all of the attributes in that CDF.

zEntry number (state)

A vAttribute zEntry operation is always performed on the current zEntry number in the current CDF for the current attribute in that CDF. For each open CDF a current zEntry number is maintained. This current zEntry number must be explicitly selected with the <SELECT_,zENTRY_> operation. (There is no implicit or default selection of the current zEntry number for a CDF.) Note that the current zEntry number is maintained for the CDF (not each attribute) - it applies to all of the attributes in that CDF.

record number, rVariables (state)

An rVariable read or write operation is always performed at (for single and multiple variable reads and writes) or starting at (for hyper reads and writes) the current record number for the rVariables in the current CDF. When a CDF is opened or created, the current record number for its rVariables is initialized to zero (0). It may then be explicitly selected using the <SELECT_,rVARs_RECNUMBER_> operation. Note that the current record number for rVariables is maintained for a CDF (not each rVariable) - it applies to all of the rVariables in that CDF.

record count, rVariables (state)

An rVariable hyper read or write operation is always performed using the current record count for the rVariables in the current CDF. When a CDF is opened or created, the current record count for its rVariables is initialized to one (1). It may then be explicitly selected using the <SELECT_,rVARs_RECCOUNT_> operation. Note that the current record count for rVariables is maintained for a CDF (not each rVariable) - it applies to all of the rVariables in that CDF.

record interval, rVariables (state)

An rVariable hyper read or write operation is always performed using the current record interval for the rVariables in the current CDF. When a CDF is opened or created, the current record interval for its rVariables is initialized to one (1). It may then be explicitly selected using the <SELECT_,rVARs_RECINTERVAL_> operation. Note that the current record interval for rVariables is maintained for a CDF (not each rVariable) - it applies to all of the rVariables in that CDF.

dimension indices, rVariables (state)

An rVariable read or write operation is always performed at (for single reads and writes) or starting at (for hyper reads and writes) the current dimension indices for the rVariables in the current CDF. When a CDF is opened or created, the current dimension indices for its rVariables are initialized to zeroes (0,0,...). They may then be explicitly selected using the <SELECT_,rVARs_DIMINDICES_> operation. Note that the current dimension indices for rVariables are maintained for a CDF (not each rVariable) - they apply to all of the rVariables in that CDF. For 0-dimensional rVariables the current dimension indices are not applicable.

dimension counts, rVariables (state)

An rVariable hyper read or write operation is always performed using the current dimension counts for the rVariables in the current CDF. When a CDF is opened or created, the current dimension counts for its rVariables are initialized to the dimension sizes of the rVariables (which specifies the entire array). They may then be explicitly selected using the <SELECT_,rVARs_DIMCOUNTS_> operation. Note that the current dimension counts for rVariables are maintained for a CDF (not each rVariable) - they apply to all of the rVariables in that CDF. For 0-dimensional rVariables the current dimension counts are not applicable.

dimension intervals, rVariables (state)

An rVariable hyper read or write operation is always performed using the current dimension intervals for the rVariables in the current CDF. When a CDF is opened or created, the current dimension intervals for its rVariables are initialized to ones (1,1,...). They may then be explicitly selected using the <SELECT_,rVARs_DIMINTERVALS_> operation. Note that the current dimension intervals for rVariables are maintained for a CDF (not each rVariable) - they apply to all of the rVariables in that CDF. For 0-dimensional rVariables the current dimension intervals are not applicable.

sequential value, rVariable (state)

An rVariable sequential read or write operation is always performed at the current sequential value for that rVariable. When an rVariable is created (or for each rVariable in a CDF being opened), the current sequential value is set to the first physical value (even if no physical values exist yet). It may then be explicitly selected using the <SELECT_,rVAR_SEQPOS_> operation. Note that a current sequential value is maintained for each rVariable in a CDF.

record number, zVariable (state)

A zVariable read or write operation is always performed at (for single reads and writes) or starting at (for hyper reads and writes) the current record number for the current zVariable in the current CDF. A multiple variable read or write operation is performed at the current record number of each of the zVariables involved. (The record numbers do not have to be the same.) When a zVariable is created (or for each zVariable in a CDF being opened), the current record number for that zVariable is initialized to zero (0). It may then be explicitly selected using the <SELECT_,zVAR_RECNUMBER_> operation (which only affects the current zVariable in the current CDF). Note that a current record number is maintained for each zVariable in a CDF.

record count, zVariable (state)

A zVariable hyper read or write operation is always performed using the current record count for the current zVariable in the current CDF. When a zVariable created (or for each zVariable in a CDF being opened), the current record count for that zVariable is initialized to one (1). It may then be explicitly selected using the <SELECT_,zVAR_RECCOUNT_> operation (which only affects the current zVariable in the current CDF). Note that a current record count is maintained for each zVariable in a CDF.

record interval, zVariable (state)

A zVariable hyper read or write operation is always performed using the current record interval for the current zVariable in the current CDF. When a zVariable is created (or for each zVariable in a CDF being opened), the current record interval for that zVariable is initialized to one (1). It may then be explicitly selected using the <SELECT_,zVAR_RECINTERVAL_> operation (which only affects the current zVariable in the current CDF). Note that a current record interval is maintained for each zVariable in a CDF.

dimension indices, zVariable (state)

A zVariable read or write operation is always performed at (for single reads and writes) or starting at (for hyper reads and writes) the current dimension indices for the current zVariable in the current CDF. When a zVariable is created (or for each zVariable in a CDF being opened), the current dimension indices for that zVariable are initialized to zeroes (0,0,...). They may then be explicitly selected using the <SELECT_,zVAR_DIMINDICES_> operation (which only affects the current zVariable in the current CDF). Note that current dimension indices are maintained for each zVariable in a CDF. For 0-dimensional zVariables the current dimension indices are not applicable.

dimension counts, zVariable (state)

A zVariable hyper read or write operation is always performed using the current dimension counts for the current zVariable in the current CDF. When a zVariable is created (or for each zVariable in a CDF being opened), the current dimension counts for that zVariable are initialized to the dimension sizes of that zVariable (which specifies the entire array). They may then be explicitly selected using the <SELECT_,zVAR_DIMCOUNTS_> operation (which only affects the current zVariable in the current CDF). Note that current dimension counts are maintained for each zVariable in a CDF. For 0-dimensional zVariables the current dimension counts are not applicable.

dimension intervals, zVariable (state)

A zVariable hyper read or write operation is always performed using the current dimension intervals for the current zVariable in the current CDF. When a zVariable is created (or for each zVariable in a CDF being opened), the current dimension intervals for that zVariable are initialized to ones (1,1,...). They may then be explicitly selected using the <SELECT_,zVAR_DIMINTERVALS_> operation (which only affects the current zVariable in the current CDF). Note that current dimension intervals are maintained for each zVariable in a CDF. For 0-dimensional zVariables the current dimension intervals are not applicable.

sequential value, zVariable (state)

A zVariable sequential read or write operation is always performed at the current sequential value for that zVariable. When a zVariable is created (or for each zVariable in a CDF being opened), the current sequential value is set to the first physical value (even if no physical values exist yet). It may then be explicitly selected using the <SELECT_,zVAR_SEQPOS_> operation. Note that a current sequential value is maintained for each zVariable in a CDF.

status code (state)

When inquiring the explanation of a CDF status code, the text returned is always for the current status code. One current status code is maintained for the entire CDF library (regardless of the number of open CDFs). The current status code may be selected using the <SELECT_,CDF_STATUS_> operation. There is no default current status code. Note that the current status code is NOT the status code from the last operation performed.[31]

7.3 Returned Status

CDF_lib returns a status code of type INTEGER*4 in the last argument given.[32] Since more than one operation may be performed with a single call to CDF_lib, the following rules apply:

[31] The CDF library now maintains the current status code from one call to the next of CDF_lib.

[32] CDF_lib has been changed from a subroutine to a function and now also returns the status code.

1. The first error detected aborts the call to CDF_lib, and the corresponding status code is returned.
2. In the absence of any errors, the status code for the last warning detected is returned.
3. In the absence of any errors or warnings, the status code for the last informational condition is returned.
4. In the absence of any errors, warnings, or informational conditions, CDF_OK is returned.

Chapter 8 explains how to interpret status codes. Appendix A lists the possible status codes and the type of each: error, warning, or informational.

7.4 Indentation/Style

Indentation should be used to make calls to CDF_lib readable. The following example shows a call to CDF_lib using proper indentation.

```
status = CDF_lib (CREATE_, CDF_, CDF_name, num_dims, dim_sizes, id,
1                 PUT_, CDF_FORMAT_, format,
2                       CDF_MAJORITY_, majority,
3                 CREATE_, ATTR_, attr_name, scope, attr_num,
4                          rVAR_, var_name, data_type, num_elements,
5                                 rec_vary, dim_varys, var_num,
6                 NULL_, status)
```

Note that the functions (CREATE, PUT_, and NULL_) are indented the same and that the items (CDF_, CDF_FORMAT_, CDF_MAJORITY_, ATTR_, and rVAR_) are indented the same under their corresponding functions.

The following example shows the same call to CDF_lib without the proper indentation.

```
status = CDF_lib (CREATE_, CDF_, CDF_name, num_dims, dim_sizes, id, PUT_,
1                 CDF_FORMAT_, format, CDF_MAJORITY_, majority, CREATE_,
2                 ATTR_, attr_name, scope, attr_num, rVAR_, var_name,
3                 data_type, num_elements, rec_vary, dim_varys, var_num,
4                 NULL_, status)
```

The need for proper indentation to ensure the readability of your applications should be obvious.

7.5 Syntax

CDF_lib takes a variable number of arguments. There must always be at least one argument. The maximum number of arguments is not limited by CDF but rather the Fortran compiler and operating system being used. Under normal circumstances that limit would never be reached (or even approached). Note also that a call to CDF_lib with a large number of arguments can always be broken up into two or more calls to CDF_lib with fewer arguments.

The syntax for CDF_lib is as follows:

```
status = CDF_lib (fnc1, item1, arg1, arg2, ...argN,
+                       item2, arg1, arg2, ...argN,
                        .
                        .
+                       itemN, arg1, arg2, ...argN,
+                  fnc2, item1, arg1, arg2, ...argN,
+                       item2, arg1, arg2, ...argN,
                        .
                        .
+                       itemN, arg1, arg2, ...argN,
                   .
                   .
                   .
+                  fncN, item1, arg1, arg2, ...argN,
+                       item2, arg1, arg2, ...argN,
                        .
                        .
+                       itemN, arg1, arg2, ...argN,
+                  NULL_, status)
```

where fncx is a function to perform, itemx is the item on which to perform the function, and argx is a required argument for the operation. The NULL_function must be used to end the call to CDF_lib. The completion status, status, is returned.

Previously, CDF_lib was a subroutine. It was changed to a function which returns the completion status code (and still stores it in the last argument) to ease the debugging of calls to CDF_lib.[33] If in a call to CDF lib an unknown function or item is specified, or if an operation's argument is missing, the status argument would never be reached (and BAD_FNC_OR_ITEM would not be stored). By returning the completion status code this situation should not occur. Note that the same Fortran variable can be used to receive the status code and as the last argument in the call to CDF_lib.

7.5.1 Macintosh, MPW Fortran

The MPW Fortran compiler does not allow variable length argument lists such as those used by CDF_lib.[34] For that reason, a number of additional Internal Interface functions are available named CDF_lib_4, CDF_lib_5, etc. Each of these functions expects the number of arguments indicated by their names. The maximum number of arguments is at least 25 (corresponding to CDF_lib_25) but can be increased if necessary by contacting CDF support. Using these functions, the second example shown in this section would be as follows:

```
.
.
status = CDF_lib_15 (CREATE_, CDF_, CDF_name, num_dims, dim_sizes, id,
1                    PUT_, CDF_ENCODING_, encoding,
2                          CDF_MAJORITY_, majority,
3                          CDF_FORMAT_, format,
4                    NULL_, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

[33] Current applications do not have to be changed because the completion status code is still stored in the last argument.
[34] If you know of a way to make MPW Fortran accept variable length argument lists, by all means let us know. We don't like having to do this any more than you do.

Note that CDF_lib may still be used but with the same number of arguments for each occurrence.

7.6 Operations. . .

An operation consists of a function being performed on an item. The supported functions are as follows:

CLOSE_	Used to close an item.
CONFIRM_	Used to confirm the value of an item.
CREATE_	Used to create an item.
DELETE_	Used to delete an item.
GET_	Used to get (read) something from an item.
NULL_	Used to signal the end of the argument list of an internal interface call.
OPEN_	Used to open an item.
PUT_	Used to put (write) something to an item.
SELECT_	Used to select the value of an item.

For each function the supported items, required arguments, and required preselected objects/states are listed below. The required preselected objects/states are those objects/states that must be selected (typically with the SELECT_ function) before a particular operation may be performed. Note that some of the required preselected objects/states have default values as described at Section 7.2.

<CLOSE_,CDF_>

Closes the current CDF. When the CDF is closed, there is no longer a current CDF. A CDF must be closed to ensure that it will be properly written to disk.

There are no required arguments.

The only required preselected object/state is the current CDF.

<CLOSE_,rVAR_>

Closes the current rVariable (in the current CDF). This operation is only applicable to multi-file CDFs.

There are no required arguments.

The required preselected objects/states are the current CDF and its current rVariable.

<CLOSE_,zVAR_>

Closes the current zVariable (in the current CDF). This operation is only applicable to multi-file CDFs.

There are no required arguments.

The required preselected objects/states are the current CDF and its current zVariable.

<CONFIRM_,ATTR_>

Confirms the current attribute (in the current CDF). Required arguments are as follows:

out: INTEGER*4 attr_num

Attribute number.

The only required preselected object/state is the current CDF.

<CONFIRM_,ATTR_EXISTENCE_>

Confirms the existence of the named attribute (in the current CDF). If the attribute does not exist, an error code will be returned. in any case the current attribute is not affected. Required arguments are as follows:

in: CHARACTER attr_name*(*)

The attribute name. This may be at most CDF_ATTR_NAME_LEN256 characters.

The only required preselected object/state is the current CDF.

<CONFIRM_,CDF_>
Confirms the current CDF. Required arguments are as follows:

out: INTEGER*4 id

The current CDF.

There are no required preselected objects/states.

<CONFIRM_,CDF_ACCESS_>
Confirms the accessibility of the current CDF. If a fatal error occurred while accessing the CDF the error code NO_MORE_ACCESS will be returned. If this is the case, the CDF should still be closed.

There are no required arguments.

The only required preselected object/state is the current CDF.

<CONFIRM_,CDF_CACHESIZE_>
Confirms the number of cache buffers being used for the dotCDF file (for the current CDF). The Concepts chapter in the CDF User's Guide describes the caching scheme used by the CDF library. Required arguments are as follows:

out: INTEGER*4 num_buffers

The number of cache buffers being used.

The only required preselected object/state is the current CDF.

<CONFIRM_,CDF_DECODING_>
Confirms the decoding for the current CDF. Required arguments are as follows:

out: INTEGER*4 decoding

The decoding. The decodings are described in Section 4.7.

The only required preselected object/state is the current CDF.

<CONFIRM_,CDF_NAME_>
Confirms the file name of the current CDF. Required arguments are as follows:

out: CHARACTER CDF_name*(CDF_PATHNAME_LEN)

File name of the CDF.

The only required preselected object/state is the current CDF.

<CONFIRM_,CDF_NEGtoPOSfp0_MODE_>

Confirms the -0.0 to 0.0 mode for the current CDF. Required arguments are as follows:

out: INTEGER*4 mode

The -0.0 to 0.0 mode. The -0.0 to 0.0 modes are described in Section 4.15.

The only required preselected object/state is the current CDF.

<CONFIRM_,CDF_READONLY_MODE_>
Confirms the read-only mode for the current CDF. Required arguments are as follows:

out: INTEGER*4 mode

The read-only mode. The read-only modes are described in Section 4.13.

The only required preselected object/state is the current CDF.

<CONFIRM_,CDF_STATUS_>
Confirms the current status code. Note that this is not the most recently returned status code but rather the most recently selected status code (see the <SELECT_,CDF_STATUS_> operation).

Required arguments are as follows:

out: INTEGER*4 status

The status code.

The only required preselected object/state is the current status code.

<CONFIRM_,zMODE_>
Confirms the zMode for the current CDF. Required arguments are as follows:

out: INTEGER*4 mode

The zMode. The zModes are described in Section 4.14.

The only required preselected object/state is the current CDF.

<CONFIRM_,COMPRESS_CACHESIZE_>
Confirms the number of cache buffers being used for the compression scratch file (for the current CDF). The Concepts chapter in the CDF User's Guide describes the caching scheme used by the CDF library. Required arguments are as follows:

out: INTEGER*4 num_buffers

The number of cache buffers being used.

The only required preselected object/state is the current CDF.

<CONFIRM_,CURgENTRY_EXISTENCE_>
Confirms the existence of the gEntry at the current gEntry number for the current attribute (in the current CDF). If the gEntry does not exist, an error code will be returned.

There are no required arguments.

The required preselected objects/states are the current CDF, its current attribute, and its current gEntry number.

NOTE: Only use this operation on gAttributes. An error will occur if used on a vAttribute.

<CONFIRM_,CURrENTRY_EXISTENCE_>
Confirms the existence of the rEntry at the current rEntry number for the current attribute (in the current CDF). If the rEntry does not exist, an error code will be returned.

There are no required arguments.

The required preselected objects/states are the current CDF, its current attribute, and its current rEntry number.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<CONFIRM_,CURzENTRY_EXISTENCE_>
Confirms the existence of the zEntry at the current zEntry number for the current attribute (in the current CDF). If the zEntry does not exist, an error code will be returned.

There are no required arguments.

The required preselected objects/states are the current CDF, its current attribute, and its current zEntry number.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<CONFIRM_,gENTRY_>
Confirms the current gEntry number for all attributes in the current CDF. Required arguments are as follows:

out: INTEGER*4 entry_num

The gEntry number.

The only required preselected object/state is the current CDF.

<CONFIRM_,gENTRY_EXISTENCE_>
Confirms the existence of the specified gEntry for the current attribute (in the current CDF). If the gEntry does not exist, an error code will be returned. in any case the current gEntry number is not affected. Required arguments are as follows:

in: INTEGER*4 entry_num

The gEntry number.

The required preselected objects/states are the current CDF and its current attribute.

NOTE: Only use this operation on gAttributes. An error will occur if used on a vAttribute.

<CONFIRM_,rENTRY_>
Confirms the current rEntry number for all attributes in the current CDF. Required arguments are as follows:

out: INTEGER*4 entry_num

The rEntry number.

The only required preselected object/state is the current CDF.

<CONFIRM_,rENTRY_EXISTENCE_>

Confirms the existence of the specified rEntry for the current attribute (in the current CDF). If the rEntry does not exist, An error code will be returned. in any case the current rEntry number is not affected. Required arguments are as follows:

in: INTEGER*4 entry_num

The rEntry number.

The required preselected objects/states are the current CDF and its current attribute.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<CONFIRM_,rVAR_>

Confirms the current rVariable (in the current CDF). Required arguments are as follows:

out: INTEGER*4 var_num

rVariable number.

The only required preselected object/state is the current CDF.

<CONFIRM_,rVAR_CACHESIZE_>

Confirms the number of cache buffers being used for the current rVariable's file (of the current CDF). This operation is not applicable to a single-file CDF. The Concepts chapter in the CDF User's Guide describes the caching scheme used by the CDF library. Required arguments are as follows:

out: INTEGER*4 num_buffers

The number of cache buffers being used.

The required preselected objects/states are the current CDF and its current rVariable.

<CONFIRM_,rVAR_EXISTENCE_>

Confirms the existence of the named rVariable (in the current CDF). If the rVariable does not exist, an error code will be returned. in any case the current rVariable is not affected. Required arguments are as follows:

in: CHARACTER var_name*(*)

The rVariable name. This may be at most CDF_VAR_NAME_LEN256 characters.

The only required preselected object/state is the current CDF.

<CONFIRM_,rVAR_PADVALUE_>

Confirms the existence of an explicitly specified pad value for the current rVariable (in the current CDF). If An explicit pad value has not been specified, the informational status code NO_PADVALUE_SPECIFIED will be returned.

There are no required arguments.

The required preselected objects/states are the current CDF and its current rVariable.

<CONFIRM_,rVAR_RESERVEPERCENT_>

Confirms the reserve percentage being used for the current rVariable (of the current CDF). This operation is only applicable to compressed rVariables. The Concepts chapter in the CDF User's Guide describes the reserve percentage scheme used by the CDF library. Required arguments are as follows:

out: INTEGER*4 percent

The reserve percentage.

The required preselected objects/states are the current CDF and its current rVariable.

<CONFIRM_,rVAR_SEQPOS_>

Confirms the current sequential value for sequential access for the current rVariable (in the current CDF). Note that a current sequential value is maintained for each rVariable individually. Required arguments are as follows:

out: INTEGER*4 rec_num

Record number.

out: INTEGER*4 indices(CDF_MAX_DIMS)

Dimension indices. Each element of indices receives the corresponding dimension index. For 0-dimensional rVariables this argument is ignored (but must be present).

The required preselected objects/states are the current CDF and its current rVariable.

<CONFIRM_,rVARs_DIMCOUNTS_>

Confirms the current dimension counts for all rVariables in the current CDF. For 0-dimensional rVariables this operation is not applicable. Required arguments are as follows:

out: INTEGER*4 counts(CDF_MAX_DIMS)

Dimension counts. Each element of counts receives the corresponding dimension count.

The only required preselected object/state is the current CDF.

<CONFIRM_,rVARs_DIMINDICES_>

Confirms the current dimension indices for all rVariables in the current CDF. For 0-dimensional rVariables this operation is not applicable. Required arguments are as follows:

out: INTEGER*4 indices(CDF_MAX_DIMS)

Dimension indices. Each element of indices receives the corresponding dimension index.

The only required preselected object/state is the current CDF.

<CONFIRM_,rVARs_DIMINTERVALS_>

Confirms the current dimension intervals for all rVariables in the current CDF. For 0-dimensional rVariables this operation is not applicable. Required arguments are as follows:

out: INTEGER*4 intervals(CDF_MAX_DIMS)

Dimension intervals. Each element of intervals receives the corresponding dimension interval.

The only required preselected object/state is the current CDF.

<CONFIRM_,rVARs_RECCOUNT_>

Confirms the current record count for all rVariables in the current CDF. Required arguments are as follows:

out: INTEGER*4 rec_count

Record count.

The only required preselected object/state is the current CDF.

<CONFIRM_,rVARs_RECINTERVAL_>
Confirms the current record interval for all rVariables in the current CDF. Required arguments are as follows:

out: INTEGER*4 rec_interval

Record interval.

The only required preselected object/state is the current CDF.

<CONFIRM_,rVARs_RECNUMBER_>
Confirms the current record number for all rVariables in the current CDF. Required arguments are as follows:

out: INTEGER*4 rec_num

Record number.

The only required preselected object/state is the current CDF.

<CONFIRM_,STAGE_CACHESIZE_>
Confirms the number of cache buffers being used for the staging scratch file (for the current CDF). The Concepts chapter in the CDF User's Guide describes the caching scheme used by the CDF library. Required arguments are as follows:

out: INTEGER*4 num_buffers

The number of cache buffers being used.

The only required preselected object/state is the current CDF.

<CONFIRM_,zENTRY_>
Confirms the current zEntry number for all attributes in the current CDF. Required arguments are as follows:

out: INTEGER*4 entry_num

The zEntry number.

The only required preselected object/state is the current CDF.

<CONFIRM_,zENTRY_EXISTENCE_>
Confirms the existence of the specified zEntry for the current attribute (in the current CDF). If the zEntry does not exist, an error code will be returned. in any case the current zEntry number is not affected. Required arguments are as follows:

in: INTEGER*4 entry_num

The zEntry number.

The required preselected objects/states are the current CDF and its current attribute.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<CONFIRM_,zVAR_>
Confirms the current zVariable (in the current CDF). Required arguments are as follows:

out: INTEGER*4 var_num

zVariable number.

The only required preselected object/state is the current CDF.

<CONFIRM_,zVAR_CACHESIZE_>
Confirms the number of cache buffers being used for the current zVariable's file (of the current CDF). This operation is not applicable to a single-file CDF. The Concepts chapter in the CDF User's Guide describes the caching scheme used by the CDF library. Required arguments are as follows:

out: INTEGER*4 num_buffers

The number of cache buffers being used.

The required preselected objects/states are the current CDF and its current zVariable.

<CONFIRM_,zVAR_DIMCOUNTS_>
Confirms the current dimension counts for the current zVariable in the current CDF. For 0-dimensional zVariables this operation is not applicable. Required arguments are as follows:

out: INTEGER*4 counts(CDF_MAX_DIMS)

Dimension counts. Each element of counts receives the corresponding dimension count.

The required preselected objects/states are the current CDF and its current zVariable.

<CONFIRM_,zVAR_DIMINDICES_>
Confirms the current dimension indices for the current zVariable in the current CDF. For 0-dimensional zVariables this operation is not applicable. Required arguments are as follows:

out: INTEGER*4 indices(CDF_MAX_DIMS)

Dimension indices. Each element of indices receives the corresponding dimension index.

The required preselected objects/states are the current CDF and its current zVariable.

<CONFIRM_,zVAR_DIMINTERVALS_>
Confirms the current dimension intervals for the current zVariable in the current CDF. For 0-dimensional zVariables this operation is not applicable. Required arguments are as follows:

out: INTEGER*4 intervals(CDF_MAX_DIMS)

Dimension intervals. Each element of intervals receives the corresponding dimension interval.

The required preselected objects/states are the current CDF and its current zVariable.

<CONFIRM_,zVAR_EXISTENCE_>
Confirms the existence of the named zVariable (in the current CDF). If the zVariable does not exist, an error code will be returned. in any case the current zVariable is not affected. Required arguments are as follows:

in: CHARACTER var_name*(*)

The zVariable name. This may be at most CDF_VAR_NAME_LEN256 characters.

The only required preselected object/state is the current CDF.

<CONFIRM_,zVAR_PADVALUE_>

Confirms the existence of an explicitly specified pad value for the current zVariable (in the current CDF). If An explicit pad value has not been specified, the informational status code NO_PADVALUE_SPECIFIED will be returned.

There are no required arguments.

The required preselected objects/states are the current CDF and its current zVariable.

<CONFIRM_,zVAR_RECCOUNT_>

Confirms the current record count for the current zVariable in the current CDF. Required arguments are as follows:

out: INTEGER*4 rec_count

Record count.

The required preselected objects/states are the current CDF and its current zVariable.

<CONFIRM_,zVAR_RECINTERVAL_>

Confirms the current record interval for the current zVariable in the current CDF. Required arguments are as follows:

out: INTEGER*4 rec_interval

Record interval.

The required preselected objects/states are the current CDF and its current zVariable.

<CONFIRM_,zVAR_RECNUMBER_>

Confirms the current record number for the current zVariable in the current CDF. Required arguments are as follows:

out: INTEGER*4 rec_num

Record number.

The required preselected objects/states are the current CDF and its current zVariable.

<CONFIRM_,zVAR_RESERVEPERCENT_>

Confirms the reserve percentage being used for the current zVariable (of the current CDF). This operation is only applicable to compressed zVariables. The Concepts chapter in the CDF User's Guide describes the reserve percentage scheme used by the CDF library. Required arguments are as follows:

out: INTEGER*4 percent

The reserve percentage.

The required preselected objects/states are the current CDF and its current zVariable.

<CONFIRM_,zVAR_SEQPOS_>

Confirms the current sequential value for sequential access for the current zVariable (in the current CDF). Note that a current sequential value is maintained for each zVariable individually. Required arguments are as follows:

out: INTEGER*4 rec_num

Record number.

out: INTEGER*4 indices(CDF_MAX_DIMS)

Dimension indices. Each element of indices receives the corresponding dimension index. For 0-dimensional zVariables this argument is ignored (but must be present).

The required preselected objects/states are the current CDF and its current zVariable.

<CREATE_,ATTR_>

A new attribute will be created in the current CDF. An attribute with the same name must not already exist in the CDF. The created attribute implicitly becomes the current attribute (in the current CDF). Required arguments are as follows:

in: CHARACTER attr_name*(*)

Name of the attribute to be created. This can be at most CDF_ATTR_NAME_LEN256 characters. Attribute names are case-sensitive.

in: INTEGER*4 scope

Scope of the new attribute. Specify one of the scopes described in Section 4.12.

out: INTEGER*4 attr_num

Number assigned to the new attribute. This number must be used in subsequent CDF function calls when referring to this attribute. An existing attribute's number may also be determined with the <GET_,ATTR_NUMBER_> operation.

The only required preselected object/state is the current CDF.

<CREATE_,CDF_>

A new CDF will be created. It is illegal to create a CDF that already exists. The created CDF implicitly becomes the current CDF. Required arguments are as follows:

in: CHARACTER CDF_name*(*)

File name of the CDF to be created. (Do not append an extension.) This can be at most CDF_PATHNAME_LEN characters. A CDF file name may contain disk and directory specifications that conform to the conventions of the operating system being used (including logical names on VMS systems and environment variables on UNIX systems).

UNIX: File names are case-sensitive.

in: INTEGER*4 num_dims

Number of dimensions for the rVariables. This can be as few as zero (0) and at most CDF_MAX_DIMS. Note that this must be specified even if the CDF will contain only zVariables.

in: INTEGER*4 dim_sizes(*)

Dimension sizes for the rVariables. Each element of dim_sizes specifies the corresponding dimension size. Each dimension size must be greater than zero (0). For 0-dimensional rVariables this argument is ignored (but must be present). Note that this must be specified even if the CDF will contain only zVariables.

out: INTEGER*4 id

CDF identifier to be used in subsequent operations on the CDF.

A CDF is created with the default format, encoding, and variable majority as specified in the configuration file of your CDF distribution. Consult your system manager to determine these defaults. These defaults can then be changed with the corresponding <PUT_,CDF_FORMAT_>, <PUT_,CDF_ENCODING_>, and <PUT_,CDF_MAJORITY_> operations if necessary.

A CDF must be closed with the <CLOSE_,CDF_> operation to ensure that the CDF will be correctly written to disk.

There are no required preselected objects/states.

<CREATE_,rVAR_>

A new rVariable will be created in the current CDF. A variable (rVariable or zVariable) with the same name must not already exist in the CDF. The created rVariable implicitly becomes the current rVariable (in the current CDF). Required arguments are as follows:

in: CHARACTER var_name*(*)

Name of the rVariable to be created. This can be at most CDF_VAR_NAME_LEN256 characters (excluding the NUL). Variable names are case-sensitive.

in: INTEGER*4 data_type

Data type of the new rVariable. Specify one of the data types described in Section 4.5.

in: INTEGER*4 num_elements

Number of elements of the data type at each value. For character data types (CDF_CHAR and CDF_UCHAR), this is the number of characters in each string (an array of characters). A string exists at each value of the variable. For the non-character data types this must be one (1) - multiple elements are not allowed for non-character data types.

in: INTEGER*4 rec_vary

Record variance. Specify one of the variances described in Section 4.9.

in: INTEGER*4 dim_varys(*)

Dimension variances. Each element of dim_varys specifies the corresponding dimension variance. For each dimension specify one of the variances described in Section 4.9. For 0-dimensional rVariables this argument is ignored (but must be present).

out: INTEGER*4 var_num

Number assigned to the new rVariable. This number must be used in subsequent CDF function calls when referring to this rVariable. An existing rVariable's number may also be determined with the <GET_,rVAR_NUMBER_> operation.

The only required preselected object/state is the current CDF.

<CREATE_,zVAR_>

A new zVariable will be created in the current CDF. A variable (rVariable or zVariable) with the same name must not already exist in the CDF. The created zVariable implicitly becomes the current zVariable (in the current CDF). Required arguments are as follows:

in: CHARACTER var_name*(*)

Name of the zVariable to be created. This can be at most CDF_VAR_NAME_LEN256 characters. Variable names are case-sensitive.

in: INTEGER*4 data_type

Data type of the new zVariable. Specify one of the data types described in Section 4.5.

in: INTEGER*4 num_elements

Number of elements of the data type at each value. For character data types (CDF_CHAR and CDF_UCHAR), this is the number of characters in each string (an array of characters). A string exists at each value of the variable. For the non-character data types this must be one (1) - multiple elements are not allowed for non-character data types.

in: INTEGER*4 num_dims

Number of dimensions for the zVariable. This may be as few as zero and at most CDF_MAX_DIMS.

in: INTEGER*4 dim_sizes(*)

The dimension sizes. Each element of dim_sizes specifies the corresponding dimension size. Each dimension size must be greater than zero (0). For a 0-dimensional zVariable this argument is ignored (but must be present).

in: INTEGER*4 rec_vary

Record variance. Specify one of the variances described in Section 4.9.

in: INTEGER*4 dim_varys(*)

Dimension variances. Each element of dim_varys specifies the corresponding dimension variance. For each dimension specify one of the variances described in Section 4.9. For a 0-dimensional zVariable this argument is ignored (but must be present).

out: INTEGER*4 var_num

Number assigned to the new zVariable. This number must be used in subsequent CDF function calls when referring to this zVariable. An existing zVariable's number may also be determined with the <GET_,zVAR_NUMBER_> operation.

The only required preselected object/state is the current CDF.

<DELETE_,ATTR_>

Deletes the current attribute (in the current CDF). Note that the attribute's entries are also deleted. The attributes which numerically follow the attribute being deleted are immediately renumbered. When the attribute is deleted, there is no longer a current attribute.

There are no required arguments.

The required preselected objects/states are the current CDF and its current attribute.

<DELETE_,CDF_>
Deletes the current CDF. A CDF must be opened before it can be deleted. When the CDF is deleted, there is no longer a current CDF.

There are no required arguments.

The only required preselected object/state is the current CDF.

<DELETE_,gENTRY_>
Deletes the gEntry at the current gEntry number of the current attribute (in the current CDF). Note that this does not affect the current gEntry number.

There are no required arguments.

The required preselected objects/states are the current CDF, its current attribute, and its current gEntry number.

NOTE: Only use this operation on gAttributes. An error will occur if used on a vAttribute.

<DELETE_,rENTRY_>
Deletes the rEntry at the current rEntry number of the current attribute (in the current CDF). Note that this does not affect the current rEntry number.

There are no required arguments.

The required preselected objects/states are the current CDF, its current attribute, and its current rEntry number.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<DELETE_,rVAR_>
Deletes the current rVariable (in the current CDF). Note that the rVariable's corresponding rEntries are also deleted (from each vAttribute). The rVariables which numerically follow the rVariable being deleted are immediately renumbered. The rEntries which numerically follow the rEntries being deleted are also immediately renumbered. When the rVariable is deleted, there is no longer a current rVariable. **NOTE:** This operation is only allowed on single-file CDFs.

There are no required arguments.

The required preselected objects/states are the current CDF and its current rVariable.

<DELETE_,rVAR_RECORDS_>
Deletes the specified range of records from the current rVariable (in the current CDF). If the rVariable has sparse records a gap of missing records will be created. If the rVariable does not have sparse records, the records following the range of deleted records are immediately renumbered beginning with the number of the first deleted record. **NOTE:** This operation is only allowed on single-file CDFs.

Required arguments are as follows:

in: INTEGER*4 first_record

The record number of the first record to be deleted.

in: INTEGER*4 last_record

The record number of the last record to be deleted.

The required preselected objects/states are the current CDF and its current rVariable.

<DELETE_,rVAR_RECORDS_RENUMBER_>
Deletes the specified range of records from the current rVariable (in the current CDF). If the rVariable has sparse records a gap of missing records will be created. If the rVariable does not have sparse records, the records following the range of deleted records are immediately renumbered beginning with the number of the first deleted record. **NOTE:** This operation is only allowed on single-file CDFs.

Required arguments are as follows:

in: INTEGER*4 first_record

The record number of the first record to be deleted.

in: INTEGER*4 last_record

The record number of the last record to be deleted.

The required preselected objects/states are the current CDF and its current rVariable.

<DELETE_,zENTRY_>
Deletes the zEntry at the current zEntry number of the current attribute (in the current CDF). Note that this does not affect the current zEntry number.

There are no required arguments.

The required preselected objects/states are the current CDF, its current attribute, and its current zEntry number.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<DELETE_,zVAR_>
Deletes the current zVariable (in the current CDF). Note that the zVariable's corresponding zEntries are also deleted (from each vAttribute). The zVariables which numerically follow the zVariable being deleted are immediately renumbered. The rEntries which numerically follow the rEntries being deleted are also immediately renumbered. When the zVariable is deleted, there is no longer a current zVariable. **NOTE:** This operation is only allowed on single-file CDFs.

There are no required arguments.

The required preselected objects/states are the current CDF and its current rVariable.

<DELETE_,zVAR_RECORDS_>
Deletes the specified range of records from the current zVariable (in the current CDF). If the zVariable has sparse records a gap of missing records will be created. If the zVariable does not have sparse records, the records following the range of deleted records are immediately renumbered beginning with the number of the first deleted record. **NOTE:** This operation is only allowed on single-file CDFs. Required arguments are as follows:

in: INTEGER*4 first_record

The record number of the first record to be deleted.

in: INTEGER*4 last_record

The record number of the last record to be deleted.

The required preselected objects/states are the current CDF and its current zVariable.

<DELETE_,zVAR_RECORDS_RENUMBER_>

Deletes the specified range of records from the current zVariable (in the current CDF). If the zVariable has sparse records a gap of missing records will be created. If the zVariable does not have sparse records, the records following the range of deleted records are immediately renumbered beginning with the number of the first deleted record. **NOTE:** This operation is only allowed on single-file CDFs. Required arguments are as follows:

in: INTEGER*4 first_record

The record number of the first record to be deleted.

in: INTEGER*4 last_record

The record number of the last record to be deleted.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,ATTR_MAXgENTRY_>

Inquires the maximum gEntry number used for the current attribute (in the current CDF). This does not necessarily correspond with the number of gEntries for the attribute. Required arguments are as follows:

out: INTEGER*4 max_entry

The maximum gEntry number for the attribute. If no gEntries exist, then a value of –1 will be passed back.

The required preselected objects/states are the current CDF and its current attribute.

NOTE: Only use this operation on gAttributes. An error will occur if used on a vAttribute.

<GET_,ATTR_MAXrENTRY_>

Inquires the maximum rEntry number used for the current attribute (in the current CDF). This does not necessarily correspond with the number of rEntries for the attribute. Required arguments are as follows:

out: INTEGER*4 max_entry

The maximum rEntry number for the attribute. If no rEntries exist, then a value of –1 will be passed back.

The required preselected objects/states are the current CDF and its current attribute.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<GET_,ATTR_MAXzENTRY_>

Inquires the maximum zEntry number used for the current attribute (in the current CDF). This does not necessarily correspond with the number of zEntries for the attribute. Required arguments are as follows:

out: INTEGER*4 max_entry

The maximum zEntry number for the attribute. If no zEntries exist, then a value of –1 will be passed back.

The required preselected objects/states are the current CDF and its current attribute.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<GET_,ATTR_NAME_>
Inquires the name of the current attribute (in the current CDF). Required arguments are as follows:

out: CHARACTER attr_name*(CDF_ATTR_NAME_LEN256)

Attribute name. This character string will be blank padded if necessary.

UNIX: For the proper operation of CDF_lib, attr_name MUST be a Fortran CHARACTER variable or constant.

The required preselected objects/states are the current CDF and its current attribute.

<GET_,ATTR_NUMBER_>
Gets the number of the named attribute (in the current CDF). Note that this operation does not select the current attribute. Required arguments are as follows:

in: CHARACTER attr_name*(*)

Attribute name. This may be at most CDF_ATTR_NAME_LEN256 characters.

UNIX: For the proper operation of CDF_lib, attr_name MUST be a Fortran CHARACTER variable or constant.

out: INTEGER*4 attr_num

The attribute number.

The only required preselected object/state is the current CDF.

<GET_,ATTR_NUMgENTRIES_>
Inquires the number of gEntries for the current attribute (in the current CDF). This does not necessarily correspond with the maximum gEntry number used. Required arguments are as follows:

out: INTEGER*4 num_entries

The number of gEntries for the attribute.

The required preselected objects/states are the current CDF and its current attribute.

NOTE: Only use this operation on gAttributes. An error will occur if used on a vAttribute.

<GET_,ATTR_NUMrENTRIES_>
Inquires the number of rEntries for the current attribute (in the current CDF). This does not necessarily correspond with the maximum rEntry number used. Required arguments are as follows:

out: INTEGER*4 num_entries

The number of rEntries for the attribute.

The required preselected objects/states are the current CDF and its current attribute.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<GET_,ATTR_NUMzENTRIES_>
Inquires the number of zEntries for the current attribute (in the current CDF). This does not necessarily correspond with the maximum zEntry number used. Required arguments are as follows:

out: INTEGER*4 num_entries

The number of zEntries for the attribute.

The required preselected objects/states are the current CDF and its current attribute.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<GET_,ATTR_SCOPE_>
Inquires the scope of the current attribute (in the current CDF). Required arguments are as follows:

out: INTEGER*4 scope

Attribute scope. The scopes are described in Section 4.12.

The required preselected objects/states are the current CDF and its current attribute.

<GET_,CDF_CHECKSUM_>
Inquires the checksum mode of the current CDF. Required arguments are as follows:

out: INTEGER*4 checksum

Checksum. The checksum is described in Section 4.19.

The only required preselected object/state is the current CDF.

<GET_,CDF_COMPRESSION_>
Inquires the compression type/parameters of the current CDF. This refers to the compression of the CDF - not of any compressed variables. Required arguments are as follows:

out: INTEGER*4 c_type

The compression type. The types of compressions are described in Section 4.10.

out: INTEGER*4 c_parms(CDF_MAX_PARMS)

The compression parameters. The compression parameters are described in Section 4.10.

out: INTEGER*4 c_pct

If compressed, the percentage of the uncompressed size of the CDF needed to store the compressed CDF.

The only required preselected object/state is the current CDF.

<GET_,CDF_COPYRIGHT_>
Reads the copyright notice for the CDF library that created the current CDF. Required arguments are as follows:

out: CHARACTER copy_right*(CDF_COPYRIGHT_LEN)

CDF copyright text. The character string will be padded if necessary.

UNIX: For the proper operation of CDF_lib, copy_right MUST be a Fortran CHARACTER variable or constant.

The only required preselected object/state is the current CDF.

<GET_,CDF_ENCODING_>
Inquires the data encoding of the current CDF. Required arguments are as follows:

out: INTEGER*4 encoding

Data encoding. The encodings are described in Section 4.6.

The only required preselected object/state is the current CDF.

<GET_,CDF_FORMAT_>
Inquires the format of the current CDF. Required arguments are as follows:

out: INTEGER*4 format

CDF format. The formats are described in Section 4.4.

The only required preselected object/state is the current CDF.

<GET_,CDF_INCREMENT_>
Inquires the incremental number of the CDF library that created the current CDF. Required arguments are as follows:

out: INTEGER*4 increment

Incremental number.

The only required preselected object/state is the current CDF.

<GET_,CDF_INFO_>
Inquires the compression type/parameters of a CDF without having to open the CDF. This refers to the compression of the CDF - not of any compressed variables. Required arguments are as follows:

in: CHARACTER CDF_name*(*)

File name of the CDF to be inquired. (Do not append an extension.) This can be at most CDF_PATHNAME_LEN characters. A CDF file name may contain disk and directory specifications that conform to the conventions of the operating system being used (including logical names on VMS systems and environment variables on UNIX systems).

UNIX: File names are case-sensitive.
UNIX: For the proper operation of CDF_lib, CDF_name MUST be a Fortran CHARACTER variable or constant.

out: INTEGER*4 c_type

The CDF compression type. The types of compressions are described in Section 4.10.

out: INTEGER*4 c_parms(CDF_MAX_PARMS)

The compression parameters. The compression parameters are described in Section 4.10.

out: INTEGER*8[35] c_size

If compressed, size in bytes of the dotCDF file. If not compressed, set to zero (0).

out: INTEGER*8[10] u_size

If compressed, size in bytes of the dotCDF file when decompressed. If not compressed, size in bytes of the dotCDF file.

There are no required preselected objects/states.

<GET_,CDF_LEAPSECONDLASTUPDATED_>
Inquires the date hat the last leap second was added to the leap second table, which the CDF is based on. Required arguments are as follows:

out: INTEGER*4 lastupdated

The date that the last leap second was added to the leap second table.

The only required preselected object/state is the current CDF.

<GET_,CDF_MAJORITY_>
Inquires the variable majority of the current CDF. Required arguments are as follows:

out: INTEGER*4 majority

Variable majority. The majorities are described in Section 4.8.

The only required preselected object/state is the current CDF.

<GET_,CDF_NUMATTRS_>
Inquires the number of attributes in the current CDF. Required arguments are as follows:

out: INTEGER*4 num_attrs

Number of attributes.

The only required preselected object/state is the current CDF.

<GET_,CDF_NUMgATTRS_>
Inquires the number of gAttributes in the current CDF. Required arguments are as follows:

out: INTEGER*4 num_attrs

Number of gAttributes.

The only required preselected object/state is the current CDF.

<GET_,CDF_NUMrVARS_>

[35] You need to have a Fortran compiler supporting 8-byte integer.

Inquires the number of rVariables in the current CDF. Required arguments are as follows:

out: INTEGER*4 num_vars

Number of rVariables.

The only required preselected object/state is the current CDF.

<GET_,CDF_NUMvATTRS_>
Inquires the number of vAttributes in the current CDF. Required arguments are as follows:

out: INTEGER*4 num_attrs

Number of vAttributes.

The only required preselected object/state is the current CDF.

<GET_,CDF_NUMzVARS_>
Inquires the number of zVariables in the current CDF. Required arguments are as follows:

out: INTEGER*4 num_vars

Number of zVariables.

The only required preselected object/state is the current CDF.

<GET_,CDF_RELEASE_>
Inquires the release number of the CDF library that created the current CDF. Required arguments are as follows:

out: INTEGER*4 release

Release number.

The only required preselected object/state is the current CDF.

<GET_,CDF_VERSION_>
Inquires the version number of the CDF library that created the current CDF. Required arguments are as follows:

out: INTEGER*4 version

Version number.

The only required preselected object/state is the current CDF.

<GET_,DATATYPE_SIZE_>
Inquires the size (in bytes) of an element of the specified data type. Required arguments are as follows:

in: INTEGER*4 data_type

Data type.

out: INTEGER*4 num_bytes

Number of bytes per element.

There are no required preselected objects/states.

<GET_,gENTRY_DATA_>
Reads the gEntry data value from the current attribute at the current gEntry number (in the current CDF). Required arguments are as follows:

out: <type> value

Value. This buffer must be large to hold the value. (<type> is dependent on the data type of the gEnrty). The value is read from the CDF and placed into memory at address value.

WARNING: If the gEntry has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the gEntry does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF, its current attribute, and its current gEntry number.

NOTE: Only use this operation on gAttributes. An error will occur if used on a vAttribute.

<GET_,gENTRY_DATATYPE_>
Inquires the data type of the gEntry at the current gEntry number for the current attribute (in the current CDF). Required arguments are as follows:

out: INTEGER*4 data_type

Data type. The data types are described in Section 4.5.

The required preselected objects/states are the current CDF, its current attribute, and its current gEntry number.

NOTE: Only use this operation on gAttributes. An error will occur if used on a vAttribute.

<GET_,gENTRY_NUMELEMS_>
Inquires the number of elements (of the data type) of the gEntry at the current gEntry number for the current attribute (in the current CDF). Required arguments are as follows:

out: INTEGER*4 num_elements

Number of elements of the data type. For character data types (CDF_CHAR and CDF_UCHAR) this is the number of characters in the string (an array of characters). For all other data types this is the number of elements in an array of that data type.

The required preselected objects/states are the current CDF, its current attribute, and its current gEntry number.

NOTE: Only use this operation on gAttributes. An error will occur if used on a vAttribute.

<GET_,LIB_COPYRIGHT_>
Reads the copyright notice of the CDF library being used. Required arguments are as follows:

out: CHARACTER copy_right*(CDF_COPYRIGHT_LEN)

CDF library copyright text.

UNIX: For the proper operation of CDF_lib, copy_right MUST be a Fortran CHARACTER variable or constant.

There are no required preselected objects/states.

<GET_,LIB_INCREMENT_>
Inquires the incremental number of the CDF library being used. Required arguments are as follows:

out: INTEGER*4 increment

Incremental number.

There are no required preselected objects/states.

<GET_,LIB_RELEASE_>
Inquires the release number of the CDF library being used. Required arguments are as follows:

out: INTEGER*4 release

Release number.

There are no required preselected objects/states.

<GET_,LIB_subINCREMENT_>
Inquires the subincremental character of the CDF library being used. Required arguments are as follows:

out: CHARACTER*1 *subincrement

Subincremental character.

UNIX: For the proper operation of CDF_lib, subincrement MUST be a Fortran CHARACTER variable or constant.

There are no required preselected objects/states.

<GET_,LIB_VERSION_>
Inquires the version number of the CDF library being used. Required arguments are as follows:

out: INTEGER*4 version

Version number.

There are no required preselected objects/states.

<GET_,rENTRY_DATA_>
Reads the rEntry data value from the current attribute at the current rEntry number (in the current CDF). Required arguments are as follows:

out: <type> value

Value. This buffer must be large to hold the value. <type> is dependent on the data type of the rEnrty. The value is read from the CDF and placed into memory at address value.

WARNING: If the rEntry has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the rEntry does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF, its current attribute, and its current rEntry number.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<GET_,rENTRY_DATATYPE_>
Inquires the data type of the rEntry at the current rEntry number for the current attribute (in the current CDF). Required arguments are as follows:

out: INTEGER*4 data_type

Data type. The data types are described in Section 4.5.

The required preselected objects/states are the current CDF, its current attribute, and its current rEntry number.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<GET_,rENTRY_NUMELEMS_>
Inquires the number of elements (of the data type) of the rEntry at the current rEntry number for the current attribute (in the current CDF). Required arguments are as follows:

out: INTEGER*4 num_elements

Number of elements of the data type. For character data types (CDF_CHAR and CDF_UCHAR) this is the number of characters in the string (an array of characters). For all other data types this is the number of elements in an array of that data type.

The required preselected objects/states are the current CDF, its current attribute, and its current rEntry number.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<GET_,rVAR_ALLOCATEDFROM_>
Inquires the next allocated record at or after a given record for the current rVariable (in the current CDF). Required arguments are as follows:

in: INTEGER*4 start_record

The record number at which to begin searching for the next allocated record. If this record exists, it will be considered the next allocated record.

out: INTEGER*4 next_record

The number of the next allocated record.

The required preselected objects/states are the current CDF and its current rVariable.

<GET_,rVAR_ALLOCATEDTO_>
Inquires the last allocated record (before the next unallocated record) at or after a given record for the current rVariable (in the current CDF). Required arguments are as follows:

in: INTEGER*4 start_record

The record number at which to begin searching for the last allocated record.

out: INTEGER*4 next_record

The number of the last allocated record.

The required preselected objects/states are the current CDF and its current rVariable.

<GET_,rVAR_BLOCKINGFACTOR_>[36]

Inquires the blocking factor for the current rVariable (in the current CDF). Blocking factors are described in the Concepts chapter in the CDF User's Guide. Required arguments are as follows:

out: INTEGER*4 blocking_factor

The blocking factor. A value of zero (0) indicates that the default blocking factor is being used.

The required preselected objects/states are the current CDF and its current rVariable.

<GET_,rVAR_COMPRESSION_>

Inquires the compression type/parameters of the current rVariable (in the current CDF). Required arguments are as follows:

out: INTEGER*4 c_type

The compression type. The types of compressions are described in Section 4.10.

out: INTEGER*4 c_parms(CDF_MAX_PARMS)

The compression parameters. The compression parameters are described in Section 4.10.

out: INTEGER*4 c_pct

If compressed, the percentage of the uncompressed size of the rVariable's data values needed to store the compressed values.

The required preselected objects/states are the current CDF and its current rVariable.

<GET_,rVAR_DATA_>

Reads a value from the current rVariable (in the current CDF). The value is read at the current record number and current dimension indices for the rVariables (in the current CDF). Required arguments are as follows:

out: <type> value

Value. This buffer must be large to hold the value. <type> is dependent on the data type of the rVariable. The value is read from the CDF and placed into memory at address value.

WARNING: If the rVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the rVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF, its current rVariable, its current record number for rVariables, and its current dimension indices for rVariables.

<GET_,rVAR_DATATYPE_>

Inquires the data type of the current rVariable (in the current CDF). Required arguments are as follows:

out: INTEGER*4 data_type

Data type. The data types are described in Section 4.5.

The required preselected objects/states are the current CDF and its current rVariable.

[36] The item rVAR_BLOCKINGFACTOR was previously named rVAR_EXTENDRECS.

<GET_,rVAR_DIMVARYS_>
Inquires the dimension variances of the current rVariable (in the current CDF). For 0-dimensional rVariables this operation is not applicable. Required arguments are as follows:

out: INTEGER*4 dim_varys(CDF_MAX_DIMS)

Dimension variances. Each element of dim_varys receives the corresponding dimension variance. The variances are described in Section 4.9.

The required preselected objects/states are the current CDF and its current rVariable.

<GET_,rVAR_HYPERDATA_>
Reads one or more values from the current rVariable (in the current CDF). The values are read based on the current record number, current record count, current record interval, current dimension indices, current dimension counts, and current dimension intervals for the rVariables (in the current CDF). Required arguments are as follows:

out: <type> buffer

Value. This buffer must be large to hold the value. <type> is dependent on the data type of the rVariable. The value is read from the CDF and placed into memory at address value.

WARNING: If the rVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the rVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF, its current rVariable, its current record number, record count, and record interval for rVariables, and its current dimension indices, dimension counts, and dimension intervals for rVariables.

<GET_,rVAR_MAXallocREC_>
Inquires the maximum record number allocated for the current rVariable (in the current CDF). Required arguments are as follows:

out: INTEGER*4 max_rec

Maximum record number allocated.

The required preselected objects/states are the current CDF and its current rVariable.

<GET_,rVAR_MAXREC_>
Inquires the maximum record number for the current rVariable (in the current CDF). For rVariables with a record variance of NOVARY, this will be at most zero (0). A value of negative one (-1) indicates that no records have been written. Required arguments are as follows:

out: INTEGER*4 max_rec

Maximum record number.

The required preselected objects/states are the current CDF and its current rVariable.

<GET_,rVAR_NAME_>
Inquires the name of the current rVariable (in the current CDF). Required arguments are as follows:

out: CHARACTER var_name*(CDF_VAR_NAME_LEN256

Name of the rVariable. This character string will be padded if necessary.

UNIX: For the proper operation of CDF_lib, var_name MUST be a Fortran CHARACTER variable or constant.

The required preselected objects/states are the current CDF and its current rVariable.

<GET_,rVAR_nINDEXENTRIES_>
Inquires the number of index entries for the current rVariable (in the current CDF). This only has significance for rVariables that are in single-file CDFs. The Concepts chapter in the CDF User's Guide describes the indexing scheme used for variable records in a single-file CDF. Required arguments are as follows:

out: INTEGER*4 num_entries

Number of index entries.

The required preselected objects/states are the current CDF and its current rVariable.

<GET_,rVAR_nINDEXLEVELS_>
Inquires the number of index levels for the current rVariable (in the current CDF). This only has significance for rVariables that are in single-file CDFs. The Concepts chapter in the CDF User's Guide describes the indexing scheme used for variable records in a single-file CDF. Required arguments are as follows:

out: INTEGER*4 num_levels

Number of index levels.

The required preselected objects/states are the current CDF and its current rVariable.

<GET_,rVAR_nINDEXRECORDS_>
Inquires the number of index records for the current rVariable (in the current CDF). This only has significance for rVariables that are in single-file CDFs. The Concepts chapter in the CDF User's Guide describes the indexing scheme used for variable records in a single-file CDF. Required arguments are as follows:

out: INTEGER*4 num_records

Number of index records.

The required preselected objects/states are the current CDF and its current rVariable.

<GET_,rVAR_NUMallocRECS_>
Inquires the number of records allocated for the current rVariable (in the current CDF). The Concepts chapter in the CDF User's Guide describes the allocation of variable records in a single-file CDF. Required arguments are as follows:

out: INTEGER*4 num_records

Number of allocated records.

The required preselected objects/states are the current CDF and its current rVariable.

<GET_,rVAR_NUMBER_>
Gets the number of the named rVariable (in the current CDF). Note that this operation does not select the current rVariable. Required arguments are as follows:

in: CHARACTER var_name*(*)

The rVariable name. This may be at most CDF_VAR_NAME_LEN256 characters.

UNIX: For the proper operation of CDF_lib, var_name MUST be a Fortran CHARACTER variable or constant.

out: INTEGER*4 var_num

The rVariable number.

The only required preselected object/state is the current CDF.

<GET_,rVAR_NUMELEMS_>

Inquires the number of elements (of the data type) for the current rVariable (in the current CDF). Required arguments are as follows:

out: INTEGER*4 num_elements

Number of elements of the data type at each value. For character data types (CDF_CHAR and CDF_UCHAR) this is the number of characters in the string. (Each value consists of the entire string.) For all other data types this will always be one (1) – multiple elements at each value are not allowed for non-character data types.

The required preselected objects/states are the current CDF and its current rVariable.

<GET_,rVAR_NUMRECS_>

Inquires the number of records written for the current rVariable (in the current CDF). This may not correspond to the maximum record written (see <GET_,rVAR_MAXREC_>) if the rVariable has sparse records. Required arguments are as follows:

out: INTEGER*4 num_records

Number of records written.

The required preselected objects/states are the current CDF and its current rVariable.

<GET_,rVAR_PADVALUE_>

Inquires the pad value of the current rVariable (in the current CDF). If a pad value has not been explicitly specified for the rVariable (see <PUT_,rVAR_PADVALUE_>), the informational status code NO_PADVALUE_SPECIFIED will be returned and the default pad value for the rVariable's data type will be placed in the pad value buffer provided. Required arguments are as follows:

out: <type> value

Pad value. This buffer must be large to hold the value. <type> is dependent on the data type of the pad value. The value is read from the CDF and placed into memory at address value.

WARNING: If the rVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the rVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF and its current rVariable.

<GET_,rVAR_RECVARY_>

Inquires the record variance of the current rVariable (in the current CDF). Required arguments are as follows:

out: INTEGER*4 rec_vary

Record variance. The variances are described in Section 4.9.

The required preselected objects/states are the current CDF and its current rVariable.

<GET_,rVAR_SEQDATA_>

Reads one value from the current rVariable (in the current CDF) at the current sequential value for that rVariable. After the read the current sequential value is automatically incremented to the next value (crossing a record boundary If necessary). An error is returned if the current sequential value is past the last record for the rVariable. Required arguments are as follows:

out: <type> value

Value. This buffer must be large to hold the value. <type> is dependent on the data type of the rVariable. The value is read from the CDF and placed into memory at address value.

WARNING: If the rVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the rVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF, its current rVariable, and the current sequential value for the rVariable. Note that the current sequential value for an rVariable increments automatically as values are read.

<GET_,rVAR_SPARSEARRAYS_>

Inquires the sparse arrays type/parameters of the current rVariable (in the current CDF). Required arguments are as follows:

out: INTEGER*4 s_arrays_type

The sparse arrays type. The types of sparse arrays are described in Section 4.11.

out: INTEGER*4 a_arrays_parms(CDF_MAX_PARMS)

The sparse arrays parameters. The sparse arrays parameters are described in Section 4.11.

out: INTEGER*4 a_arrays_pct

If sparse arrays, the percentage of the non-sparse size of the rVariable's data values needed to store the sparse values.

The required preselected objects/states are the current CDF and its current rVariable.

<GET_,rVAR_SPARSERECORDS_>

Inquires the sparse records type of the current rVariable (in the current CDF). Required arguments are as follows:

out: INTEGER*4 s_records_type

The sparse records type. The types of sparse records are described in Section 4.11.

The required preselected objects/states are the current CDF and its current rVariable.

<GET_,rVARs_DIMSIZES_>

Inquires the size of each dimension for the rVariables in the current CDF. For 0-dimensional rVariables this operation is not applicable. Required arguments are as follows:

out: INTEGER*4 dim_sizes(CDF_MAX_DIMS)

Dimension sizes. Each element of dim_sizes receives the corresponding dimension size.

The only required preselected object/state is the current CDF.

<GET_,rVARs_MAXREC_>

Inquires the maximum record number of the rVariables in the current CDF. Note that this is not the number of records but rather the maximum record number (which is one less than the number of records). A value of negative one (-1) indicates that the rVariables contain no records. The maximum record number for an individual rVariable may be inquired using the <GET_,rVAR_MAXREC_> operation. Required arguments are as follows:

out: INTEGER*4 max_rec

Maximum record number.

The only required preselected object/state is the current CDF.

<GET_,rVARs_NUMDIMS_>

Inquires the number of dimensions for the rVariables in the current CDF. Required arguments are as follows:

out: INTEGER*4 num_dims

Number of dimensions.

The only required preselected object/state is the current CDF.

<GET_,rVARs_RECDATA_>

Reads full-physical records from one or more rVariables (in the current CDF). The full-physical records are read at the current record number for rVariables. This operation does not affect the current rVariable (in the current CDF). Required arguments are as follows:

in: INTEGER*4 num_vars

The number of rVariables from which to read. This must be at least one (1).

in: INTEGER*4 var_nums(*)

The rVariables from which to read. This array, whose size is determined by the value of num_vars, contains rVariable numbers. The rVariable numbers can be listed in any order.

out: <type> buffer

The buffer into which the full-physical rVariable records being read are to be placed. This buffer must be large enough to hold the full-physical records. <type> must be a Fortran variable that will be passed by reference and cannot be of type CHARACTER. (The CDF library is expecting an address at which to place the full-physical records being read.) The order of the full-physical rVariable records in this buffer will correspond to the rVariable numbers listed in varNums, and this buffer will be contiguous --- there will be no spacing between full-physical rVariable records. Be careful if using Fortran STRUCTUREs to receive multiple full-physical rVariable records. Fortran compilers on some operating systems will pad between the elements of a STRUCTURE in order to prevent memory

alignment errors (i.e., the elements of a STRUCTURE may not be contiguous). See the Concepts chapter in the CDF User's Guide for more details on how to create this buffer.

The required preselected objects/states are the current CDF and its current record number for rVariables. [37]

<GET_,STATUS_TEXT_>
Inquires the explanation text for the current status code. Note that the current status code is NOT the status from the last operation performed. Required arguments are as follows:

out: CHARACTER text*(CDF_STATUSTEXT_LEN)

Text explaining the status code.

UNIX: For the proper operation of CDF_lib, text MUST be a Fortran CHARACTER variable or constant.

The only required preselected object/state is the current status code.

<GET_,zENTRY_DATA_>
Reads the zEntry data value from the current attribute at the current zEntry number (in the current CDF). Required arguments are as follows:

out: <type> value

Value. This buffer must be large to hold the value. <type> is dependent on the data type of the zEnrty. The value is read from the CDF and placed into memory at address value.

WARNING: If the zEntry has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the zEntry does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF, its current attribute, and its current zEntry number.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<GET_,zENTRY_DATATYPE_>
Inquires the data type of the zEntry at the current zEntry number for the current attribute (in the current CDF). Required arguments are as follows:

out: INTEGER*4 data_type

Data type. The data types are described in Section 4.5.

The required preselected objects/states are the current CDF, its current attribute, and its current zEntry number.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<GET_,zENTRY_NUMELEMS_>
Inquires the number of elements (of the data type) of the zEntry at the current zEntry number for the current attribute (in the current CDF). Required arguments are as follows:

out: INTEGER*4 num_elements

[37] A Standard Interface at Section 5.13 provides the same functionality.

Number of elements of the data type. For character data types (CDF_CHAR and CDF_UCHAR) this is the number of characters in the string (an array of characters). For all other data types this is the number of elements in an array of that data type.

The required preselected objects/states are the current CDF, its current attribute, and its current zEntry number.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<GET_,zVAR_ALLOCATEDFROM_>
Inquires the next allocated record at or after a given record for the current zVariable (in the current CDF). Required arguments are as follows:

in: INTEGER*4 start_record

The record number at which to begin searching for the next allocated record. If this record exists, it will be considered the next allocated record.

out: INTEGER*4 next_record

The number of the next allocated record.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_ALLOCATEDTO_>
Inquires the last allocated record (before the next unallocated record) at or after a given record for the current zVariable (in the current CDF). Required arguments are as follows:

in: INTEGER*4 start_record

The record number at which to begin searching for the last allocated record.

out: INTEGER*4 next_record

The number of the last allocated record.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_BLOCKINGFACTOR_>[38]
Inquires the blocking factor for the current zVariable (in the current CDF). Blocking factors are described in the Concepts chapter in the CDF User's Guide. Required arguments are as follows:

out: INTEGER*4 blocking_factor

The blocking factor. A value of zero (0) indicates that the default blocking factor is being used.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_COMPRESSION_>
Inquires the compression type/parameters of the current zVariable (in the current CDF). Required arguments are as follows:

out: INTEGER*4 c_type

The compression type. The types of compressions are described in Section 4.10.

[38] The item zVAR_BLOCKINGFACTOR was previously named zVAR_EXTENDRECS .

out: INTEGER*4 c_parms(CDF_MAX_PARMS)

The compression parameters. The compression parameters are described in Section 4.10.

out: INTEGER*4 c_pct

If compressed, the percentage of the uncompressed size of the zVariable's data values needed to store the compressed values.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_DATA_>

Reads a value from the current zVariable (in the current CDF). The value is read at the current record number and current dimension indices for that zVariable (in the current CDF). Required arguments are as follows:

out: <type> value

Value. This buffer must be large to hold the value. <type> is dependent on the data type of the zVariable. The value is read from the CDF and placed into memory at address value.

WARNING: If the zVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the zVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF, its current zVariable, the current record number for the zVariable, and the current dimension indices for the zVariable.

<GET_,zVAR_DATATYPE_>

Inquires the data type of the current zVariable (in the current CDF). Required arguments are as follows:

out: INTEGER*4 data_type

Data type. The data types are described in Section 4.5.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_DIMSIZES_>

Inquires the size of each dimension for the current zVariable in the current CDF. For 0-dimensional zVariables this operation is not applicable. Required arguments are as follows:

out: INTEGER*4 dim_sizes(CDF_MAX_DIMS)

Dimension sizes. Each element of dim_sizes receives the corresponding dimension size.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_DIMVARYS_>

Inquires the dimension variances of the current zVariable (in the current CDF). For 0-dimensional zVariables this operation is not applicable. Required arguments are as follows:

out: INTEGER*4 dim_varys(CDF_MAX_DIMS)

Dimension variances. Each element of dim_varys receives the corresponding dimension variance. The variances are described in Section 4.9.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_HYPERDATA_>

Reads one or more values from the current zVariable (in the current CDF). The values are read based on the current record number, current record count, current record interval, current dimension indices, current dimension counts, and current dimension intervals for that zVariable (in the current CDF). Required arguments are as follows:

out: <type> buffer

Value. This buffer must be large to hold the value. <type> is dependent on the data type of the zVariable. The value is read from the CDF and placed into memory at address value.

WARNING: If the zVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the zVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF, its current zVariable, the current record number, record count, and record interval for the zVariable, and the current dimension indices, dimension counts, and dimension intervals for the zVariable.

<GET_,zVAR_MAXallocREC_>

Inquires the maximum record number allocated for the current zVariable (in the current CDF). Required arguments are as follows:

out: INTEGER*4 max_rec

Maximum record number allocated.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_MAXREC_>

Inquires the maximum record number for the current zVariable (in the current CDF). For zVariables with a record variance of NOVARY, this will be at most zero (0). A value of negative one (-1) indicates that no records have been written. Required arguments are as follows:

out: INTEGER*4 max_rec

Maximum record number.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_NAME_>

Inquires the name of the current zVariable (in the current CDF). Required arguments are as follows:

out: CHARACTER var_name*(CDF_VAR_NAME_LEN256)

Name of the zVariable.

UNIX: For the proper operation of CDF_lib, var_name MUST be a Fortran CHARACTER variable or constant.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_nINDEXENTRIES_>

Inquires the number of index entries for the current zVariable (in the current CDF). This only has significance for zVariables that are in single-file CDFs. The Concepts chapter in the CDF User's Guide describes the indexing scheme used for variable records in a single-file CDF. Required arguments are as follows:

out: INTEGER*4 num_entries

Number of index entries.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_nINDEXLEVELS_>

Inquires the number of index levels for the current zVariable (in the current CDF). This only has significance for zVariables that are in single-file CDFs. The Concepts chapter in the CDF User's Guide describes the indexing scheme used for variable records in a single-file CDF. Required arguments are as follows:

out: INTEGER*4 num_levels

Number of index levels.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_nINDEXRECORDS_>

Inquires the number of index records for the current zVariable (in the current CDF). This only has significance for zVariables that are in single-file CDFs. The Concepts chapter in the CDF User's Guide describes the indexing scheme used for variable records in a single-file CDF. Required arguments are as follows:

out: INTEGER*4 num_records

Number of index records.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_NUMallocRECS_>

Inquires the number of records allocated for the current zVariable (in the current CDF). The Concepts chapter in the CDF User's Guide describes the allocation of variable records in a single-file CDF. Required arguments are as follows:

out: INTEGER*4 num_records

Number of allocated records.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_NUMBER_>

Gets the number of the named zVariable (in the current CDF). Note that this operation does not select the current zVariable. Required arguments are as follows:

in: CHARACTER var_name*(*)

The zVariable name. This may be at most CDF_VAR_NAME_LEN256 characters.

UNIX: For the proper operation of CDF_lib, var_name MUST be a Fortran CHARACTER variable or constant.

out: INTEGER*4 var_num

The zVariable number.

The only required preselected object/state is the current CDF.

<GET_,zVAR_NUMDIMS_>
Inquires the number of dimensions for the current zVariable in the current CDF. Required arguments are as follows:

out: INTEGER*4 num_dims

Number of dimensions.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_NUMELEMS_>
Inquires the number of elements (of the data type) for the current zVariable (in the current CDF). Required arguments are as follows:

out: INTEGER*4 num_elements

Number of elements of the data type at each value. For character data types (CDF_CHAR and CDF_UCHAR) this is the number of characters in the string. (Each value consists of the entire string.) For all other data types this will always be one (1) – multiple elements at each value are not allowed for non-character data types.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_NUMRECS_>
Inquires the number of records written for the current zVariable (in the current CDF). This may not correspond to the maximum record written (see <GET_,zVAR_MAXREC_>) if the zVariable has sparse records. Required arguments are as follows:

out: INTEGER*4 num_records

Number of records written.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_PADVALUE_>
Inquires the pad value of the current zVariable (in the current CDF). If a pad value has not been explicitly specified for the zVariable (see <PUT_,zVAR_PADVALUE_>), the informational status code NO_PADVALUE_SPECIFIED will be returned and the default pad value for the zVariable's data type will be placed in the pad value buffer provided. Required arguments are as follows:

out: <type> value

Pad value. This buffer must be large to hold the value. <type> is dependent on the data type of the zVariable. The value is read from the CDF and placed into memory at address value.

WARNING: If the zVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the zVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_RECVARY_>

Inquires the record variance of the current zVariable (in the current CDF). Required arguments are as follows:

out: INTEGER*4 rec_vary

Record variance. The variances are described in Section 4.9.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_SEQDATA_>

Reads one value from the current zVariable (in the current CDF) at the current sequential value for that zVariable. After the read the current sequential value is automatically incremented to the next value (crossing a record boundary If necessary). An error is returned if the current sequential value is past the last record for the zVariable. Required arguments are as follows:

out: <type> value

Value. This buffer must be large enough to hold the value. The value is read from the CDF and placed into memory at address value.

The required preselected objects/states are the current CDF, its current zVariable, and the current sequential value for the zVariable. Note that the current sequential value for a zVariable increments automatically as values are read.

<GET_,zVAR_SPARSEARRAYS_>

Inquires the sparse arrays type/parameters of the current zVariable (in the current CDF). Required arguments are as follows:

out: INTEGER*4 s_arrays_type

The sparse arrays type. The types of sparse arrays are described in Section 4.11.

out: INTEGER*4 a_arrays_parms(CDF_MAX_PARMS)

The sparse arrays parameters. The sparse arrays parameters are described in Section 4.11.

out: INTEGER*4 a_arrays_pct

If sparse arrays, the percentage of the non-sparse size of the zVariable's data values needed to store the sparse values.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVAR_SPARSERECORDS_>

Inquires the sparse records type of the current zVariable (in the current CDF). Required arguments are as follows:

out: INTEGER*4 s_records_type

The sparse records type. The types of sparse records are described in Section 4.11.

The required preselected objects/states are the current CDF and its current zVariable.

<GET_,zVARs_MAXREC_>

Inquires the maximum record number of the zVariables in the current CDF. Note that this is not the number of records but rather the maximum record number (which is one less than the number of records). A value of

negative one (-1) indicates that the zVariables contain no records. The maximum record number for an individual zVariable may be inquired using the <GET_,zVAR_MAXREC_> operation. Required arguments are as follows:

out: INTEGER*4 max_rec

Maximum record number.

The only required preselected object/state is the current CDF.

<GET_,zVARs_RECDATA_>

Reads full-physical records from one or more zVariables (in the current CDF). The full-physical record for a particular zVariable is read at the current record number for that zVariable. (The record numbers do not have to be the same but in most cases probably will be.) This operation does not affect the current zVariable (in the current CDF). Required arguments are as follows:

in: INTEGER*4 num_vars

The number of zVariables from which to read. This must be at least one (1).

in: INTEGER*4 var_nums(*)

The zVariables from which to read. This array, whose size is determined by the value of num_vars, contains zVariable numbers. The zVariable numbers can be listed in any order.

out: <type> buffer

The buffer into which the full-physical zVariable records being read are to be placed. This buffer must be large enough to hold the full-physical records. <type> must be a Fortran variable that will be passed by reference and cannot be of type CHARACTER. (The CDF library is expecting an address at which to place the full-physical records being read.) The order of the full-physical zVariable records in this buffer will correspond to the zVariable numbers listed in varNums, and this buffer will be contiguous --- there will be no spacing between full-physical zVariable records. Be careful if using Fortran STRUCTUREs to receive multiple full-physical zVariable records. Fortran compilers on some operating systems will pad between the elements of a STRUCTURE in order to prevent memory alignment errors (i.e., the elements of a STRUCTURE may not be contiguous). See the Concepts chapter in the CDF User's Guide for more details on how to create this buffer.

The required preselected objects/states are the current CDF and the current record number for each of the zVariables specified. A convenience operation exists, <SELECT_,zVARs_RECNUMBER_>, that allows the current record number for each zVariable to be selected at one time (as opposed to selecting the current record numbers one at a time using <SELECT_,zVAR_RECNUMBER_>). [39]

<NULL_>

Marks the end of the argument list that is passed to An internal interface call. No other arguments are allowed after it.

<OPEN ,CDF_>

Opens the named CDF. The opened CDF implicitly becomes the current CDF. Required arguments are as follows:

in: CHARACTER CDF_name*(*)

[39] A Standard Interface at Section 5.14 provides the same functionality.

File name of the CDF to be opened. (Do not append an extension.) This can be at most CDF_PATHNAME_LEN characters. A CDF file name may contain disk and directory specifications that conform to the conventions of the operating system being used (including logical names on VMS systems and environment variables on UNIX systems).

UNIX: File names are case-sensitive.

UNIX: For the proper operation of CDF_lib, CDF_name MUST be a Fortran CHARACTER variable or constant.

out: INTEGER*4 id

CDF identifier to be used in subsequent operations on the CDF.

There are no required preselected objects/states.

<PUT_,ATTR_NAME_>
Renames the current attribute (in the current CDF). An attribute with the same name must not already exist in the CDF. Required arguments are as follows:

in: CHARACTER attr_name*(*)

New attribute name. This may be at most CDF_ATTR_NAME_LEN256 characters.

UNIX: For the proper operation of CDF_lib, attr_name MUST be a Fortran CHARACTER variable or constant.

The required preselected objects/states are the current CDF and its current attribute.

<PUT_,ATTR_SCOPE_>
Respecifies the scope for the current attribute (in the current CDF). Required arguments are as follows:

in: INTEGER*4 scope

New attribute scope. Specify one of the scopes described in Section 4.12.

The required preselected objects/states are the current CDF and its current attribute.

<PUT_,CDF_CHECKSUM_>
Respecifies the checksum mode for the current CDF. Required arguments are as follows:

in: INTEGER*4 checksum

New checksum. The checksum is described in Section 4.19.

The only required preselected object/state is the current CDF.

<PUT_,CDF_COMPRESSION_>
Specifies the compression type/parameters for the current CDF. This refers to the compression of the CDF - not of any variables. Required arguments are as follows:

in: INTEGER*4 cType

The compression type. The types of compressions are described in Section 4.10.

in: INTEGER*4 c_parms(*)

The compression parameters. The compression parameters are described in Section 4.10.

The only required preselected object/state is the current CDF.

<PUT_,CDF_ENCODING_>
Respecifies the data encoding of the current CDF. A CDF's data encoding may not be changed after any variable values (including the pad value) or attribute entries have been written. Required arguments are as follows:

in: INTEGER*4 encoding

New data encoding. Specify one of the encodings described in Section 4.6.

The only required preselected object/state is the current CDF.

<PUT_,CDF_FORMAT_>
Respecifies the format of the current CDF. A CDF's format may not be changed after any variables have been created. Required arguments are as follows:

in: INTEGER*4 format

New CDF format. Specify one of the formats described in Section 4.4.

The only required preselected object/state is the current CDF.

<PUT_,CDF_LEAPSECONDLASTUPDATED_>
Respecifies the date that the last leap second was added to the leap second table, which this CDF is built upon. Normally, this is done for the older CDFs that have not had this information set.

in: INTEGER*4 lastupdated

lastupdated, in YYYYMMDD form, has to be a valid entry in the currently used leap second table, or zero (0).

The only required preselected object/state is the current CDF.

<PUT_,CDF_MAJORITY_>
Respecifies the variable majority of the current CDF. A CDF's variable majority may not be changed after any variable values have been written. Required arguments are as follows:

in: INTEGER*4 majority

New variable majority. Specify one of the majorities described in Section 4.8.

The only required preselected object/state is the current CDF.

<PUT_,gENTRY_DATA_>
Writes a gEntry to the current attribute at the current gEntry number (in the current CDF). An existing gEntry may be overwritten with a new gEntry having the same data specification (data type and number of elements) or a different data specification. Required arguments are as follows:

in: INTEGER*4 data_type

Data type of the gEntry. Specify one of the data types described in Section 4.5.

in: INTEGER*4 num_elements

Number of elements of the data type. This may be greater than one (1) for any of the supported data types. For character data types (CDF_CHAR and CDF_UCHAR) this is the number of characters in the string (an array of characters). For all other data types this is the number of elements in an array of that data type.

in: <type> value

Value. <type> is dependent on the data type of the gEnrty. The value is written to the CDF from value.

WARNING: If the gEntry has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the gEntry does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF, its current attribute, and its current gEntry number.

NOTE: Only use this operation on gAttributes. An error will occur if used on a vAttribute.

<PUT_,gENTRY_DATASPEC_>

Modifies the data specification (data type and number of elements) of the gEntry at the current gEntry number of the current attribute (in the current CDF). The new and old data types must be equivalent, and the number of elements must not be changed. Equivalent data types are described in the Concepts chapter in the CDF User's Guide. Required arguments are as follows:

in: INTEGER*4 data_type

New data type of the gEntry. Specify one of the data types described in Section 4.5.

in: INTEGER*4 num_elements

Number of elements of the data type.

The required preselected objects/states are the current CDF, its current attribute, and its current gEntry number.

NOTE: Only use this operation on gAttributes. An error will occur if used on a vAttribute.

<PUT_,rENTRY_DATA_>

Writes an rEntry to the current attribute at the current rEntry number (in the current CDF). An existing rEntry may be overwritten with a new rEntry having the same data specification (data type and number of elements) or a different data specification. Required arguments are as follows:

in: INTEGER*4 data_type

Data type of the rEntry. Specify one of the data types described in Section 4.5.

in: INTEGER*4 num_elements

Number of elements of the data type. This may be greater than one (1) for any of the supported data types. For character data types (CDF_CHAR and CDF_UCHAR) this is the number of characters in the string (an array of characters). For all other data types this is the number of elements in an array of that data type.

in: <type> value

Value. <type> is dependent on the data type of the rEnrty. The value is written to the CDF from value.

WARNING: If the rEntry has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the rEntry does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF, its current attribute, and its current rEntry number.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<PUT_,rENTRY_DATASPEC_>

Modifies the data specification (data type and number of elements) of the rEntry at the current rEntry number of the current attribute (in the current CDF). The new and old data types must be equivalent, and the number of elements must not be changed. Equivalent data types are described in the Concepts chapter in the CDF User's Guide. Required arguments are as follows:

in: INTEGER*4 data_type

New data type of the rEntry. Specify one of the data types described in Section 4.5.

in: INTEGER*4 num_elements

Number of elements of the data type.

The required preselected objects/states are the current CDF, its current attribute, and its current rEntry number.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<PUT_,rVAR_ALLOCATEBLOCK_>

Specifies a range of records to allocate for the current rVariable (in the current CDF). This operation is only applicable to uncompressed rVariables in single-file CDFs. The Concepts chapter in the CDF User's Guide describes the allocation of variable records. Required arguments are as follows:

in: INTEGER*4 first_record

The first record number to allocate.

in: INTEGER*4 last_record

The last record number to allocate.

The required preselected objects/states are the current CDF and its current rVariable.

<PUT_,rVAR_ALLOCATERECS_>

Specifies the number of records to allocate for the current rVariable (in the current CDF). The records are allocated beginning at record number 0 (zero). This operation is only applicable to uncompressed rVariables in single-file CDFs. The Concepts chapter in the CDF User's Guide describes the allocation of variable records. Required arguments are as follows:

in: INTEGER*4 num_records

Number of records to allocate.

The required preselected objects/states are the current CDF and its current rVariable.

<PUT_,rVAR_BLOCKINGFACTOR_>[40]

Specifies the blocking factor for the current rVariable (in the current CDF). The Concepts chapter in the CDF User's Guide describes a variable's blocking factor. **NOTE:** The blocking factor has no effect for NRV variables or multi-file CDFs. Required arguments are as follows:

in: INTEGER*4 blockingFactor

The blocking factor. A value of zero (0) indicates that the default blocking factor should be used.

The required preselected objects/states are the current CDF and its current rVariable.

<PUT_,rVAR_COMPRESSION_>

Specifies the compression type/parameters for the current rVariable (in current CDF). Required arguments are as follows:

in: INTEGER*4 cType

The compression type. The types of compressions are described in Section 4.10.

in: INTEGER*4 c_parms(*)

The compression parameters. The compression parameters are described in Section 4.10.

The required preselected objects/states are the current CDF and its current rVariable.

<PUT_,rVAR_DATA_>

Writes one value to the current rVariable (in the current CDF). The value is written at the current record number and current dimension indices for the rVariables (in the current CDF). Required arguments are as follows:

in: <type> value

Value. <type> is dependent on the data type of the rVariable. The value is written to the CDF from value.

WARNING: If the rVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the rVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF, its current rVariable, its current record number for rVariables, and its current dimension indices for rVariables.

<PUT_,rVAR_DATASPEC_>

Respecifies the data specification (data type and number of elements) of the current rVariable (in the current CDF). An rVariable's data specification may not be changed If the new data specification is not equivalent to the old data specification and any values (including the pad value) have been written. Data specifications are considered equivalent If the data types are equivalent (see the Concepts chapter in the CDF User's Guide) and the number of elements are the same. Required arguments are as follows:

in: INTEGER*4 data_type

New data type. Specify one of the data types described in Section 4.5.

in: INTEGER*4 num_elements

[40] The item rVAR_BLOCKINGFACTOR was previously named rVAR_EXTENDRECS .

Number of elements of the data type at each value. For character data types (CDF_CHAR and CDF_UCHAR), this is the number of characters in each string (an array of characters). A string exists at each value. For the non-character data types this must be one (1) - arrays of values are not allowed for non-character data types.

The required preselected objects/states are the current CDF and its current rVariable.

<PUT_,rVAR_DIMVARYS_>

Respecifies the dimension variances of the current rVariable (in the current CDF). An rVariable's dimension variances may not be changed if any values have been written (except for an explicit pad value - it may have been written). For 0-dimensional rVariables this operation is not applicable. Required arguments are as follows:

in: INTEGER*4 dim_varys(*)

New dimension variances. Each element of dim_varys specifies the corresponding dimension variance. For each dimension specify one of the variances described in Section 4.9.

The required preselected objects/states are the current CDF and its current rVariable.

<PUT_,rVAR_HYPERDATA_>

Writes one or more values to the current rVariable (in the current CDF). The values are written based on the current record number, current record count, current record interval, current dimension indices, current dimension counts, and current dimension intervals for the rVariables (in the current CDF). Required arguments are as follows:

in: <type> buffer

Value. <type> is dependent on the data type of the rVariable. The values in buffer are written to the CDF.

WARNING: If the rVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the rVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF, its current rVariable, its current record number, record count, and record interval for rVariables, and its current dimension indices, dimension counts, and dimension intervals for rVariables.

<PUT_,rVAR_INITIALRECS_>

Specifies the number of records to initially write to the current rVariable (in the current CDF). The records are written beginning at record number 0 (zero). This may be specified only once per rVariable and before any other records have been written to that rVariable. If a pad value has not yet been specified, the default is used (see the Concepts chapter in the CDF User's Guide). If a pad value has been explicitly specified, that value is written to the records. The Concepts chapter in the CDF User's Guide describes initial records. Required arguments are as follows:

in: INTEGER*4 num_records

Number of records to write.

The required preselected objects/states are the current CDF and its current rVariable.

<PUT_,rVAR_NAME_>

Renames the current rVariable (in the current CDF). A variable (rVariable or zVariable) with the same name must not already exist in the CDF. Required arguments are as follows:

in: CHARACTER var_name*(*)

New name of the rVariable. This may consist of at most CDF_VAR_NAME_LEN256 characters.

UNIX: For the proper operation of CDF_lib, var_name MUST be a Fortran CHARACTER variable or constant.

The required preselected objects/states are the current CDF and its current rVariable.

<PUT_,rVAR_PADVALUE_>

Specifies the pad value for the current rVariable (in the current CDF). An rVariable's pad value may be specified (or respecified) at any time without affecting already written values (including where pad values were used). The Concepts chapter in the CDF User's Guide describes variable pad values. Required arguments are as follows:

in: <type> value

Pad value. <type> is dependent on the data type of the rVariable. The pad value is written to the CDF from value.

WARNING: If the rVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the rVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF and its current rVariable.

<PUT_,rVAR_RECVARY_>

Respecifies the record variance of the current rVariable (in the current CDF). An rVariable's record variance may not be changed if any values have been written (except for an explicit pad value - it may have been written). Required arguments are as follows:

in: INTEGER*4 rec_vary

New record variance. Specify one of the variances described in Section 4.9.

The required preselected objects/states are the current CDF and its current rVariable.

<PUT_,rVAR_SEQDATA_>

Writes one value to the current rVariable (in the current CDF) at the current sequential value for that rVariable. After the write the current sequential value is automatically incremented to the next value (crossing a record boundary if necessary). If the current sequential value is past the last record for the rVariable, the rVariable is extended as necessary. Required arguments are as follows:

in: <type> value

Value. <type> is dependent on the data type of the rVariable. The value is written to the CDF from value.

WARNING: If the rVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the rVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF, its current rVariable, and the current sequential value for the rVariable. Note that the current sequential value for an rVariable increments automatically as values are written.

<PUT_,rVAR_SPARSEARRAYS_>
Specifies the sparse arrays type/parameters for the current rVariable (in the current CDF). Required arguments are as follows:

in: INTEGER*4 s_arrays_type

The sparse arrays type. The types of sparse arrays are described in Section 4.11.

in: INTEGER*4 a_arrays_parms(*)

The sparse arrays parameters. The sparse arrays parameters are described in Section 4.11.

The required preselected objects/states are the current CDF and its current rVariable.

<PUT_,rVAR_SPARSERECORDS_>
Specifies the sparse records type for the current rVariable (in the current CDF). Required arguments are as follows:

in: INTEGER*4 s_records_type

The sparse records type. The types of sparse records are described in Section 4.11.

The required preselected objects/states are the current CDF and its current rVariable.

<PUT_,rVARs_RECDATA_>
Writes full-physical records to one or more rVariables (in the current CDF). The full-physical records are written at the current record number for rVariables. This operation does not affect the current rVariable (in the current CDF). Required arguments are as follows:

in: INTEGER*4 num_vars

The number of rVariables to which to write. This must be at least one (1).

in: INTEGER*4 var_nums(*)

The rVariables to which to write. This array, whose size is determined by the value of num_vars, contains rVariable numbers. The rVariable numbers can be listed in any order.

in: <type> buffer

The buffer of full-physical rVariable records to be written. <type> must be a Fortran variable that will be passed by reference and cannot be of type CHARACTER. (The CDF library is expecting an address at which to get the full-physical records being written.) The order of the full-physical rVariable records in this buffer must agree with the rVariable numbers listed in varNums and this buffer must be contiguous --- there can be no spacing between full-physical rVariable records. Be careful if using Fortran STRUCTUREs to store multiple full-physical rVariable records. Fortran compilers on some operating systems will pad between the elements of a STRUCTURE in order to prevent memory alignment errors (i.e., the elements of a STRUCTURE may not be contiguous). See the Concepts chapter in the CDF User's Guide for more details on how to create this buffer.

The required preselected objects/states are the current CDF and its current record number for rVariables. [41]

<PUT_,zENTRY_DATA_>

[41] A Standard Interface at Section 5.17 provides the same functionality.

Writes a zEntry to the current attribute at the current zEntry number (in the current CDF). An existing zEntry may be overwritten with a new zEntry having the same data specification (data type and number of elements) or a different data specification. Required arguments are as follows:

in: INTEGER*4 data_type

Data type of the zEntry. Specify one of the data types described in Section 4.5.

in: INTEGER*4 num_elements

Number of elements of the data type. This may be greater than one (1) for any of the supported data types. For character data types (CDF_CHAR and CDF_UCHAR) this is the number of characters in the string (an array of characters). For all other data types this is the number of elements in an array of that data type.

in: <type> value

The value(s). <type> depends on the data type of the zEntry. The value is written to the CDF from value.

WARNING: If the zEntry has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the zEntry does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF, its current attribute, and its current zEntry number.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<PUT_,zENTRY_DATASPEC_>

Modifies the data specification (data type and number of elements) of the zEntry at the current zEntry number of the current attribute (in the current CDF). The new and old data types must be equivalent, and the number of elements must not be changed. Equivalent data types are described in the Concepts chapter in the CDF User's Guide. Required arguments are as follows:

in: INTEGER*4 data_type

New data type of the zEntry. Specify one of the data types described in Section 4.5.

in: INTEGER*4 num_elements

Number of elements of the data type.

The required preselected objects/states are the current CDF, its current attribute, and its current zEntry number.

NOTE: Only use this operation on vAttributes. An error will occur if used on a gAttribute.

<PUT_,zVAR_ALLOCATEBLOCK_>

Specifies a range of records to allocate for the current zVariable (in the current CDF). This operation is only applicable to uncompressed zVariables in single-file CDFs. The Concepts chapter in the CDF User's Guide describes the allocation of variable records. Required arguments are as follows:

in: INTEGER*4 first_record

The first record number to allocate.

in: INTEGER*4 last_record

The last record number to allocate.

The required preselected objects/states are the current CDF and its current zVariable.

<PUT_,zVAR_ALLOCATERECS_>
Specifies the number of records to allocate for the current zVariable (in the current CDF). The records are allocated beginning at record number 0 (zero). This operation is only applicable to uncompressed zVariables in single-file CDFs. The Concepts chapter in the CDF User's Guide describes the allocation of variable records. Required arguments are as follows:

in: INTEGER*4 num_records

Number of records to allocate.

The required preselected objects/states are the current CDF and its current zVariable.

<PUT_,zVAR_BLOCKINGFACTOR_>[42]
Specifies the blocking factor for the current zVariable (in the current CDF). The Concepts chapter in the CDF User's Guide describes a variable's blocking factor. **NOTE:** The blocking factor has no effect for NRV variables or multi-file CDFs. Required arguments are as follows:

in: INTEGER*4 blockingFactor

The blocking factor. A value of zero (0) indicates that the default blocking factor should be used.

The required preselected objects/states are the current CDF and its current zVariable.

<PUT_,zVAR_COMPRESSION_>
Specifies the compression type/parameters for the current zVariable (in current CDF). Required arguments are as follows:

in: INTEGER*4 cType

The compression type. The types of compressions are described in Section 4.10.

in: INTEGER*4 c_parms(*)

The compression parameters. The compression parameters are described in Section 4.10.

The required preselected objects/states are the current CDF and its current zVariable.

<PUT_,zVAR_DATA_>
Writes one value to the current zVariable (in the current CDF). The value is written at the current record number and current dimension indices for that zVariable (in the current CDF). Required arguments are as follows:

in: <type> value

Value. <type> is dependent on the data type of the zVariable. The value is written to the CDF from value.

WARNING: If the zVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the zVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

[42] The item zVAR_BLOCKINGFACTOR was previously named zVAR_EXTENDRECS .

The required preselected objects/states are the current CDF, its current zVariable, the current record number for the zVariable, and the current dimension indices for the zVariable.

<PUT_,zVAR_DATASPEC_>

Respecifies the data specification (data type and number of elements) of the current zVariable (in the current CDF). A zVariable's data specification may not be changed If the new data specification is not equivalent to the old data specification and any values (including the pad value) have been written. Data specifications are considered equivalent If the data types are equivalent (see the Concepts chapter in the CDF User's Guide) and the number of elements are the same. Required arguments are as follows:

in: INTEGER*4 data_type

New data type. Specify one of the data types described in Section 4.5.

in: INTEGER*4 num_elements

Number of elements of the data type at each value. For character data types (CDF_CHAR and CDF_UCHAR), this is the number of characters in each string (an array of characters). A string exists at each value. For the non-character data types this must be one (1) - arrays of values are not allowed for non-character data types.

The required preselected objects/states are the current CDF and its current zVariable.

<PUT_,zVAR_DIMVARYS_>

Respecifies the dimension variances of the current zVariable (in the current CDF). A zVariable's dimension variances may not be changed if any values have been written (except for an explicit pad value - it may have been written). For 0-dimensional zVariables this operation is not applicable. Required arguments are as follows:

in: INTEGER*4 dim_varys(*)

New dimension variances. Each element of dim_varys specifies the corresponding dimension variance. For each dimension specify one of the variances described in Section 4.9.

The required preselected objects/states are the current CDF and its current zVariable.

<PUT_,zVAR_INITIALRECS_>

Specifies the number of records to initially write to the current zVariable (in the current CDF). The records are written beginning at record number 0 (zero). This may be specified only once per zVariable and before any other records have been written to that zVariable. If a pad value has not yet been specified, the default is used (see the Concepts chapter in the CDF User's Guide). If a pad value has been explicitly specified, that value is written to the records. The Concepts chapter in the CDF User's Guide describes initial records. Required arguments are as follows:

in: INTEGER*4 num_records

Number of records to write.

The required preselected objects/states are the current CDF and its current zVariable.

<PUT_,zVAR_HYPERDATA_>

Writes one or more values to the current zVariable (in the current CDF). The values are written based on the current record number, current record count, current record interval, current dimension indices, current dimension counts, and current dimension intervals for that zVariable (in the current CDF). Required arguments are as follows:

in: <type> buffer

Value. <type> is dependent on the data type of the zVariable. The value is written to the CDF from value.

WARNING: If the zVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the zVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF, its current zVariable, the current record number, record count, and record interval for the zVariable, and the current dimension indices, dimension counts, and dimension intervals for the zVariable.

<PUT_,zVAR_NAME_>

Renames the current zVariable (in the current CDF). A variable (rVariable or zVariable) with the same name must not already exist in the CDF. Required arguments are as follows:

in: CHARACTER var_name*(*)

New name of the zVariable. This may consist of at most CDF_VAR_NAME_LEN256 characters.

The required preselected objects/states are the current CDF and its current zVariable.

<PUT_,zVAR_PADVALUE_>

Specifies the pad value for the current zVariable (in the current CDF). A zVariable's pad value may be specified (or respecified) at any time without affecting already written values (including where pad values were used). The Concepts chapter in the CDF User's Guide describes variable pad values. Required arguments are as follows:

in: <type> value

Pad value. <type> is dependent on the data type of the zVariable. The value is written to the CDF from value.

WARNING: If the zVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the zVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF and its current zVariable.

<PUT_,zVAR_RECVARY_>

Respecifies the record variance of the current zVariable (in the current CDF). A zVariable's record variance may not be changed if any values have been written (except for an explicit pad value - it may have been written). Required arguments are as follows:

in: INTEGER*4 rec_vary

New record variance. Specify one of the variances described in Section 4.9.

The required preselected objects/states are the current CDF and its current zVariable.

<PUT_,zVAR_SEQDATA_>

Writes one value to the current zVariable (in the current CDF) at the current sequential value for that zVariable. After the write the current sequential value is automatically incremented to the next value (crossing a record

boundary if necessary). If the current sequential value is past the last record for the zVariable, the zVariable is extended as necessary. Required arguments are as follows:

in: <type> value

Value. <type> is dependent on the data type of the zVariable. The value is written to the CDF from value.

WARNING: If the zVariable has one of the character data types (CDF_CHAR or CDF_UCHAR), then value must be a CHARACTER Fortran variable. If the zVariable does not have one of the character data types, then value must NOT be a CHARACTER Fortran variable.

The required preselected objects/states are the current CDF, its current zVariable, and the current sequential value for the zVariable. Note that the current sequential value for a zVariable increments automatically as values are written.

<PUT_,zVAR_SPARSEARRAYS_>

Specifies the sparse arrays type/parameters for the current zVariable (in the current CDF). Required arguments are as follows:

in: INTEGER*4 s_arrays_type

The sparse arrays type. The types of sparse arrays are described in Section 4.11.

in: INTEGER*4 a_arrays_parms(*)

The sparse arrays parameters. The sparse arrays parameters are described in Section 4.11.

The required preselected objects/states are the current CDF and its current zVariable.

<PUT_,zVAR_SPARSERECORDS_>

Specifies the sparse records type for the current zVariable (in the current CDF). Required arguments are as follows:

in: INTEGER*4 s_records_type

The sparse records type. The types of sparse records are described in Section 4.11.

The required preselected objects/states are the current CDF and its current zVariable.

<PUT_,zVARs_RECDATA_>

Writes full-physical records to one or more zVariables (in the current CDF). The full-physical record for a particular zVariable is written at the current record number for that zVariable. (The record numbers do not have to be the same but in most cases probably will be.) This operation does not affect the current zVariable (in the current CDF). Required arguments are as follows:

in: INTEGER*4 num_vars

The number of zVariables to which to write. This must be at least one (1).

in: INTEGER*4 var_nums(*)

The zVariables to which to write. This array, whose size is determined by the value of num_vars, contains zVariable numbers. The zVariable numbers can be listed in any order.

in: <type> buffer

The buffer of full-physical zVariable records to be written. <type> must be a Fortran variable that will be passed by reference and cannot be of type CHARACTER. (The CDF library is expecting an address at which to get the full-physical records being written.) The order of the full-physical zVariable records in this buffer must agree with the zVariable numbers listed in varNums and this buffer must be contiguous --- there can be no spacing between full-physical zVariable records. Be careful if using Fortran STRUCTUREs to store multiple full-physical zVariable records. Fortran compilers on some operating systems will pad between the elements of a STRUCTURE in order to prevent memory alignment errors (i.e., the elements of a STRUCTURE may not be contiguous). See the Concepts chapter in the CDF User's Guide for more details on how to create this buffer.

The required preselected objects/states are the current CDF and the current record number for each of the zVariables specified. A convenience operation exists, <SELECT_,zVARs_RECNUMBER_>, that allows the current record number for each zVariable to be selected at one time (as opposed to selecting the current record numbers one at a time using <SELECT_,zVAR_RECNUMBER_>). [43]

<SELECT_,ATTR_>

Explicitly selects the current attribute (in the current CDF) by number. Required arguments are as follows:

in: INTEGER*4 attr_num

Attribute number.

The only required preselected object/state is the current CDF.

<SELECT_,ATTR_NAME_>

Explicitly selects the current attribute (in the current CDF) by name. **NOTE:** Selecting the current attribute by number (see <SELECT_,ATTR_>) is more efficient. Required arguments are as follows:

in: CHARACTER attr_name*(*)

Attribute name. This may be at most CDF_ATTR_NAME_LEN256 characters.

UNIX: For the proper operation of CDF_lib, attr_name MUST be a Fortran CHARACTER variable or constant.

The only required preselected object/state is the current CDF.

<SELECT_,CDF_>

Explicitly selects the current CDF. Required arguments are as follows:

in: INTEGER*4 id

Identifier of the CDF. This identifier must have been initialized by a successful <CREATE_,CDF_> or <OPEN ,CDF_> operation.

There are no required preselected objects/states.

<SELECT_,CDF_CACHESIZE_>

Selects the number of cache buffers to be used for the dotCDF file (for the current CDF). The Concepts chapter in the CDF User's Guide describes the caching scheme used by the CDF library. Required arguments are as follows:

in: INTEGER*4 num_buffers

[43] A Standard Interface at Section 5.18 provides the same functionality.

The number of cache buffers to be used.

The only required preselected object/state is the current CDF.

<SELECT_,CDF_DECODING_>
Selects a decoding (for the current CDF). Required arguments are as follows:

in: INTEGER*4 decoding

The decoding. Specify one of the decodings described in Section 4.7.

The only required preselected object/state is the current CDF.

<SELECT_,CDF_NEGtoPOSfp0_MODE_>
Selects a -0.0 to 0.0 mode (for the current CDF). Required arguments are as follows:

in: INTEGER*4 mode

The -0.0 to 0.0 mode. Specify one of the -0.0 to 0.0 modes described in Section 4.15.

The only required preselected object/state is the current CDF.

<SELECT_,CDF_READONLY_MODE_>
Selects a read-only mode (for the current CDF). Required arguments are as follows:

in: INTEGER*4 mode

The read-only mode. Specify one of the read-only modes described in Section 4.13.

The only required preselected object/state is the current CDF.

<SELECT_,CDF_SCRATCHDIR_>
Selects a directory to be used for scratch files (by the CDF library) for the current CDF. The Concepts chapter in the CDF User's Guide describes how the CDF library uses scratch files. This scratch directory will override the directory specified by the CDF$TMP logical name (on VMS systems) or CDF TMP environment variable (on UNIX and MS-DOS systems). Required arguments are as follows:

in: CHARACTER scratch_dir*(*)

The directory to be used for scratch files. The length of this directory specification is limited only by the operating system being used.

UNIX: For the proper operation of CDF_lib, scratch_dir MUST be a Fortran CHARACTER variable or constant.

The only required preselected object/state is the current CDF.

<SELECT_,CDF_STATUS_>
Selects the current status code. Required arguments are as follows:

in: INTEGER*4 status

CDF status code.

There are no required preselected objects/states.

<SELECT_,CDF_zMODE_>
Selects a zMode (for the current CDF). Required arguments are as follows:

in: INTEGER*4 mode

The zMode. Specify one of the zModes described in Section 4.14.

The only required preselected object/state is the current CDF.

<SELECT_,COMPRESS_CACHESIZE_>
Selects the number of cache buffers to be used for the compression scratch file (for the current CDF). The Concepts chapter in the CDF User's Guide describes the caching scheme used by the CDF library. Required arguments are as follows:

in: INTEGER*4 num_buffers

The number of cache buffers to be used.

The only required preselected object/state is the current CDF.

<SELECT_,gENTRY_>
Selects the current gEntry number for all gAttributes in the current CDF. Required arguments are as follows:

in: INTEGER*4 entry_num

gEntry number.

The only required preselected object/state is the current CDF.

<SELECT_,rENTRY_>
Selects the current rEntry number for all vAttributes in the current CDF. Required arguments are as follows:

in: INTEGER*4 entry_num

rEntry number.

The only required preselected object/state is the current CDF.

<SELECT_,rENTRY_NAME_>
Selects the current rEntry number for all vAttributes (in the current CDF) by rVariable name. The number of the named rVariable becomes the current rEntry number. (The current rVariable is not changed.) **NOTE:** Selecting the current rEntry by number (see <SELECT_,rENTRY_>) is more efficient. Required arguments are as follows:

in: CHARACTER var_name*(*)

rVariable name. This may be at most CDF_VAR_NAME_LEN256 characters.

UNIX: For the proper operation of CDF_lib, var_name MUST be a Fortran CHARACTER variable or constant.

The only required preselected object/state is the current CDF.

<SELECT_,rVAR_>
Explicitly selects the current rVariable (in the current CDF) by number. Required arguments are as follows:

in: INTEGER*4 var_num

rVariable number.

The only required preselected object/state is the current CDF.

<SELECT_,rVAR_CACHESIZE_>
Selects the number of cache buffers to be used for the current rVariable's file (of the current CDF). This operation is not applicable to a single-file CDF. The Concepts chapter in the CDF User's Guide describes the caching scheme used by the CDF library. Required arguments are as follows:

in: INTEGER*4 num_buffers

The number of cache buffers to be used.

The required preselected objects/states are the current CDF and its current rVariable.

<SELECT_,rVAR_NAME_>
Explicitly selects the current rVariable (in the current CDF) by name. **NOTE:** Selecting the current rVariable by number (see <SELECT_,rVAR_>) is more efficient. Required arguments are as follows:

in: CHARACTER var_name*(*)

rVariable name. This may be at most CDF_VAR_NAME_LEN256 characters.

UNIX: For the proper operation of CDF_lib, var_name MUST be a Fortran CHARACTER variable or constant.

The only required preselected object/state is the current CDF.

<SELECT_,rVAR_RESERVEPERCENT_>
Selects the reserve percentage to be used for the current rVariable (in the current CDF). This operation is only applicable to compressed rVariables. The Concepts chapter in the CDF User's Guide describes the reserve percentage scheme used by the CDF library. Required arguments are as follows:

in: INTEGER*4 percent

The reserve percentage.

The required preselected objects/states are the current CDF and its current rVariable.

<SELECT_,rVAR_SEQPOS_>
Selects the current sequential value for sequential access for the current rVariable (in the current CDF). Note that a current sequential value is maintained for each rVariable individually. Required arguments are as follows:

in: INTEGER*4 rec_num

Record number.

in: INTEGER*4 indices(*)

Dimension indices. Each element of indices specifies the corresponding dimension index. For 0-dimensional rVariables this argument is ignored (but must be present).

The required preselected objects/states are the current CDF and its current rVariable.

<SELECT_,rVARs_CACHESIZE_>

Selects the number of cache buffers to be used for all of the rVariable files (of the current CDF). This operation is not applicable to a single-file CDF. The Concepts chapter in the CDF User's Guide describes the caching scheme used by the CDF library. Required arguments are as follows:

in: INTEGER*4 num_buffers

The number of cache buffers to be used.

The only required preselected object/state is the current CDF.

<SELECT_,rVARs_DIMCOUNTS_>

Selects the current dimension counts for all rVariables in the current CDF. For 0-dimensional rVariables this operation is not applicable. Required arguments are as follows:

in: INTEGER*4 counts(*)

Dimension counts. Each element of counts specifies the corresponding dimension count.

The only required preselected object/state is the current CDF.

<SELECT_,rVARs_DIMINDICES_>

Selects the current dimension indices for all rVariables in the current CDF. For 0-dimensional rVariables this operation is not applicable. Required arguments are as follows:

in: INTEGER*4 indices(*)

Dimension indices. Each element of indices specifies the corresponding dimension index.

The only required preselected object/state is the current CDF.

<SELECT_,rVARs_DIMINTERVALS_>

Selects the current dimension intervals for all rVariables in the current CDF. For 0-dimensional rVariables this operation is not applicable. Required arguments are as follows:

in: INTEGER*4 intervals(*)

Dimension intervals. Each element of intervals specifies the corresponding dimension interval.

The only required preselected object/state is the current CDF.

<SELECT_,rVARs_RECCOUNT_>

Selects the current record count for all rVariables in the current CDF. Required arguments are as follows:

in: INTEGER*4 rec_count

Record count.

The only required preselected object/state is the current CDF.

<SELECT_,rVARs_RECINTERVAL_>

Selects the current record interval for all rVariables in the current CDF. Required arguments are as follows:

in: INTEGER*4 rec_interval

Record interval.

The only required preselected object/state is the current CDF.

<SELECT_,rVARs_RECNUMBER_>
Selects the current record number for all rVariables in the current CDF. Required arguments are as follows:

in: INTEGER*4 rec_num

Record number.

The only required preselected object/state is the current CDF.

<SELECT_,STAGE CACHESIZE_>
Selects the number of cache buffers to be used for the staging scratch file (for the current CDF). The Concepts chapter in the CDF User's Guide describes the caching scheme used by the CDF library. Required arguments are as follows:

in: INTEGER*4 num_buffers

The number of cache buffers to be used.

The only required preselected object/state is the current CDF.

<SELECT_,zENTRY_>
Selects the current zEntry number for all vAttributes in the current CDF. Required arguments are as follows:

in: INTEGER*4 entry_num

zEntry number.

The only required preselected object/state is the current CDF.

<SELECT_,zENTRY_NAME_>
Selects the current zEntry number for all vAttributes (in the current CDF) by zVariable name. The number of the named zVariable becomes the current zEntry number. (The current zVariable is not changed.) **NOTE:** Selecting the current zEntry by number (see <SELECT_,zENTRY_>) is more efficient. Required arguments are as follows:

in: CHARACTER var_name*(*)

zVariable name. This may be at most CDF_VAR_NAME_LEN256 characters.

UNIX: For the proper operation of CDF_lib, var_name MUST be a Fortran CHARACTER variable or constant.

The only required preselected object/state is the current CDF.

<SELECT_,zVAR_>
Explicitly selects the current zVariable (in the current CDF) by number. Required arguments are as follows:

in: INTEGER*4 var_num

zVariable number.

The only required preselected object/state is the current CDF.

<SELECT_,zVAR_CACHESIZE_>
Selects the number of cache buffers to be used for the current zVariable's file (of the current CDF). This operation is not applicable to a single-file CDF. The Concepts chapter in the CDF User's Guide describes the caching scheme used by the CDF library. Required arguments are as follows:

in: INTEGER*4 num_buffers

The number of cache buffers to be used.

The required preselected objects/states are the current CDF and its current zVariable.

<SELECT_,zVAR_DIMCOUNTS_>
Selects the current dimension counts for the current zVariable in the current CDF. For 0-dimensional zVariables this operation is not applicable. Required arguments are as follows:

in: INTEGER*4 counts(*)

Dimension counts. Each element of counts specifies the corresponding dimension count.

The required preselected objects/states are the current CDF and its current zVariable.

<SELECT_,zVAR_DIMINDICES_>
Selects the current dimension indices for the current zVariable in the current CDF. For 0-dimensional zVariables this operation is not applicable. Required arguments are as follows:

in: INTEGER*4 indices(*)

Dimension indices. Each element of indices specifies the corresponding dimension index.

The required preselected objects/states are the current CDF and its current zVariable.

<SELECT_,zVAR_DIMINTERVALS_>
Selects the current dimension intervals for the current zVariable in the current CDF. For 0-dimensional zVariables this operation is not applicable. Required arguments are as follows:

in: INTEGER*4 intervals(*)

Dimension intervals. Each element of intervals specifies the corresponding dimension interval.

The required preselected objects/states are the current CDF and its current zVariable.

<SELECT_,zVAR_NAME_>
Explicitly selects the current zVariable (in the current CDF) by name. **NOTE:** Selecting the current zVariable by number (see <SELECT_,zVAR_>) is more efficient. Required arguments are as follows:

in: CHARACTER var_name*(*)

zVariable name. This may be at most CDF_VAR_NAME_LEN256 characters.

UNIX: For the proper operation of CDF_lib, var_name MUST be a Fortran CHARACTER variable or constant.

The only required preselected object/state is the current CDF.

<SELECT_,zVAR_RECCOUNT_>

Selects the current record count for the current zVariable in the current CDF. Required arguments are as follows:

in: INTEGER*4 rec_count

Record count.

The required preselected objects/states are the current CDF and its current zVariable.

<SELECT_,zVAR_RECINTERVAL_>

Selects the current record interval for the current zVariable in the current CDF. Required arguments are as follows:

in: INTEGER*4 rec_interval

Record interval.

The required preselected objects/states are the current CDF and its current zVariable.

<SELECT_,zVAR_RECNUMBER_>

Selects the current record number for the current zVariable in the current CDF. Required arguments are as follows:

in: INTEGER*4 rec_num

Record number.

The required preselected objects/states are the current CDF and its current zVariable.

<SELECT_,zVAR_RESERVEPERCENT_>

Selects the reserve percentage to be used for the current zVariable (in the current CDF). This operation is only applicable to compressed zVariables. The Concepts chapter in the CDF User's Guide describes the reserve percentage scheme used by the CDF library. Required arguments are as follows:

in: INTEGER*4 percent

The reserve percentage.

The required preselected objects/states are the current CDF and its current zVariable.

<SELECT_,zVAR_SEQPOS_>

Selects the current sequential value for sequential access for the current zVariable (in the current CDF). Note that a current sequential value is maintained for each zVariable individually. Required arguments are as follows:

in: INTEGER*4 rec_num

Record number.

in: INTEGER*4 indices(*)

Dimension indices. Each element of indices specifies the corresponding dimension index. For 0-dimensional zVariables this argument is ignored (but must be present).

The required preselected objects/states are the current CDF and its current zVariable.

<SELECT_,zVARs_CACHESIZE_>

Selects the number of cache buffers to be used for all of the zVariable files (of the current CDF). This operation is not applicable to a single-file CDF. The Concepts chapter in the CDF User's Guide describes the caching scheme used by the CDF library. Required arguments are as follows:

in: INTEGER*4 num_buffers

The number of cache buffers to be used.

The only required preselected object/state is the current CDF.

<SELECT_,zVARs_RECNUMBER_>

Selects the current record number for each zVariable in the current CDF. This operation is provided to simplify the selection of the current record numbers for the zVariables involved in a multiple variable access operation (see the Concepts chapter in the CDF User's Guide). Required arguments are as follows:

in: INTEGER*4 rec_num

Record number.

The only required preselected object/state is the current CDF.

7.7 More Examples

Several more examples of the use of CDF_lib follow. in each example it is assumed that the current CDF has already been selected (either implicitly by creating/opening the CDF or explicitly with <SELECT_,CDF_>).

7.7.1 Creation

In this example an rVariable will be created with a pad value being specified; initial records will be written; and the rVariable's blocking factor will be specified. Note that the pad value was specified before the initial records. This results in the specified pad value being written. Had the pad value not been specified first, the initial records would have been written with the default pad value. It is assumed that the current CDF has already been selected.

```
.
.

INCLUDE '<path>cdf.inc'
.
.
INTEGER*4 status           ! Status returned from CDF library.
INTEGER*4 dim_varys(2)     ! Dimension variances.
INTEGER*4 var_num          ! rVariable number.
REAL*4 pad_value           ! Pad value.

DATA pad_value/-999.9/
.
.
dim_varys(1) = VARY
dim_varys(2) = VARY
status = CDF_lib (CREATE_, rVAR_, 'HUMIDITY', CDF_REAL4, 1, VARY,
1                                 dim_varys, var_num,
```

```
2                 PUT_, rVAR_PADVALUE_, pad_value,
3                       rVAR_INITIALRECS_, 500,
4                       rVAR_BLOCKINGFACTOR_, 50,
5                 NULL_, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

7.7.2 zVariable Creation (Character Data Type)

In this example a zVariable with a character data type will be created with a pad value being specified. It is assumed that the current CDF has already been selected.

```
.
.
INCLUDE '<path>CDF.INC'
.
.
INTEGER*4 status           ! Status returned from CDF library.
INTEGER*4 dim_varys(1)     ! Dimension variances.
INTEGER*4 var_num          ! zVariable number.
INTEGER*4 num_dims         ! Number of dimension.
INTEGER*4 dim_sizes(1)     ! Dimension sizes.
INTEGER*4 num_elems        ! Number of elements (of the data type).
CHARACTER*10 pad_value     ! Pad value.

DATA pad_value/'**********'/,
0    num_dims/1/,
1    dim_sizes/20/,
2    num_elems/10/
.
.
dim_varys(1) = VARY
status = CDF_lib (CREATE_, zVAR_, 'Station', CDF_CHAR, num_elems, num_dims,
1                                 dim_sizes, NOVARY, dim_varys, var_num,
2                 PUT_, zVAR_PADVALUE_, pad_value,
3                 NULL_, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

7.7.3 Hyper Read with Subsampling

In this example an rVariable will be subsampled in a CDF whose rVariables are 2-dimensional and have dimension sizes [100,200]. The CDF is column major, and the data type of the rVariable is CDF_UINT2. It is assumed that the current CDF has already been selected.

```
.
.
INCLUDE '<path>CDF.INC'
.
```

```
.
INTEGER*4 status                ! Status returned from CDF library.
INTEGER*2 values(50,100)        ! Buffer to receive values.
INTEGER*4 rec_count             ! Record count, one record per hyper get.
INTEGER*4 rec_interval          ! Record interval, set to one to indicate
                                ! contiguous records (really meaningless
                                ! since record count is one).
INTEGER*4 indices(2)            ! Dimension indices, start each read
                                ! at 1,1 of the array.
INTEGER*4 counts(2)             ! Dimension counts, half of the values along
                                ! each dimension will be read.
INTEGER*4 intervals(2)          ! Dimension intervals, every other value
                                ! along each dimension will be read.
INTEGER*4 rec_num               ! Record number.
INTEGER*4 max_rec               ! Maximum rVariable record in the
                                ! CDF - this was determined with a call
                                ! to CDF_inquire.

DATA rec_count/1/, rec_interval/1/, indices/1,1/, counts/50,100/,
1    intervals/2,2/
.
.
status = CDF_lib (SELECT_, rVAR_NAME_, 'BRIGHTNESS',
1                          rVARs_RECCOUNT_, rec_count,
2                          rVARs_RECINTERVAL_, rec_interval,
3                          rVARs_DIMINDICES_, indices,
4                          rVARs_DIMCOUNTS_, counts,
5                          rVARs_DIMINTERVALS_, intervals,
6                  NULL_, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)

DO rec_num = 1, max_rec
   status = CDF_lib (SELECT_, rVARs_RECNUMBER_, rec_num,
   1                  GET_, rVAR_HYPERDATA_, values,
   2                  NULL_, status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
       .
       .
       ! process values
       .
       .
END DO
.
.
```

7.7.4 Attribute Renaming

In this example the attribute named Tmp will be renamed to TMP. It is assumed that the current CDF has already been selected.

```
.
.
INCLUDE '<path>CDF.INC'
.
```

```
.
INTEGER*4 status     ! Status returned from CDF library.
.
.
status = CDF_lib (SELECT_, ATTR_NAME_, 'Tmp',
1                 PUT_, ATTR_NAME, 'TMP',
2                 NULL_, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
```

7.7.5 Sequential Access

In this example the values for a zVariable will be averaged. The values will be read using the sequential access method (see the Concepts chapter in the CDF User's Guide). Each value in each record will be read and averaged. It is assumed that the data type of the zVariable has been determined to be CDF_REAL4. It is assumed that the current CDF has already been selected.

```
.
.
INCLUDE '<path>CDF.INC'
.
.
INTEGER*4 status           ! Status returned from CDF library.
INTEGER*4 var_num          ! zVariable number.
INTEGER*4 rec_num          ! Record number, start at first record.
INTEGER*4 indices(2)       ! Dimension indices.
REAL*4    value            ! Value read.
REAL*8    sum              ! Sum of all values.
INTEGER*4 count            ! Number of values.
REAL*4    ave              ! Average value.

DATA indices/1,1/, sum/0.0/, count/0/, rec_num/1/
.
.
status = CDF_lib (GET_, zVAR_NUMBER_, 'FLUX', var_num,
1                 NULL_, status)
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)

status = CDF_lib (SELECT_, zVAR_, var_num,
1                          zVAR_SEQPOS_, rec_num, indices,
2                 GET_, zVAR_SEQDATA_, value,
3                 NULL_, status)

DO WHILE (status .GE. CDF_OK)
   sum = sum + value
   count = count + 1
   status = CDF_lib (GET_, zVAR_SEQDATA_, value,
   1                 NULL_, status)
END DO

IF (status .NE. END_OF_VAR) CALL UserStatusHandler (status)
```

```
   ave = sum / count

.
.
```

7.7.6 Attribute rEntry Writes

In this example a set of attribute rEntries for a particular rVariable will be written. It is assumed that the current CDF has already been selected.

```
   .
   .
   INCLUDE '<path>CDF.INC'
   .
   .
   INTEGER*4 status           ! Status returned from CDF library.
   REAL*4    scale(2)         ! Scale, minimum/maximum.

   DATA scale/-90.0,90.0/
   .
   .
   status = CDF_lib (SELECT_, rENTRY_NAME_, 'LATITUDE',
   1                          ATTR_NAME_, 'FIELDNAM',
   2                 PUT_, rENTRY_DATA_, CDF_CHAR, 20, 'Latitude',
   3                 SELECT_, ATTR_NAME_, 'SCALE',
   4                 PUT_, rENTRY_DATA_, CDF_REAL4, 2, scale,
   5                 SELECT_, ATTR_NAME_, 'UNITS',
   6                 PUT_, rENTRY_DATA_, CDF_CHAR, 20, 'Degrees north',
   7                 NULL_, status)
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
   .
   .
```

7.7.7 Multiple zVariable Write

In this example full-physical records will be written to the zVariables in a CDF. Note the ordering of the zVariables (see the Concepts chapter in the CDF User's Guide). It is assumed that the current CDF has already been selected.

```
   .
   .
   INCLUDE '<path>CDF.INC'
   .
   .
   INTEGER*4 status           ! Status returned from CDF library.
   INTEGER*2 time             ! `Time' value.
   BYTE      vector_a(3)      ! `vectorA' values.
   REAL*8    vector_b(5)      ! `vectorB' values.
   INTEGER*4 rec_number       ! Record number.
   BYTE      buffer(45)       ! Buffer of full-physical records.
   INTEGER*4 var_numbers(3)   ! Variable numbers.
```

```
EQUIVALENCE (vector_b, buffer(1))
EQUIVALENCE (time, buffer(41))
EQUIVALENCE (vector_a, buffer(43))
.
.
status = CDF_lib (GET_, zVAR_NUMBER_, 'vectorB', var_numbers(1),

1                       zVAR_NUMBER_, 'time', var_numbers(2),
2                       zVAR_NUMBER_, 'vectorA', var_numbers(3),
3                  NULL_, status);
IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
.
.
DO rec_number = 1, 100
   .
   /* read values from input file */
   .
   status = CDF_lib (SELECT_, zVARs_RECNUMBER_, rec_number,
   1                  PUT_, zVARs_RECDATA_, 3L, var_numbers, buffer,
   2                  NULL_, status);
   IF (status .NE. CDF_OK) CALL UserStatusHandler (status)
END DO
.
.
```

Chapter 8

8 Interpreting CDF Status Codes

Most CDF functions return a status code of type INTEGER*4. The symbolic names for these codes are defined in cdf.inc and should be used in your applications rather than using the true numeric values. Appendix A explains each status code. When the status code returned from a CDF function is tested, the following rules apply.

status > CDF_OK	Indicates successful completion but some additional information is provided. These are informational codes.
status = CDF_OK	Indicates successful completion.
CDF_WARN < status < CDF_OK	Indicates that the function completed but probably not as expected. These are warning codes.
status < CDF_WARN	Indicates that the function did not complete. These are error codes.

The following example shows how you could check the status code returned from CDF functions.

```
INTEGER*4 status
.
.
CALL CDF_function (..., status)        ! any CDF function returning status
IF (status .NE. CDF_OK) THEN
    CALL UserStatusHandler (status, ...)
   .
   .
END IF
```

In your own status handler you can take whatever action is appropriate to the application. An example status handler follows. Note that no action is taken in the status handler if the status is CDF_OK.

```
INCLUDE '<path>cdf.inc'

SUBROUTINE UserStatusHandler (status)
INTEGER*4 status
```

```
   CHARACTER message*(CDF_STATUSTEXT_LEN)

   IF (status .LT. CDF_WARN) THEN
       WRITE (6,10)
10     FORMAT (' ','An error has occurred, halting...')
       CALL CDF_error (status, message)
       WRITE (6,11) message
11     FORMAT (' ',A)
       STOP
   ELSE
       IF (status .LT. CDF_OK) THEN
          WRITE (6,12)
12        FORMAT (' ','Warning, function may not have completed as expected...')
          CALL CDF_error (status, message)
          WRITE (6,13) message
13        FORMAT (' ',A)
       ELSE
          IF (status .GT. CDF_OK) THEN
              WRITE (6,14)
14            FORMAT (' ','Function completed successfully, but be advised that...')
              CALL CDF_error (status, message)
              WRITE (6,15) message
15            FORMAT (' ',A)
          END IF
       END IF
   END IF

   RETURN
   END
```

Explanations for all CDF status codes are available to your applications through the function CDF_error. CDF_error encodes in a text string an explanation of a given status code.

Chapter 9

9 EPOCH Utility Routines

Several subroutines exist that compute, decompose, parse, and encode CDF_EPOCH and CDF_EPOCH16 values. These functions may be called by applications using the CDF_EPOCH and CDF_EPOCH16 data types and are included in the CDF library. Function prototypes for these functions may be found in the include file cdf.h. The Concepts chapter in the CDF User's Guide describes EPOCH values. The date/time components for CDF_EPOCH and CDF_EPOCH16 are **UTC-based**, without leap seconds.

The CDF_EPOCH and CDF_EPOCH16 data types are used to store time values referenced from a particular epoch. For CDF that epoch values for CDF_EPOCH and CDF_EPOCH16 are milliseconds from 01-Jan-0000 00:00:00.000 and pico-seconds from 01-Jan-0000 00:00:00.000.000.000.000, respectively.

9.1 compute_EPOCH

compute_EPOCH calculates a CDF_EPOCH value given the individual components. If an illegal component is detected, the value returned will be ILLEGAL_EPOCH_VALUE.

```
SUBROUTINE  compute_EPOCH (
INTEGER*4  year,                ! in  --  Year  (AD,  e.g.,  1994).
INTEGER*4  month,               ! in  --  Month.
INTEGER*4  day,                 ! in  --  Day.
INTEGER*4  hour,                ! in  --  Hour.
INTEGER*4  minute,              ! in  --  Minute.
INTEGER*4  second,              ! in  --  Second.
INTEGER*4  msec,                ! in  --  Millisecond.
REAL*8      epoch)              ! out--  CDF_EPOCH value
```

NOTE: Previously, fields for month, day, hour, minute, second and msec should have a valid ranges, mainly 1-12 for month, 1-31 for day, 0-23 for hour, 0-59 for minute and second, and 0-999 for msec. However, there are two variations on how computeEPOCH can be used. The month argument is allowed to be 0 (zero), in which case, the day argument is assumed to be the day of the year (DOY) having a range of 1 through 366. Also, if the hour, minute, and second arguments are all 0s (zero), then the msec argument is assumed to be the millisecond of the day, having a range of 0 through 86400000. The modified computeEPOCH, since the CDF V3.3.1, allows month, day, hour minute, second and msec to be any values, even negative ones, without range checking as long as the comulative date is after 0AD. Any cumulative date before 0AD will cause this function to return ILLEGAL_EPOCH_VALUE (–1.0) By not checking the

range of dta fields, the epoch will be computed from any given values for month, day, hour, etc. For example, the epoch can be computed by passing a Unix-time (seconds from 1970-1-1) in a set of arguments of "1970, 1, 1, 0, 0, unix-time, 0". While the second field is allowed to have a value of 60 (or greater), the CDF epoch still does not support of leap second. An input of 60 for the second field will automatically be interpreted as 0 (zero) second in the following minute. If the month field is 0, the day field is still considered as DOY. If the day field is 0, the date will fall back to the last day of the previous month, e.g., a date of 2010-2-0 becoming 2010-1-31. The following table shows how the year, month and day components of the epoch will be interpreted by the following EPOCHbreakdown function when the month and/or day field is passed in with 0 or negative value to computeEPOCH function.

Year	Month	Day		Year	Month	Day	
2010	0	0	➔	2009	12	31	Last day of the previous year
2010	-1	0	➔	2009	11	30	Last day of November of the previous year
2010	0	1	➔	2010	1	1	First day of the year
2010	1	0	➔	2009	12	31	Last day of the previous year
2010	0	-1	➔	2009	12	30	Two days before January 1st of current year
2010	-1	-1	➔	2009	11	29	Two months and two days before January 1st of current year

Input Year/Month/Day **Interpreted Year/Month/Day**

9.2 EPOCH_breakdown

EPOCH_breakdown decomposes a CDF_EPOCH value into the individual components.

```
SUBROUTINE  EPOCH_breakdown (
REAL*8       epoch,          ! in  -- The CDF_EPOCH value.
INTEGER*4  year,             ! out -- Year (AD, e.g., 1994).
INTEGER*4  month,            ! out -- Month (1-12).
INTEGER*4  day,              ! out -- Day (1-31).
INTEGER*4  hour,             ! out -- Hour (0-23).
INTEGER*4  minute,           ! out -- Minute (0-59).
INTEGER*4  second,           ! out -- Second (0-59).
INTEGER*4  msec)             ! out -- Millisecond (0-999).
```

9.3 toencode_EPOCH

toencode_EPOCH encodes a CDF_EPOCH value into the standard date/time character string, based on the passed style. The fomats of the string are:

- **Style 0**: **dd-mmm-yyyy hh:mm:ss.ccc** where dd is the day of the month (1-31), mmm is the month (Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, or Dec), yyyy is the year, hh is the hour (0-23), mm is the minute (0-59), ss is the second (0-59), and ccc is the millisecond (0-999).
- **Style 1**: **yyyymmdd.tttttt** where yyyy is the year, mm is the month (1-12), dd is the day of the month (1-31), and tttttt is the fraction of the day (e.g., 5000000 is 12 o'clock noon).
- **Style 2**: **yyyymmddhhmmss** where yyyy is the year, mm is the month (01-12), dd is the day of the month (1-31), hh is the hour (0-23), mm is the minute (0-59), and ss is the second (0-59).

- **Style 3**: **yyyy-mm-ddThh:mm:ss.cccZ** where yyyy is the year, mm is the month (01-12), dd is the day of the month (1-31), hh is the hour (0-23), mm is the minute (0-59), ss is the second (0-59), and ccc is the millisecond (0-999).
- **Style 4**[44]: **yyyy-mm-ddThh:mm:ss.ccc** where yyyy is the year, mm is the month (01-12), dd is the day of the month (1-31), hh is the hour (0-23), mm is the minute (0-59), ss is the second (0-59), and ccc is the millisecond (0-999).

```
SUBROUTINE  toencode_EPOCH (
REAL*8          epoch,                              ! in   -- The CDF_EPOCH  value.
INTEGER*4             style,                        ! in   -- The encoded string style.
CHARACTER  epString*(EPOCH_STRING_LEN)              ! out  -- The standard  date/time character string.
```

EPOCH_STRING_LEN, the maximum of the possible string, is defined in cdf.inc.

9.4 encode_EPOCH

encode_EPOCH encodes a CDF_EPOCH value into the standard date/time character string. The format of the string is **dd-mmm-yyyy hh:mm:ss.ccc** where dd is the day of the month (1-31), mmm is the month (Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, or Dec), yyyy is the year, hh is the hour (0-23), mm is the minute (0-59), ss is the second (0-59), and ccc is the millisecond (0-999).

```
SUBROUTINE  encode_EPOCH (

REAL*8          epoch,                              ! in   -- The CDF_EPOCH  value.
CHARACTER  epString*(EPOCH_STRING_LEN))             ! out  -- The standard  date/time character string.
```

EPOCH_STRING_LEN is defined in cdf.inc.

9.5 encode_EPOCH1

encode_EPOCH1 encodes a CDF_EPOCH value into an alternate date/time character string. The format of the string is yyyymmdd.tttttt, where yyyy is the year, mm is the month (1-12), dd is the day of the month (1-31), and tttttt is the fraction of the day (e.g., 5000000 is 12 o'clock noon).

```
SUBROUTINE  encode_EPOCH1(

REAL*8          epoch,                               ! in   -- The CDF_EPOCH  value.
CHARACTER  epString*(EPOCH1_STRING_LEN))             ! out  -- The alternate date/time character string.
```

EPOCH1_STRING_LEN is defined in cdf.inc.

[44] If the style is invalid (not in 0-4 range), then style 4 is the default.

9.6 encode_EPOCH2

encode_EPOCH2 encodes a CDF_EPOCH value into an alternate date/time character string. The format of the string is yyyymoddhhmmss where yyyy is the year, mo is the month (1-12), dd is the day of the month (1-31), hh is the hour (0-23), mm is the minute (0-59), and ss is the second (0-59).

```
SUBROUTINE  encode_EPOCH2 (

REAL*8          epoch,                                  ! in  -- The CDF_EPOCH  value.
CHARACTER  epString*(EPOCH2_STRING_LEN))    ! out -- The alternate  date/time character string.
```

EPOCH2_STRING_LEN is defined in cdf.inc.

9.7 encode_EPOCH3

encode_EPOCH3 encodes a CDF_EPOCH value into an alternate date/time character string. The format of the string is yyyy-mo-ddThh:mm:ss.cccZ where yyyy is the year, mo is the month (1-12), dd is the day of the month (1-31), hh is the hour (0-23), mm is the minute (0-59), ss is the second (0-59), and ccc is the millisecond (0-999).

```
SUBROUTINE  encode_EPOCH3 (

REAL*8          epoch,                                  ! in  -- The CDF_EPOCH  value.
CHARACTER  epString*(EPOCH3_STRING_LEN))    ! out -- The alternate  date/time character string.
```

EPOCH3_STRING_LEN is defined in cdf.inc.

9.8 encode_EPOCH4

encode_EPOCH4 encodes a CDF_EPOCH value into an alternate, ISO 8601 date/time character string. The format of the string is yyyy-mo-ddThh:mm:ss.ccc where yyyy is the year, mo is the month (1-12), dd is the day of the month (1-31), hh is the hour (0-23), mm is the minute (0-59), ss is the second (0-59), and ccc is the millisecond (0-999).

```
SUBROUTINE  encode_EPOCH4 (

REAL*8          epoch,                                  ! in  -- The CDF_EPOCH  value.
CHARACTER  epString*(EPOCH4_STRING_LEN))    ! out -- The ISO 8601  date/time character string.
```

EPOCH4_STRING_LEN is defined in cdf.inc.

9.9 encode_EPOCHx

encode_EPOCHx encodes a CDF_EPOCH value into a custom date/time character string. The format of the encoded string is specified by a format string.

```
SUBROUTINE  encode_EPOCHx (

REAL*8  epoch,                                  ! in   -- The CDF_EPOCH  value.
CHARACTER format*(EPOCHx_FORMAT_MAX),           ! in   -- The format string.
CHARACTER encoded*(EPOCHx_STRING_MAX))          ! out  -- The custom  date/time character string.
```

The format string consists of EPOCH components which are encoded and text which is simply copied to the encoded custom string. Components are enclosed in angle brackets and consist of a component token and an optional width. The syntax of a component is: <token[.width]>. If the optional width contains a leading zero, then the component will be encoded with leading zeroes (rather than leading blanks).

The supported component tokens and their default widths are as follows. . .

Token	Meaning	Default
dom	Day of month (1-31)	<dom.0>
doy	Day of year (001-366)	<doy.03>
month	Month (`Jan',`Feb',...,`Dec')	<month>
mm	Month (1,2,...,12)	<mm.0>
year	Year (4-digit)	<year.04>
yr	Year (2-digit)	<yr.02>
hour	Hour (00-23)	<hour.02>
min	Minute (00-59)	<min.02>
sec	Second (00-59)	<sec.02>
fos	Fraction of second.	<fos.3>
fod	Fraction of day.	<fod.8>

Note that a width of zero indicates that as many digits as necessary should be used to encoded the component. The <month> component is always encoded with three characters. The <fos> and <fod> components are always encoded with leading zeroes.

If a left angle bracket is desired in the encoded string, then simply specify two left angle brackets (<<) in the format string (character stuffing).

For example, the format string used to encode the standard EPOCH date/time character string (see Section 9.3) would be. . .

```
<dom.02>-<month>-<year>  <hour>:<min>:<sec>.<fos>
```

EPOCHx_FORMAT_LEN and EPOCHx_STRING_MAX are defined in cdf.inc.

9.10 toparse_EPOCH

toparse_EPOCH parses a standard date/time character string and returns a CDF_EPOCH value. The format of the string can be one of valid styles used by the encoding functions described in Section 9.3-9.8. If an illegal field is detected in the string the value returned will be ILLEGAL_EPOCH_VALUE.

```
SUBROUTINE  parse_EPOCH (
CHARACTER  epString*(EPOCH_STRING_LEN),         ! in  -- The standard date/time character string.
REAL*8         epoch)                           ! out -- CDF_EPOCH value
```

EPOCH_STRING_LEN is defined in cdf.inc.

9.11 parse_EPOCH

parse_EPOCH parses a standard date/time character string and returns a CDF_EPOCH value. The format of the string is that produced by the encode_EPOCH function described in Section 9.3. If an illegal field is detected in the string the value returned will be ILLEGAL_EPOCH_VALUE.

```
SUBROUTINE  parse_EPOCH (
CHARACTER  epString*(EPOCH_STRING_LEN),        ! in  --  The standard date/time character string.
REAL*8          epoch)                         ! out -- CDF_EPOCH value
```

EPOCH_STRING_LEN is defined in cdf.inc.

9.12 parse_EPOCH1

parse_EPOCH1 parses an alternate date/time character string and returns a CDF_EPOCH value. The format of the string is that produced by the encode_EPOCH1 function described in Section 9.5. If an illegal field is detected in the string the value returned will be ILLEGAL_EPOCH_VALUE.

```
SUBROUTINE  parse_EPOCH1 (
CHARACTER  epString*(EPOCH1_STRING_LEN),       ! in  --  The alternate date/time character string.
REAL*8          epoch)                         ! out -- CDF_EPOCH value
```

EPOCH1_STRING_LEN is defined in cdf.inc.

9.13 parse_EPOCH2

parse_EPOCH2 parses an alternate date/time character string and returns a CDF_EPOCH value. The format of the string is that produced by the encode_EPOCH2 function described in Section 9.6. If an illegal field is detected in the string the value returned will be ILLEGAL_EPOCH_VALUE.

```
SUBROUTINE  parse_EPOCH2 (
CHARACTER  epString*(EPOCH2_STRING_LEN),       ! in  --  The alternate date/time character string.
REAL*8          epoch)                         ! out -- CDF_EPOCH value
```

EPOCH2_STRING_LEN is defined in cdf.inc.

9.14 parse_EPOCH3

parse_EPOCH3 parses an alternate date/time character string and returns a CDF_EPOCH value. The format of the string is that produced by the encode_EPOCH3 function described in Section 9.7. If an illegal field is detected in the string the value returned will be ILLEGAL_EPOCH_VALUE.

```
SUBROUTINE  parse_EPOCH3 (
```

```
CHARACTER  epString*(EPOCH3_STRING_LEN),        ! in  --  The alternate date/time character string.
REAL*8     epoch)                               ! out -- CDF_EPOCH value
```

EPOCH3_STRING_LEN is defined in cdf.inc.

9.15 parse_EPOCH4

parse_EPOCH4 parses an alternate, ISO 8601 date/time character string and returns a CDF_EPOCH value. The format of the string is that produced by the encode_EPOCH3 function described in Section 9.8. If an illegal field is detected in the string the value returned will be ILLEGAL_EPOCH_VALUE.

```
SUBROUTINE  parse_EPOCH4 (
CHARACTER  epString*(EPOCH4_STRING_LEN),        ! in  --  The ISO 8601 date/time string.
REAL*8     epoch)                               ! out -- CDF_EPOCH value
```

EPOCH4_STRING_LEN is defined in cdf.inc.

9.16 compute_EPOCH16

compute_EPOCH16 calculates a CDF_EPOCH16 value given the individual components. If An illegal component is detected, the value returned will be ILLEGAL_EPOCH_VALUE.

```
SUBROUTINE  compute_EPOCH16 (
INTEGER*4  year,                    ! in  --  Year  (AD,  e.g.,  1994).
INTEGER*4  month,                   ! in  --  Month.
INTEGER*4  day,                     ! in  --  Day.
INTEGER*4  hour,                    ! in  --  Hour.
INTEGER*4  minute,                  ! in  --  Minute.
INTEGER*4  second,                  ! in  --  Second.
INTEGER*4  msec,                    ! in  --  Millisecond.
INTEGER*4  usec,                    ! in  --  Microsecond.
INTEGER*4  nsec,                    ! in  --  Nanosecond.
INTEGER*4  psec,                    ! in  --  Picosecond.
REAL*8     epoch(2))                ! out--  CDF_EPOCH16 value
```

Similar to computeEPOCH, this function no longer performs range checks for each individual componenet as long as the cumulative date is after 0AD.

9.17 EPOCH16_breakdown

EPOCH16_breakdown decomposes a CDF_EPOCH16 value into the individual components.

```
SUBROUTINE  EPOCH_breakdown (
REAL*8     epoch(2),                ! in   --  The CDF_EPOCH16 value.
```

```
INTEGER*4  year,                ! out -- Year (AD, e.g., 1994).
INTEGER*4  month,               ! out -- Month (1-12).
INTEGER*4  day,                 ! out -- Day (1-31).
INTEGER*4  hour,                ! out -- Hour (0-23).
INTEGER*4  minute,              ! out -- Minute (0-59).
INTEGER*4  second,              ! out -- Second (0-59).
INTEGER*4  msec,                ! out -- Millisecond (0-999).
INTEGER*4  usec,                ! out -- Microsecond (0-999).
INTEGER*4  nsec,                ! out -- Nanosecond (0-999).
INTEGER*4  psec)                ! out -- Picosecond (0-999).
```

9.18 toencode_EPOCH16

toencode_EPOCH16 encodes a CDF_EPOCH16 value into the standard date/time character string, based on the passed style. The fomats of the string are:

- **Style 0**: **dd-mmm-yyyy hh:mm:ss.mmm.uuu.nnn.ppp** where dd is the day of the month (1-31), mmm is the month (Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, or Dec), yyyy is the year, hh is the hour (0-23), mm is the minute (0-59), ss is the second (0-59), and mmm is the millisecond (0-999), uuu is the microsecond (0-999), nnn is the nanosecond (0-999), and ppp is the picosecond (0-999).
- **Style 1**: **yyyymmdd.tttttttttttttt** where yyyy is the year, mm is the month (1-12), dd is the day of the month (1-31), and ttttttttttttt is the fraction of the day (e.g., 5000000 is 12 o'clock noon).
- **Style 2**: **yyyymmddhhmmss** where yyyy is the year, mm is the month (01-12), dd is the day of the month (1-31), hh is the hour (0-23), mm is the minute (0-59), and ss is the second (0-59).
- **Style 3**: **yyyy-mm-ddThh:mm:ss.mmm.uuu.nnn.pppZ** where yyyy is the year, mm is the month (01-12), dd is the day of the month (1-31), hh is the hour (0-23), mm is the minute (0-59), ss is the second (0-59), and mmm is the millisecond (0-999), uuu is the microsecond (0-999), nnn is the nanosecond (0-999), and ppp is the picosecond (0-999).
- **Style 4**[45]: **yyyy-mm-ddThh:mm:ss.mmmuuunnnppp** where yyyy is the year, mm is the month (01-12), dd is the day of the month (1-31), hh is the hour (0-23), mm is the minute (0-59), ss is the second (0-59), and mmm is the millisecond (0-999), uuu is the microsecond (0-999), nnn is the nanosecond (0-999), and ppp is the picosecond (0-999).

```
SUBROUTINE toencode_EPOCH16(
    REAL*8  epoch(2);                                  /* in -- The CDF_EPOCH16 value. */
    INTEGER*4    style;                                /* in -- The string style. */
    CHARACTER  epString(EPOCH16_STRING_LEN+1);         /* out -- The date/time character string. */
```

EPOCH16_STRING_LEN (happens to be the largest string length among all styles) is defined in cdf.h.

9.19 encode_EPOCH16

encode_EPOCH16 encodes a CDF_EPOCH16 value into the standard date/time character string. The format of the string is **dd-mmm-yyyy hh:mm:ss.ccc.uuu.nnn.ppp** where dd is the day of the month (1-31), mmm is the month (Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, or Dec), yyyy is the year, hh is the hour (0-23), mm is the minute (0-59), ss is the second (0-59), ccc is the millisecond (0-999), uuu is the microsecond (0-999), nnn is the nanosecond (0-999), and ppp is the picosecond (0-999).

```
SUBROUTINE  encode_EPOCH16 (
REAL*8         epoch(2),                           ! in   -- The CDF_EPOCH16  value.
```

[45] If the style is invalid (not in 0-4 range), then style 4 is the default.

```
CHARACTER  epString*(EPOCH16_STRING_LEN))          ! out --  The standard  date/time string.
```

EPOCH16_STRING_LEN is defined in cdf.inc.

9.20 encode_EPOCH16_1

encode_EPOCH16_1 encodes a CDF_EPOCH16 value into an alternate date/time character string. The format of the string is yyyymmdd.tttttttttttttt, where yyyy is the year, mm is the month (1-12), dd is the day of the month (1-31), and tttttttttttttt is the fraction of the day (e.g., 500000000000000 is 12 o'clock noon).

```
SUBROUTINE  encode_EPOCH16_1(
REAL*8         epoch(2),                                  ! in   --  The CDF_EPOCH16  value.
CHARACTER  epString*(EPOCH16_1_STRING_LEN))               ! out  --  The date/time string.
```

EPOCH16_1_STRING_LEN is defined in cdf.inc.

9.21 encode_EPOCH16_2

encode_EPOCH16_2 encodes a CDF_EPOCH16 value into an alternate date/time character string. The format of the string is yyyymoddhhmmss where yyyy is the year, mo is the month (1-12), dd is the day of the month (1-31), hh is the hour (0-23), mm is the minute (0-59), and ss is the second (0-59).

```
SUBROUTINE  encode_EPOCH16_2 (
REAL*8         epoch(2),                                  ! in   --  The CDF_EPOCH16  value.
CHARACTER  epString*(EPOCH16_2_STRING_LEN))               ! out  --  The date/time string.
```

EPOCH16_2_STRING_LEN is defined in cdf.inc.

9.22 encode_EPOCH16_3

encode_EPOCH16_3 encodes a CDF_EPOCH16 value into an alternate date/time character string. The format of the string is yyyy-mo-ddThh:mm:ss.ccc.uuu.nnn.pppZ where yyyy is the year, mo is the month (1-12), dd is the day of the month (1-31), hh is the hour (0-23), mm is the minute (0-59), ss is the second (0-59), ccc is the millisecond (0-999), uuu is the microsecond (0-999), nnn is the nanosecond (0-999), and ppp is the picosecond (0-999).

```
SUBROUTINE  encode_EPOCH16_3 (
REAL*8         epoch(2),                                  ! in   --  The CDF_EPOCH16  value.
CHARACTER  epString*(EPOCH16_3_STRING_LEN))               ! out  --  The date/time string.
```

EPOCH16_3_STRING_LEN is defined in cdf.inc.

9.23 encode_EPOCH16_4

encode_EPOCH16_4 encodes a CDF_EPOCH16 value into an alternate, ISO 8601 date/time character string. The format of the string is yyyy-mo-ddThh:mm:ss.cccuuunnnppp where yyyy is the year, mo is the month (1-12), dd is the day of the month (1-31), hh is the hour (0-23), mm is the minute (0-59), ss is the second (0-59), ccc is the millisecond (0-999), uuu is the microsecond (0-999), nnn is the nanosecond (0-999), and ppp is the picosecond (0-999).

```
SUBROUTINE  encode_EPOCH16_4 (
REAL*8          epoch(2),                                   ! in  -- The CDF_EPOCH16  value.
CHARACTER  epString*(EPOCH16_4_STRING_LEN))                 ! out -- The ISO 8601 date/time string.
```

EPOCH16_4_STRING_LEN is defined in cdf.inc.

9.24 encode_EPOCH16_x

encode_EPOCH16_x encodes a CDF_EPOCH16 value into a custom date/time character string. The format of the encoded string is specified by a format string.

```
SUBROUTINE  encode_EPOCH16_x (
REAL*8  epoch(2);                                   ! in  -- The CDF_EPOCH16  value.
CHARACTER format*(EPOCHx_FORMAT_MAX)                ! in  -- The format string.
CHARACTER encoded*(EPOCHx_STRING_MAX))              ! out -- The custom  date/time character string.
```

The format string consists of EPOCH components which are encoded and text which is simply copied to the encoded custom string. Components are enclosed in angle brackets and consist of a component token and an optional width. The syntax of a component is: <token[.width]>. If the optional width contains a leading zero, then the component will be encoded with leading zeroes (rather than leading blanks).

The supported component tokens and their default widths are as follows.

Token	Meaning	Default
dom	Day of month (1-31)	<dom.0>
doy	Day of year (001-366)	<doy.03>
month	Month (`Jan',`Feb',...,`Dec')	<month>
mm	Month (1,2,...,12)	<mm.0>
year	Year (4-digit)	<year.04>
yr	Year (2-digit)	<yr.02>
hour	Hour (00-23)	<hour.02>
min	Minute (00-59)	<min.02>
sec	Second (00-59)	<sec.02>
msc	Millisecond (000-999)	<msc.3>
usc	Microsecond (000-999)	<usc.3>
nsc	Nanosecond (000-999)	<nsc.3>
psc	Picosecond (000-999)	<psc.3>
fos	Fraction of second.	<fos.3>
fod	Fraction of day.	<fod.8>

Note that a width of zero indicates that as many digits as necessary should be used to encoded the component. The <month> component is always encoded with three characters. The <fos> and <fod> components are always encoded with leading zeroes.

If a left angle bracket is desired in the encoded string, then simply specify two left angle brackets (<<) in the format string (character stuffing).

For example, the format string used to encode the standard EPOCH16 date/time character string (see Section 9.18) would be. . .

<dom.02>-<month>-<year> <hour>:<min>:<sec>.<msc>.<usc>.<nsc>.<psc>.<fos>

EPOCHx_FORMAT_LEN and EPOCHx_STRING_MAX are defined in cdf.inc.

9.25 toparse_EPOCH16

toparse_EPOCH16 parses a standard date/time character string and returns a CDF_EPOCH16 value. The format of the string can be one of valid styles used by the encoding functions described in Section 9.18-9.23. If an illegal field is detected in the string the value returned will be ILLEGAL_EPOCH_VALUE.

```
SUBROUTINE  toparse_EPOCH16 (
CHARACTER  epString*(EPOCH16_STRING_LEN),          ! in  --  The date/time string.
REAL*8         epoch(2))                           ! out -- CDF_EPOCH16 value
```

EPOCH16_STRING_LEN is defined in cdf.inc.

9.26 parse_EPOCH16

parse_EPOCH16 parses a standard date/time character string and returns a CDF_EPOCH16 value. The format of the string is that produced by the encode_EPOCH16 function. If an illegal field is detected in the string the value returned will be ILLEGAL_EPOCH_VALUE.

```
SUBROUTINE  parse_EPOCH16 (
CHARACTER  epString*(EPOCH16_STRING_LEN),          ! in  --  The date/time string.
REAL*8         epoch(2))                           ! out -- CDF_EPOCH16 value
```

EPOCH16_STRING_LEN is defined in cdf.inc.

9.27 parse_EPOCH16_1

parse_EPOCH16_1 parses an alternate date/time character string and returns a CDF_EPOCH16 value. The format of the string is that produced by the encode_EPOCH16_1 function. If an illegal field is detected in the string the value returned will be ILLEGAL_EPOCH_VALUE.

```
SUBROUTINE  parse_EPOCH16_1 (
CHARACTER   epString*(EPOCH16_1_STRING_LEN),       ! in  --  The date/time string.
REAL*8         epoch(2))                           ! out -- CDF_EPOCH16 value
```

EPOCH16_1_STRING_LEN is defined in cdf.inc.

9.28 parse_EPOCH16_2

parse_EPOCH16_2 parses an alternate date/time character string and returns a CDF_EPOCH16 value. The format of the string is that produced by the encode_EPOCH16_2 function. If an illegal field is detected in the string the value returned will be ILLEGAL_EPOCH_VALUE.

```
SUBROUTINE  parse_EPOCH16_2 (
CHARACTER  epString*(EPOCH16_2_STRING_LEN),        ! in  --  The date/time string.
REAL*8          epoch(2))                          ! out -- CDF_EPOCH16 value
```

EPOCH16_2_STRING_LEN is defined in cdf.inc.

9.29 parse_EPOCH16_3

parse_EPOCH16_3 parses an alternate date/time character string and returns a CDF_EPOCH16 value. The format of the string is that produced by the encode_EPOCH16_3 function. If an illegal field is detected in the string the value returned will be ILLEGAL_EPOCH_VALUE.

```
SUBROUTINE  parse_EPOCH16_3 (
CHARACTER    epString*(EPOCH16_3_STRING_LEN),      ! in  --  The date/time string.
REAL*8          epoch(2))                          ! out -- CDF_EPOCH16 value
```

EPOCH16_3_STRING_LEN is defined in cdf.inc.

9.30 parse_EPOCH16_4

parse_EPOCH16_4 parses an alternate, ISO 8601 date/time character string and returns a CDF_EPOCH16 value. The format of the string is that produced by the encode_EPOCH16_4 function. If an illegal field is detected in the string the value returned will be ILLEGAL_EPOCH_VALUE.

```
SUBROUTINE  parse_EPOCH16_4 (
CHARACTER    epString*(EPOCH16_4_STRING_LEN),      ! in  --  The date/time string.
REAL*8          epoch(2))                          ! out -- CDF_EPOCH16 value
```

EPOCH16_4_STRING_LEN is defined in cdf.inc.

9.31 EPOCH_to_UnixTime

EPOCH_to_UnixTime converts epoch times of CDF_EPOCH type into Unix times. A CDF_EPOCH epoch, a double, is milliseconds from 0000-01-01T00:00:00.000 while Unix time, also a double, is seconds from 1970-01-01T00:00:00.000. The Unix time can have sub-second, with a time resolution of microseconds, in its fractional part.

```
SUBROUTINE EPOCH_to_UnixTime (
    REAL*8  epoch,                          ! in  -- CDF_EPOCH epoch times
    REAL*8 unixTime,                        ! out  -- Unix times
    INTEGER  numTimes)                      ! in  -- # of times to be converted
```

9.32 UnixTime_to_EPOCH

UnixTime_to_EPOCH converts Unix times into epoch times of CDF_EPOCH type. A Unix time, a double, is seconds from 1970-01-01T00:00:00.000 while a CDF_EPOCH epoch, also a double, is milliseconds from 0000-01-01T00:00:00.000. The Unix time can have sub-second, with a time resolution of microseconds, in its fractional part. Converting the Unix time to EPOCH will only keep the resolution to milliseconds.

```
SUBROUTINE UnixTime_to_EPOCH (
    REAL8 unixTime,                         ! in  -- Unix times
    REAL*8 epoch,                           ! out  --  CDF_EPOCH epoch times
    INTEGER  numTimes)                      ! in  -- # of times to be converted
```

9.33 EPOCH16_to_UnixTime

EPOCH16_to_UnixTime converts epoch times of CDF_EPOCH16 type into Unix times. A CDF_EPOCH16 epoch, a two-double, is picoseconds from 0000-01-01T00:00:00.000.000.000.000 while Unix time, a double, is seconds from 1970-01-01T00:00:00.000. The Unix time can have sub-second, with a time resolution of microseconds, in its fractional part. **Note**: As CDF_EPOCH16 has much higher time resolution, sub-microseconds portion of its time might get lost during the conversion.

```
SUBROUTINE EPOCH16_to_UnixTime (
    REAL*8 epoch,                           ! in  -- CDF_EPOCH16 epoch times
    REAL*8 unixTime,                        ! out  -- Unix times
    INTEGER  numTimes)                      ! in  -- # of times to be converted
```

9.34 UnixTime_to_EPOCH16

UnixTime_to_EPOCH16 converts Unix times into epoch times of CDF_EPOCH16 type. A Unix time, a double, is seconds from 1970-01-01T00:00:00.000 while a CDF_EPOCH16 epoch, a two-double, is picoseconds from 0000-01-01T00:00:00.000.000.000.000. The Unix time can have sub-second, with a time resolution of microseconds, in its fractional part. Sub-microseconds will be filled with 0's when converting from Unix time to EPOCH16.

```
SUBROUTINE UnixTime_to_EPOCH16 (
    REAL*8 unixTime,                        ! in  -- Unix times
    REAL*8 epoch,                           ! out  --  CDF_EPOCH16 epoch times
    INTEGER  numTimes)                      !  in  -- # of times to be converted
```

10 TT2000 Utility Routines

Several subroutines exist that compute, decompose, parse, and encode CDF_TIME_TT2000 values. These functions may be called by applications using the CDF_TIME_TT2000 data type and are included in the CDF library. Function prototypes for these functions may be found in the include file cdf.h. The Concepts chapter in the CDF User's Guide describes TT2000 values. The date/time components for CDF_TIME_TT2000 are **UTC-based**, with leap seconds.

The CDF_TIME_TT2000 data type is used to store time values referenced from **J2000** (2000-01-01T12:00:00.000000000). Values in CDF_TIME_TT2000 are nanoseconds from J2000 with **leap seconds** included. TT2000 data can cover years between 1707 and 2292.

10.1 compute_TT2000

compute_TT2000 calculates a CDF_TIME_TT2000 value given the individual UTC-based time components. If an illegal component is detected, e.g., date is outside the range that TT2000 can cover, the value returned will be ILLEGAL_TT2000_VALUE.

```
SUBROUTINE  compute_TT2000 (
INTEGER*4  year,                        ! in  --  Year  (AD,  e.g.,  1994).
INTEGER*4  month,                       ! in  --  Month.
INTEGER*4  day,                         ! in  --  Day.
INTEGER*4  hour,                        ! in  --  Hour.
INTEGER*4  minute,                      ! in  --  Minute.
INTEGER*4  second,                      ! in  --  Second.
INTEGER*4  msec,                        ! in  --  Millisecond.
INTEGER*4  usec,                        ! in  --  Microsecond.
INTEGER*4  nsec,                        ! in  --  Nanosecond.
INTEGER*8          tt2000)              ! out--  CDF_TIME_TT2000 value
```

The "**INTEGER*8**" for returned TT2000 value is just a symbol and not a true Fortran type. This symbol is used in the following sections as well. It should be an 8-byte integer type. Refer to Section 4.21. It can be defined as follows

```
INCLUDE 'CDF.INC
INTEGER (KIND=KIND_INT8) tt2000
```

The day componment can be presented as day of the month or day of the year (DOY). If DOY form is used, the month componment must have a value of one (1).

10.2 TT2000_breakdown

TT2000_breakdown decomposes a CDF_TIME_TT2000 value into the individual UTC-based time components.

```
SUBROUTINE  TT2000_breakdown (
INTEGER*8          tt2000,              ! in   --  The CDF_TIME_TT2000  value.
```

```
INTEGER*4  year,                    ! out -- Year  (1707-2292).
INTEGER*4  month,                   ! out -- Month  (1-12).
INTEGER*4  day,                     ! out -- Day  (1-31).
INTEGER*4  hour,                    ! out -- Hour  (0-23).
INTEGER*4  minute,                  ! out -- Minute  (0-59).
INTEGER*4  second,                  ! out -- Second  (0-59 or 60 if leap second).
INTEGER*4  msec,                    ! out -- Millisecond  (0-999).
INTEGER*4  usec,                    ! out -- Microsecond  (0-999).
INTEGER*4  nsec)                    ! out -- Nanosecond  (0-999).
```

10.3 toencode_TT2000[46]

toencode_TT2000 encodes a CDF_TIME_TT2000 value into the standard UTC-based date/time character string, based on the passed in style. The fomats of the string are:

- **Style 0**: **dd-mmm-yyyy hh:mm:ss.mmm.uuu.nnn** where dd is the day of the month (1-31), mmm is the month (Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, or Dec), yyyy is the year, hh is the hour (0-23), mm is the minute (0-59), ss is the second (0-59/60), and mmm is the millisecond (0-999), uuu is the microsecond (0-999), and nnn is the nanosecond (0-999).
- **Style 1**: **yyyymmdd.ttttttttttttt** where yyyy is the year, mm is the month (1-12), dd is the day of the month (1-31), and ttttttttttttt is the fraction of the day (e.g., 5000000 is 12 o'clock noon).
- **Style 2**: **yyyymmddhhmmss** where yyyy is the year, mm is the month (01-12), dd is the day of the month (1-31), hh is the hour (0-23), mm is the minute (0-59), and ss is the second (0-59/60).
- **Style 3**: **yyyy-mm-ddThh:mm:ss.mmmuuunnn** where yyyy is the year, mm is the month (01-12), dd is the day of the month (1-31), hh is the hour (0-23), mm is the minute (0-59), ss is the second (0-59/60), and mmm is the millisecond (0-999), uuu is the microsecond (0-999), and nnn is the nanosecond (0-999).
- **Style 4**: **yyyy-mm-ddThh:mm:ss.mmmuuunnnZ** where yyyy is the year, mm is the month (01-12), dd is the day of the month (1-31), hh is the hour (0-23), mm is the minute (0-59), ss is the second (0-59/60), and mmm is the millisecond (0-999), uuu is the microsecond (0-999), and nnn is the nanosecond (0-999).

```
void  toencode_TT2000[47](
   INTEGER*8  tt2000,                          ! in -- The CDF_TIME_TT2000  value.  */
   INTEGER*4    style,                         ! in -- encoded UTC string style */
   CHARACTER  epString*(TT2000_*_STRING_LEN))  ! out -- The encoded  date/time string.
```

10.4 encode_TT2000

encode_TT2000 encodes a CDF_TIME_TT2000 value into the standard date/time UTC-based time character string.

```
SUBROUTINE  encode_EPOCH (
INTEGER*8          tt2000,                  ! in   -- The CDF_TIME_TT2000  value.
INTEGER*4          style,                   ! in   -- The output string format (0-4)
CHARACTER  epString*(TT2000_*_STRING_LEN))  ! out  -- The date/time character string.
```

TT2000_*_STRING_LEN (where * is 0-4) is defined in cdf.inc.

For style value **0**, the encoded UTC string is **DD-Mon-YYYY hh:mm:ss.mmmuuunnn**, where DD is the day of the month (1-31), Mon is the month (Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, or Dec), YYYY is the year,

[46] To compliment other CDF epoch data typoes: toencode_EPOCH and toencode_EPOCH16.
[47] The default encoding style is **3** for CDF_TIME_TT2000 data type for the date/time string

hh is the hour (0-23), mm is the minute (0-59 or 0-60 if leap second), ss is the second (0-59), mmm is the millisecond (0-999), uuu is the microsecond (0-999), and nnn is the nanosecond (0-999). The encoded string has a length of TT2000_0_STRING_LEN (**30**).

For style value **1**, the encoded UTC string is **YYYYMMDD.tttttttt**, where YYYY is the year, MM is the month (1-12) DD is the day of the month (1-31), and tttttttt is sub-day.(0-999999999). The encoded string has a length of TT2000_1_STRING_LEN (**19**).

For style value **2**, the encoded UTC string is **YYYYMMDDhhmmss**, where YYYY is the year, MM is the month (1-12) DD is the day of the month (1-31), hh is the hour (0-23), mm is the minute (0-59),and ss is the second (0-59 or 0-60 if leap second). The encoded string has a length of TT2000_2_STRING_LEN (**14**).

For style value **3**, the encoded UTC string is in **ISO 8601** form: **YYYY-MM-DDThh:mm:ss.mmmuuunnn**, where YYYY is the year, MM is the month (1-12), DD is the day of the month (1-31), hh is the hour (0-23), mm is the minute (0-59 or 0-60 if leap second), ss is the second (0-59), mmm is the millisecond (0-999), uuu is the microsecond (0-999), and nnn is the nanosecond (0-999). The encoded string has a length of TT2000_3_STRING_LEN (**29**)

For style value **4**, the encoded UTC string is in **ISO 8601** form: **YYYY-MM-DDThh:mm:ss.mmmuuunnnZ,** where YYYY is the year, MM is the month (1-12), DD is the day of the month (1-31), hh is the hour (0-23), mm is the minute (0-59 or 0-60 if leap second), ss is the second (0-59), mmm is the millisecond (0-999), uuu is the microsecond (0-999), and nnn is the nanosecond (0-999). The encoded string has a length of TT2000_4_STRING_LEN (**30**)

10.5 toparse_TT2000[48]

toparse_TT2000 parses a standard UTC-based date/time string and returns a CDF_TIME_TT2000 value. The format of the string is one of the strings produced by toencode_TT2000 or other encoding functions described in this Section. If the epoch is outside the range for TT2000, the value returned will be ILLEGAL_TT2000_VALUE.

```
SUBROUTINE  toparse_TT2000(
CHARACTER  epString*(TT2000_*_STRING_LEN),      ! in  --  The standard date/time character string.
INTEGER*8          tt2000)                      ! out -- CDF_TIME_TT2000 value
```

TT2000_*_STRING_LEN (* is 0-4) is defined in cdf.inc.

10.6 parse_TT2000

parse_TT2000 parses a standard UTC-based date/time character string and returns a CDF_TIME_TT2000 value. The format of the string is one of the strings produced by the encode_TT2000 function described in Section 9.3. If an illegal field is detected in the string the value returned will be ILLEGAL_TT2000_VALUE.

```
SUBROUTINE  parse_TT2000 (
CHARACTER  epString*(TT2000_*_STRING_LEN),      ! in  --  The standard date/time character string.
INTEGER*8          tt2000)                      ! out -- CDF_TIME_TT2000 value
```

TT2000_*_STRING_LEN (* is 0-4) is defined in cdf.inc.

[48] To compliment to other CDF epoch data types: toparse_EPOCH and toparse_EPOCH16.

10.7 TT2000_from_EPOCH

TT2000_from_EPOCH converts a value in CDF_EPOCH type to CDF_TIME_TT2000 type. If the epoch is outside the range for TT2000, the value returned will be ILLEGAL_TT2000_VALUE. If the epoch is a predefined, filled dummy value, DUMMY_TT2000_VALUE is returned.

```
SUBROUTINE  TT2000_from_EPOCH(
    REAL*8  epoch,                          ! in  --  CDF_EPOCH value.  */
    INTEGER*8  tt2000)                      ! out -- CDF_TIME_TT2000 value
```

Both microsecond and nanosecond fields for TT2000 are zero-filled.

10.8 TT2000_to_EPOCH

TT2000_to_EPOCH converts a value in CDF_TIME_TT2000 type to CDF_EPOCH type.

```
SUBROUTINE  TT2000_to_EPOCH(
    INTEGER*8  tt2000,                      ! in  --  The CDF_TIME_TT2000  value.
    REAL*8  epoch)                          ! out  --  The CDF_EPOCH value
```

The microsecond and nanosecond fields in TT2000 are ignored. As the CDF_EPOCH type does not have leap seconds, the date/time falls on a leap second in TT2000 type will be converted to the zero (0) second of the next day.

10.9 TT2000_from_EPOCH16

TT2000_from_EPOCH16 converts a data value in CDF_EPOCH16 type to CDF_TT2000 type. If the epoch is outside the range for TT2000, the value returned will be ILLEGAL_TT2000_VALUE. If the epoch is a predefined, filled dummy value, DUMMY_TT2000_VALUE is returned.

```
SUBROUTINE  TT2000_from_EPOCH16(
    REAL*8  epoch16(2),                     ! in  --  The CDF_EPOCH16 value.
    INTEGER*8  tt2000)                      ! out  --  CDF_TIME_TT2000  value returned.
```

The picoseconds from CDF_EPOCH16 is ignored.

10.10 TT2000_to_EPOCH16

TT2000_to_EPOCH16 converts a data value in CDF_TIME_TT2000 type to CDF_EPOCH16 type.

```
SUBROUTINE  TT2000_to_EPOCH16(
    INTEGER*8  tt2000;                      ! in  --  The CDF_TIME_TT2000  value.
    REAL*8  epoch16(2))                     ! out  --  CDF_EPOCH16 value
```

The picoseconds to CDF_EPOCH16 are zero(0)-filled. As the CDF_EPOCH16 does not have leap seconds, the date/time falls on a leap second in TT2000 type will be converted to the zero (0) second of the next day.

10.11 TT2000_to_UnixTime

TT2000_to_UnixTime converts epoch times of CDF_TIME_TT2000 (TT2000) type into Unix times. A CDF_TIME_TT2000 epoch, a 8-byte integer, is nanoseconds from J2000 with leap seconds while Unix time, a double, is seconds from 1970-01-01T00:00:00.000. The Unix time can have sub-second, with a time resolution of microseconds, in its fractional part. **Note**: As CDF_TIME_TT2000 has much higher time resolution, sub-microseconds portion of its time might get lost during the conversion. Also, TT2000's leap seconds will get lost after the conversion.

```
SUBROUTINE  TT2000_to_UnixTime (
    INTEGER*8 epoch,                    !  in  -- CDF_TIME_TT2000 epoch times.  */
    REAL*8 unixTime,                    !  out  -- Unix times.  */
    INTEGER  numTimes)                  !  in  -- Number of times to be converted.  */
```

10.12 UnixTime_to_TT2000

UnixTime_to_TT2000 converts Unix times into epoch times of CDF_TIME_TT2000 (TT2000) type. A Unix time, a double, is seconds from 1970-01-01T00:00:00.000 while a CDF_TIME_TT2000 epoch, a 8-byte integer, is nanoseconds from J2000 with leap seconds. The Unix time can have sub-second, with a time resolution of microseconds, in its fractional part. Sub-microseconds will be filled with 0's when converting from Unix time to TT2000.

```
SUBROUTINE  UnixTime_to_TT2000 (
    REAL*8 unixTime,                    !  in  -- Unix times
    INTEGER*8 epoch,                    ! out  --  CDF_TIME_TT2000 epoch times
    INTEGER  numTimes)                  !  in  -- Number of times to be converted
```

Appendix A

A.1 Introduction

A status code is returned from most CDF functions. The cdf.inc (for C) and CDF.INC (for Fortran) include files contain the numerical values (constants) for each of the status codes (and for any other constants referred to in the explanations). The CDF library Standard Interface functions CDFerror (for C) and CDF_error (for Fortran) can be used within a program to inquire the explanation text for a given status code. The Internal Interface can also be used to inquire explanation text.

There are three classes of status codes: informational, warning, and error. The purpose of each is as follows:

Informational	Indicates success but provides some additional information that may be of interest to an application.
Warning	Indicates that the function completed but possibly not as expected.
Error	Indicates that a fatal error occurred and the function aborted.

Status codes fall into classes as follows:

Error codes < CDF_WARN < Warning codes < CDF_OK < Informational codes

CDF_OK indicates an unqualified success (it should be the most commonly returned status code). CDF_WARN is simply used to distinguish between warning and error status codes.

A.2 Status Codes and Messages

The following list contains an explanation for each possible status code. Whether a particular status code is considered informational, a warning, or an error is also indicated.

ATTR_EXISTS	Named attribute already exists - cannot create or rename. Each attribute in a CDF must have a unique name. Note that trailing blanks are ignored by the CDF library when comparing attribute names. [Error]
ATTR_NAME_TRUNC	Attribute name truncated to CDF_ATTR_NAME_LEN256 characters. The attribute was created but with a truncated name. [Warning]

BAD_ALLOCATE_RECS	An illegal number of records to allocate for a variable was specified. For RV variables the number must be one or greater. For NRV variables the number must be exactly one. [Error]
BAD_ARGUMENT	An illegal/undefined argument was passed. Check that all arguments are properly declared and initialized. [Error]
BAD_ATTR_NAME	Illegal attribute name specified. Attribute names must contain at least one character, and each character must be printable. [Error]
BAD_ATTR_NUM	Illegal attribute number specified. Attribute numbers must be zero (0) or greater for C applications and one (1) or greater for Fortran applications. [Error]
BAD_BLOCKING_FACTOR[49]	An illegal blocking factor was specified. Blocking factors must be at least zero (0). [Error]
BAD_CACHESIZE	An illegal number of cache buffers was specified. The value must be at least zero (0). [Error]
BAD_CDF_EXTENSION	An illegal file extension was specified for a CDF. In general, do not specify an extension except possibly for a single-file CDF which has been renamed with a different file extension or no file extension. [Error]
BAD_CDF_ID	CDF identifier is unknown or invalid. The CDF identifier specified is not for a currently open CDF. [Error]
BAD_CDF_NAME	Illegal CDF name specified. CDF names must contain at least one character, and each character must be printable. Trailing blanks are allowed but will be ignored. [Error]
BAD_CDFSTATUS	Unknown CDF status code received. The status code specified is not used by the CDF library. [Error]
BAD_CHECKSUM	An illegal checksum mode received. It is invlid or currently not supported. [Error]
BAD_COMPRESSION_PARM	An illegal compression parameter was specified. [Error]
BAD_DATA_TYPE	An unknown data type was specified or encountered. The CDF data types are defined in cdf.inc for C applications and in cdf.inc for Fortran applications. [Error]
BAD_DECODING	An unknown decoding was specified. The CDF decodings are defined in cdf.inc for C applications and in cdf.inc for Fortran applications. [Error]
BAD_DIM_COUNT	Illegal dimension count specified. A dimension count must be at least one (1) and not greater than the size of the dimension. [Error]
BAD_DIM_INDEX	One or more dimension index is out of range. A valid value must be specified regardless of the dimension variance. Note also that

[49] The status code BAD_BLOCKING_FACTOR was previously named BAD_EXTEND_RECS.

	the combination of dimension index, count, and interval must not specify an element beyond the end of the dimension. [Error]
BAD_DIM_INTERVAL	Illegal dimension interval specified. Dimension intervals must be at least one (1). [Error]
BAD_DIM_SIZE	Illegal dimension size specified. A dimension size must be at least one (1). [Error]
BAD_ENCODING	Unknown data encoding specified. The CDF encodings are defined in cdf.inc for C applications and in cdf.inc for Fortran applications. [Error]
BAD_ENTRY_NUM	Illegal attribute entry number specified. Entry numbers must be at least zero (0) for C applications and at least one (1) for Fortran applications. [Error]
BAD_FNC_OR_ITEM	The specified function or item is illegal. Check that the proper number of arguments are specified for each operation being performed. Also make sure that NULL_ is specified as the last operation. [Error]
BAD_FORMAT	Unknown format specified. The CDF formats are defined in cdf.inc for C applications and in cdf.inc for Fortran applications. [Error]
BAD_INITIAL_RECS	An illegal number of records to initially write has been specified. The number of initial records must be at least one (1). [Error]
BAD_MAJORITY	Unknown variable majority specified. The CDF variable majorities are defined in cdf.inc for C applications and in cdf.inc for Fortran applications. [Error]
BAD_MALLOC	Unable to allocate dynamic memory - system limit reached. Contact CDF User Support if this error occurs. [Error]
BAD_NEGtoPOSfp0_MODE	An illegal -0.0 to 0.0 mode was specified. The -0.0 to 0.0 modes are defined in cdf.inc for C applications and in cdf.inc for Fortran applications. [Error]
BAD_NUM_DIMS	The number of dimensions specified is out of the allowed range. Zero (0) through CDF_MAX_DIMS dimensions are allowed. If more are needed, contact CDF User Support. [Error]
BAD_NUM_ELEMS	The number of elements of the data type is illegal. The number of elements must be at least one (1). For variables with a non-character data type, the number of elements must always be one (1). [Error]
BAD_NUM_VARS	Illegal number of variables in a record access operation. [Error]
BAD_READONLY_MODE	Illegal read-only mode specified. The CDF read-only modes are defined in cdf.inc for C applications and in cdf.inc for Fortran applications. [Error]

BAD_REC_COUNT	Illegal record count specified. A record count must be at least one (1). [Error]
BAD_REC_INTERVAL	Illegal record interval specified. A record interval must be at least one (1). [Error]
BAD_REC_NUM	Record number is out of range. Record numbers must be at least zero (0) for C applications and at least one (1) for Fortran applications. Note that a valid value must be specified regardless of the record variance. [Error]
BAD_SCOPE	Unknown attribute scope specified. The attribute scopes are defined in cdf.inc for C applications and in cdf.inc for Fortran applications. [Error]
BAD_SCRATCH_DIR	An illegal scratch directory was specified. The scratch directory must be writeable and accessible (if a relative path was specified) from the directory in which the application has been executed. [Error]
BAD_SPARSEARRAYS_PARM	An illegal sparse arrays parameter was specified. [Error]
BAD_VAR_NAME	Illegal variable name specified. Variable names must contain at least one character and each character must be printable. [Error]
BAD_VAR_NUM	Illegal variable number specified. Variable numbers must be zero (0) or greater for C applications and one (1) or greater for Fortran applications. [Error]
BAD_zMODE	Illegal zMode specified. The CDF zModes are defined in cdf.inc for C applications and in cdf.inc for Fortran applications. [Error]
CANNOT_ALLOCATE_RECORDS	Records cannot be allocated for the given type of variable (e.g., a compressed variable). [Error]
CANNOT_CHANGE	Because of dependencies on the value, it cannot be changed. Some possible causes of this error follow: 1. Changing a CDF's data encoding after a variable value (including a pad value) or an attribute entry has been written. 2. Changing a CDF's format after a variable has been created or if a compressed single-file CDF. 3. Changing a CDF's variable majority after a variable value (excluding a pad value) has been written. 4. Changing a variable's data specification after a value (including the pad value) has been written to that variable or after records have been allocated for that variable. 5. Changing a variable's record variance after a value (excluding the pad value) has been written to that variable or after records have been allocated for that variable.

6. Changing a variable's dimension variances after a value (excluding the pad value) has been written to that variable or after records have been allocated for that variable.

7. Writing “initial" records to a variable after a value (excluding the pad value) has already been written to that variable.

8. Changing a variable's blocking factor when a compressed variable and a value (excluding the pad value) has been written or when a variable with sparse records and a value has been accessed.

9. Changing an attribute entry's data specification where the new specification is not equivalent to the old specification.

CANNOT_COMPRESS	The CDF or variable cannot be compressed. For CDFs, this occurs if the CDF has the multi-file format. For variables, this occurs if the variable is in a multi-file CDF, values have been written to the variable, or if sparse arrays have already been specified for the variable. [Error]
CANNOT_SPARSEARRAYS	Sparse arrays cannot be specified for the variable. This occurs if the variable is in a multi-file CDF, values have been written to the variable, records have been allocated for the variable, or if compression has already been specified for the variable. [Error]
CANNOT_SPARSERECORDS	Sparse records cannot be specified for the variable. This occurs if the variable is in a multi-file CDF, values have been written to the variable, or records have been allocated for the variable. [Error]
CDF_CLOSE_ERROR	Error detected while trying to close CDF. Check that sufficient disk space exists for the dotCDF file and that it has not been corrupted. [Error]
CDF_CREATE_ERROR	Cannot create the CDF specified - error from file system. Make sure that sufficient privilege exists to create the dotCDF file in the disk/directory location specified and that an open file quota has not already been reached. [Error]
CDF_DELETE_ERROR	Cannot delete the CDF specified - error from file system. Insufficient privileges exist the delete the CDF file(s). [Error]
CDF_EXISTS	The CDF named already exists - cannot create it. The CDF library will not overwrite an existing CDF. [Error]
CDF_INTERNAL_ERROR	An unexpected condition has occurred in the CDF library. Report this error to CDFsupport. [Error]
CDF_NAME_TRUNC	CDF file name truncated to CDF_PATHNAME_LEN characters. The CDF was created but with a truncated name. [Warning]
CDF_OK	Function completed successfully.

CDF OPEN_ERROR	Cannot open the CDF specified - error from file system. Check that the dotCDF file is not corrupted and that sufficient privilege exists to open it. Also check that an open file quota has not already been reached. [Error]
CDF_READ_ERROR	Failed to read the CDF file - error from file system. Check that the dotCDF file is not corrupted. [Error]
CDF_WRITE_ERROR	Failed to write the CDF file - error from file system. Check that the dotCDF file is not corrupted. [Error]
CHECKSUM_ERROR	The data integrity verification through the checksum failed. [Error]
CHECKSUM_NOT_ALLOWED	The checksum is not allowed for old versioned files. [Error]
COMPRESSION_ERROR	An error occurred while compressing a CDF or block of variable records. This is an internal error in the CDF library. Contact CDF User Support. [Error]
CORRUPTED_V2_CDF	This Version 2 CDF is corrupted. An error has been detected in the CDF's control information. If the CDF file(s) are known to be valid, please contact CDF User Support. [Error]
DECOMPRESSION_ERROR	An error occurred while decompressing a CDF or block of variable records. The most likely cause is a corrupted dotCDF file. [Error]
DID_NOT_COMPRESS	For a compressed variable, a block of records did not compress to smaller than their uncompressed size. They have been stored uncompressed. This can result If the blocking factor is set too low or if the characteristics of the data are such that the compression algorithm chosen is unsuitable. [Informational]
EMPTY_COMPRESSED_CDF	The compressed CDF being opened is empty. This will result if a program which was creating/modifying the CDF abnormally terminated. [Error]
END_OF_VAR	The sequential access current value is at the end of the variable. Reading beyond the end of the last physical value for a variable is not allowed (when performing sequential access). [Error]
FORCED_PARAMETER	A specified parameter was forced to an acceptable value (rather than an error being returned). [Warning]
IBM_PC_OVERFLOW	An operation involving a buffer greater than 64k bytes in size has been specified for PCs running 16-bit DOS/Windows 3.*. [Error]
ILLEGAL_EPOCH_VALUE	Illegal component is detected in computing an epoch value or an illegal epoch value is provided in decomposing an epoch value. [Error]
ILLEGAL_FOR_SCOPE	The operation is illegal for the attribute's scope. For example, only gEntries may be written for gAttributes - not rEntries or zEntries. [Error]

ILLEGAL_IN_zMODE	The attempted operation is illegal while in zMode. Most operations involving rVariables or rEntries will be illegal. [Error]
ILLEGAL_ON_V1_CDF	The specified operation (i.e., opening) is not allowed on Version 1 CDFs. [Error]
ILLEGAL_TT2000_VALUE	Illegal component is detected in computing an epoch value or an illegal epoch value is provided in decomposing an epoch value. [Error]
MULTI_FILE_FORMAT	The specified operation is not applicable to CDFs with the multi-file format. For example, it does not make sense to inquire indexing statistics for a variable in a multi-file CDF (indexing is only used in single-file CDFs). [Informational]
NA_FOR_VARIABLE	The attempted operation is not applicable to the given variable. [Warning]
NEGATIVE_FP_ZERO	One or more of the values read/written are -0.0 (An illegal value on VAXes and DEC Alphas running OpenVMS). [Warning]
NO_ATTR_SELECTED	An attribute has not yet been selected. First select the attribute on which to perform the operation. [Error]
NO_CDF_SELECTED	A CDF has not yet been selected. First select the CDF on which to perform the operation. [Error]
NO_DELETE_ACCESS	Deleting is not allowed (read-only access). Make sure that delete access is allowed on the CDF file(s). [Error]
NO_ENTRY_SELECTED	An attribute entry has not yet been selected. First select the entry number on which to perform the operation. [Error]
NO_MORE_ACCESS	Further access to the CDF is not allowed because of a severe error. If the CDF was being modified, an attempt was made to save the changes made prior to the severe error. in any event, the CDF should still be closed. [Error]
NO_PADVALUE_SPECIFIED	A pad value has not yet been specified. The default pad value is currently being used for the variable. The default pad value was returned. [Informational]
NO_STATUS SELECTED	A CDF status code has not yet been selected. First select the status code on which to perform the operation. [Error]
NO_SUCH_ATTR	The named attribute was not found. Note that attribute names are case-sensitive. [Error]
NO_SUCH_CDF	The specified CDF does not exist. Check that the file name specified is correct. [Error]
NO_SUCH_ENTRY	No such entry for specified attribute. [Error]
NO_SUCH_RECORD	The specified record does not exist for the given variable. [Error]

NO_SUCH_VAR	The named variable was not found. Note that variable names are case-sensitive. [Error]
NO_VAR_SELECTED	A variable has not yet been selected. First select the variable on which to perform the operation. [Error]
NO_VARS_IN_CDF	This CDF contains no rVariables. The operation performed is not applicable to a CDF with no rVariables. [Informational]
NO_WRITE_ACCESS	Write access is not allowed on the CDF file(s). Make sure that the CDF file(s) have the proper file system privileges and ownership. [Error]
NOT_A_CDF	Named CDF is corrupted or not actually a CDF. This can also occur if an older CDF distribution is being used to read a CDF created by a more recent CDF distribution. Contact CDF User Support if you are sure that the specified file is a CDF that should be readable by the CDF distribution being used. CDF is backward compatible but not forward compatible. [Error]
PRECEEDING_RECORDS_ALLOCATED	Because of the type of variable, records preceding the range of records being allocated were automatically allocated as well. [Informational]
READ_ONLY_DISTRIBUTION	Your CDF distribution has been built to allow only read access to CDFs. Check with your system manager if you require write access. [Error]
READ_ONLY_MODE	The CDF is in read-only mode - modifications are not allowed. [Error]
SCRATCH_CREATE_ERROR	Cannot create a scratch file - error from file system. If a scratch directory has been specified, ensure that it is writable. [Error]
SCRATCH_DELETE_ERROR	Cannot delete a scratch file - error from file system. [Error]
SCRATCH_READ_ERROR	Cannot read from a scratch file - error from file system. [Error]
SCRATCH_WRITE_ERROR	Cannot write to a scratch file - error from file system. [Error]
SINGLE_FILE_FORMAT	The specified operation is not applicable to CDFs with the single-file format. For example, it does not make sense to close a variable in a single-file CDF. [Informational]
SOME_ALREADY_ALLOCATED	Some of the records being allocated were already allocated. [Informational]
TOO_MANY_PARMS	A type of sparse arrays or compression was encountered having too many parameters. This could be causes by a corrupted CDF or if the CDF was created/modified by a CDF distribution more recent than the one being used. [Error]
TOO_MANY_VARS	A multi-file CDF on a PC may contain only a limited number of variables because of the 8.3 file naming convention of MS-DOS. This consists of 100 rVariables and 100 zVariables. [Error]

UNKNOWN_COMPRESSION	An unknown type of compression was specified or encountered. [Error]
UNKNOWN_SPARSENESS	An unknown type of sparseness was specified or encountered. [Error]
UNSUPPORTED_OPERATION	The attempted operation is not supported at this time. [Error]
VAR_ALREADY_CLOSED	The specified variable is already closed. [Informational]
VAR_CLOSE_ERROR	Error detected while trying to close variable file. Check that sufficient disk space exists for the variable file and that it has not been corrupted. [Error]
VAR_CREATE_ERROR	An error occurred while creating a variable file in a multi-file CDF. Check that a file quota has not been reached. [Error]
VAR_DELETE_ERROR	An error occurred while deleting a variable file in a multi-file CDF. Check that sufficient privilege exist to delete the CDF files. [Error]
VAR_EXISTS	Named variable already exists - cannot create or rename. Each variable in a CDF must have a unique name (rVariables and zVariables can not share names). Note that trailing blanks are ignored by the CDF library when comparing variable names. [Error]
VAR_NAME_TRUNC	Variable name truncated to CDF_VAR_NAME_LEN256 characters. The variable was created but with a truncated name. [Warning]
VAR_OPEN_ERROR	An error occurred while opening variable file. Check that sufficient privilege exists to open the variable file. Also make sure that the associated variable file exists. [Error]
VAR_READ_ERROR	Failed to read variable as requested - error from file system. Check that the associated file is not corrupted. [Error]
VAR_WRITE_ERROR	Failed to write variable as requested - error from file system. Check that the associated file is not corrupted. [Error]
VIRTUAL_RECORD_DATA	One or more of the records are virtual (never actually written to the CDF). Virtual records do not physically exist in the CDF file(s) but are part of the conceptual view of the data provided by the CDF library. Virtual records are described in the Concepts chapter in the CDF User's Guide. [Informational]

Appendix B

B.1 Original Standard Interface

```
SUBROUTINE CDF_attr_create  (id, attr_name, attr_scope, attr_num,  status)
INTEGER*4       id                                                      ! in
CHARACTER       attr_name*(*)                                           ! in
INTEGER*4       attr_scope                                              ! in
INTEGER*4       attr_num                                                ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_attr_entry_inquire  (id, attr_num, entry_num, data_type, num_elements,
1                                   status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! in
INTEGER*4       data_type                                               ! out
INTEGER*4       num_elements                                            ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_attr_get  (id, attr_num, entry_num,  value,  status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! in
<type>          value                                                   ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_attr_inquire  (id, attr_num, attr_name, attr_scope,  max_entry,  status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
CHARACTER       attr_name*(*)                                           ! out
INTEGER*4       attr_scope                                              ! out
INTEGER*4       max_entry                                               ! out
INTEGER*4       status                                                  ! out

INTEGER*4  FUNCTION CDF_attr_num  (id, attr_name)
INTEGER*4       id                                                      ! in
CHARACTER       attr_name*(*)                                           ! in

SUBROUTINE CDF_attr_put  (id, attr_num, entry_num, data_type,  num_elements, value,
1                         status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
```

```
INTEGER*4       entry_num                                                   ! in
INTEGER*4       data_type                                                   ! in
INTEGER*4       num_elements                                                ! in
<type>          value                                                       ! in
INTEGER*4       status                                                      ! out

SUBROUTINE CDF_attr_rename (id, attr_num, attr_name, status)
INTEGER*4       id                                                          ! in
INTEGER*4       attr_num                                                    ! in
CHARACTER       attr_name*(*)                                               ! in
INTEGER*4       status                                                      ! out

SUBROUTINE CDF_close  (id,  status)
INTEGER*4       id                                                          ! in
INTEGER*4       status                                                      ! out

SUBROUTINE CDF_create  (CDF_name, num_dims, dim_sizes, encoding, majority, id, status)
CHARACTER       CDF_name*(*)                                                ! in
INTEGER*4       num_dims                                                    ! in
INTEGER*4       dim_sizes(*)                                                ! in
INTEGER*4       encoding                                                    ! in
INTEGER*4       majority                                                    ! in
INTEGER*4       id                                                          ! out
INTEGER*4       status                                                      ! out

SUBROUTINE CDF_delete  (id,  status)
INTEGER*4       id                                                          ! in
INTEGER*4       status                                                      ! out

SUBROUTINE CDF_doc  (id,  version,  release,  text,  status)
INTEGER*4       id                                                          ! in
INTEGER*4       version                                                     ! out
INTEGER*4       release                                                     ! out
CHARACTER        text*(CDF_DOCUMENT_LEN)                                    ! out
INTEGER*4       status                                                      ! out

SUBROUTINE CDF_error (status,  message,  status)
INTEGER*4       status                                                      ! in
CHARACTER       message*(CDF_STATUSTEXT_LEN)                                ! out
INTEGER*4       status                                                      ! out

SUBROUTINE CDF_getrvarsrecorddata (id,  num_var,  var_nums,  rec_num,
1                                  buffer,  status)
INTEGER*4       id                                                          ! in
INTEGER*4       num_var                                                     ! in
INTEGER*4       var_nums(*)                                                 ! in
INTEGER*4       rec_num                                                     ! in
<type>          buffer                                                      ! out
INTEGER*4       status                                                      ! out

SUBROUTINE CDF_getzvarsrecorddata (id,  num_var,  var_nums,  rec_num,
1                                   buffer,  status)
INTEGER*4       id                                                          ! in
INTEGER*4       num_var                                                     ! in
INTEGER*4       var_nums(*)                                                 ! in
INTEGER*4       rec_num                                                     ! in
```

```
<type>          buffer                                                  ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_inquire (id, num_dims, dim_sizes, encoding, majority, max_rec,
                        num_vars, num_attrs,  status)
INTEGER*4       id                                                      ! in
INTEGER*4       num_dims                                                ! out
INTEGER*4       dim_sizes(CDF_MAX_DIMS)                                 ! out
INTEGER*4       encoding                                                ! out
INTEGER*4       majority                                                ! out
INTEGER*4       max_rec                                                 ! out
INTEGER*4       num_vars                                                ! out
INTEGER*4       num_attrs                                               ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_open (CDF_name, id, status)
CHARACTER       CDF_name*(*)                                            ! in
INTEGER*4       id                                                      ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_putrvarsrecorddata (id,  num_var,  var_nums,  rec_num,
1                                  buffer,  status)
INTEGER*4       id                                                      ! in
INTEGER*4       num_var                                                 ! in
INTEGER*4       var_nums(*)                                             ! in
INTEGER*4       rec_num                                                 ! in
<type>          buffer                                                  ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_putzvarsrecorddata (id,  num_var,  var_nums,  rec_num,
1                                  buffer,  status)
INTEGER*4       id                                                      ! in
INTEGER*4       num_var                                                 ! in
INTEGER*4       var_nums(*)                                             ! in
INTEGER*4       rec_num                                                 ! in
<type>          buffer                                                  ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_var_close  (id,  var_num,  status)
INTEGER*4       id                                                      ! in
INTEGER*4       var_num                                                 ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_var_create  (id,  var_name, data_type,  num_elements, rec_variances,
1                           dim_variances,  var_num,  status)
INTEGER*4       id                                                      ! in
CHARACTER       var_name*(*)                                            ! in
INTEGER*4       data_type                                               ! in
INTEGER*4       num_elements                                            ! in
INTEGER*4       rec_variance                                            ! in
INTEGER*4       dim_variances(*)                                        ! in
INTEGER*4       var_num                                                 ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_var_get  (id,  var_num,  rec_num, indices,  value,  status)
INTEGER*4       id                                                      ! in
```

```
INTEGER*4       var_num                                                 ! in
INTEGER*4       rec_num                                                 ! in
INTEGER*4       indices(*)                                              ! in
<type>          value                                                   ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_var_hyper_get (id, var_num, rec_start, rec_count, rec_interval,
1                                   indices, counts, intervals, buffer, status)
INTEGER*4       id;                                                     ! in
INTEGER*4       var_num                                                 ! in
INTEGER*4       rec_start                                               ! in
INTEGER*4       rec_count                                               ! in
INTEGER*4       rec_interval                                            ! in
INTEGER*4       indices(*)                                              ! in
INTEGER*4       counts(*)                                               ! in
INTEGER*4       intervals(*)                                            ! in
<type>          buffer                                                  ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_var_hyper_put (id, var_num, rec_start, rec_count, rec_interval,
1                                   indices, counts, intervals, buffer, status)
INTEGER*4       id                                                      ! in
INTEGER*4       var_num                                                 ! in
INTEGER*4       rec_start                                               ! in
INTEGER*4       rec_count                                               ! in
INTEGER*4       rec_interval                                            ! in
INTEGER*4       indices(*)                                              ! in
INTEGER*4       counts(*)                                               ! in
INTEGER*4       intervals(*)                                            ! in
<type>          buffer                                                  ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_var_inquire (id, var_num, var_name, data_type, num_elements,
1                                   rec_variance, dim_variances, status)
INTEGER*4       id                                                      ! in
INTEGER*4       var_num                                                 ! in
CHARACTER       var_name*(CDF_VAR_NAME_LEN256)                          ! out
INTEGER*4       data_type                                               ! out
INTEGER*4       num_elements                                            ! out
INTEGER*4       rec_variance                                            ! out
INTEGER*4       dim_variances(CDF_MAX_DIMS)                             ! out
INTEGER*4       status                                                  ! out

INTEGER*4  FUNCTION CDF_var_num (id, var_name)
INTEGER*4       id                                                      ! in
CHARACTER       var_name*(*)                                            ! in

SUBROUTINE CDF_var_put (id, var_num, rec_num, indices, value, status)
INTEGER*4       id                                                      ! in
INTEGER*4       var_num                                                 ! in
INTEGER*4       rec_num                                                 ! in
INTEGER*4       indices(*)                                              ! in
<type>          value                                                   ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_var_rename (id, var_num, var_name, status)
```

```
INTEGER*4     id                                  ! in
INTEGER*4     var_num                             ! in
CHARACTER     var_name*(*)                        ! in
INTEGER*4     status                              ! out
```

B.2 Extended Standard Interface

```
SUBROUTINE CDF_close_cdf  (id,  status)
INTEGER*4       id                                                  ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_close_zvar  (id,  var_num, status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       status                                              ! out

INTEGER*4 FUNCTION  CDF_confirm_attr_existence  (id,  attr_name)
INTEGER*4       id                                                  ! in
CHARACTER       attr_name*(*)                                       ! in

INTEGER*4 FUNCTION  CDF_confirm_gentry_existence  (id,  attr_num, entry_num)
INTEGER*4       id                                                  ! in
INTEGER*4       attr_num                                            ! in
INTEGER*4       entry_num                                           ! in

INTEGER*4 FUNCTION  CDF_confirm_rentry_existence  (id,  attr_num, entry_num)
INTEGER*4       id                                                  ! in
INTEGER*4       attr_num                                            ! in
INTEGER*4       entry_num                                           ! in

INTEGER*4 FUNCTION  CDF_confirm_zentry_existence  (id,  attr_num, entry_num)
INTEGER*4       id                                                  ! in
INTEGER*4       attr_num                                            ! in
INTEGER*4       entry_num                                           ! in

INTEGER*4 FUNCTION  CDF_confirm_zvar_existence  (id,  var_name)
INTEGER*4       id                                                  ! in
CHARACTER       var_name*(*)                                        ! in

INTEGER*4 FUNCTION  CDF_confirm_zvar_padvalue_exist  (id,  var_num)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in

SUBROUTINE CDF_create_attr  (id, attr_name, attr_scope, attr_num,  status)
INTEGER*4       id                                                  ! in
CHARACTER       attr_name*(*)                                       ! in
INTEGER*4       attr_scope                                          ! in
INTEGER*4       attr_num                                            ! out
INTEGER*4       status                                              ! out

SUBROUTINE CDF_create_cdf  (CDF_name, id, status)
CHARACTER       CDF_name*(*)                                        ! in
INTEGER*4       id                                                  ! out
INTEGER*4       status                                              ! out
```

```
SUBROUTINE CDF_create_zvar  (id,  var_name, data_type,  num_elements, num_dims,
1                           dim_sizes, rec_variances, dim_variances,  var_num,  status)
INTEGER*4       id                                                          ! in
CHARACTER       var_name*(*)                                                ! in
INTEGER*4       data_type                                                   ! in
INTEGER*4       num_elements                                                ! in
INTEGER*4       num_dims                                                    ! in
INTEGER*4       dim_sizes(*)                                                ! in
INTEGER*4       rec_variance                                                ! in
INTEGER*4       dim_variances(*)                                            ! in
INTEGER*4       var_num                                                     ! out
INTEGER*4       status                                                      ! out

SUBROUTINE CDF_delete_attr  (id,  attr_num, status)
INTEGER*4       id                                                          ! in
INTEGER*4       attr_num                                                    ! in
INTEGER*4       status                                                      ! out

SUBROUTINE CDF_delete_attr_gentry  (id,  attr_num, entry_num, status)
INTEGER*4       id                                                          ! in
INTEGER*4       attr_num                                                    ! in
INTEGER*4       entry_num                                                   ! in
INTEGER*4       status                                                      ! out

SUBROUTINE CDF_delete_attr_rentry  (id,  attr_num, entry_num, status)
INTEGER*4       id                                                          ! in
INTEGER*4       attr_num                                                    ! in
INTEGER*4       entry_num                                                   ! in
INTEGER*4       status                                                      ! out

SUBROUTINE CDF_delete_attr_zentry  (id,  attr_num, entry_num, status)
INTEGER*4       id                                                          ! in
INTEGER*4       attr_num                                                    ! in
INTEGER*4       entry_num                                                   ! in
INTEGER*4       status                                                      ! out

SUBROUTINE CDF_delete_cdf  (id,  status)
INTEGER*4       id                                                          ! in
INTEGER*4       status                                                      ! out

SUBROUTINE CDF_delete_zvar  (id,  var_num, status)
INTEGER*4       id                                                          ! in
INTEGER*4       var_num                                                     ! in
INTEGER*4       status                                                      ! out

SUBROUTINE CDF_delete_zvar_recs  (id,  var_num, start_rec, end_rec, status)
INTEGER*4       id                                                          ! in
INTEGER*4       var_num                                                     ! in
INTEGER*4       start_rec                                                   ! in
INTEGER*4       end_rec                                                     ! in
INTEGER*4       status                                                      ! out

SUBROUTINE CDF_delete_zvar_recs_renumber  (id,  var_num, start_rec, end_rec, status)
INTEGER*4       id                                                          ! in
INTEGER*4       var_num                                                     ! in
INTEGER*4       start_rec                                                   ! in
```

```
INTEGER*4       end_rec                                                 ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_attr_gentry_datatype (id, attr_num, entry_num, data_type, status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! in
INTEGER*4       data_type                                               ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_attr_gentry_numelems (id, attr_num, entry_num, num_elems, status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! in
INTEGER*4       num_elems                                               ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_attr_gentry  (id, attr_num, entry_num,  value,  status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! in
<type>          value                                                   ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_attr_max_gentry  (id, attr_num, entry_num, status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_attr_max_rentry  (id, attr_num, entry_num, status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_attr_max_zentry  (id, attr_num, entry_num, status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_attr_name  (id, attr_num, attr_name, status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
CHARACTER       attr_name*(*)                                           ! out
INTEGER*4       status                                                  ! out

INTEGER*4 FUNCTION CDF_get_attr_num  (id, attr_name, status)
INTEGER*4       id                                                      ! in
CHARACTER       attr_name*(*)                                           ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_attr_num_gentries  (id, attr_num, entries, status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
```

```
INTEGER*4       entries                                                 ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_attr_num_rentries  (id, attr_num, entries, status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entries                                                 ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_attr_num_zentries  (id, attr_num, entries, status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entries                                                 ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_attr_rentry  (id, attr_num, entry_num,  value,  status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! in
<type>          value                                                   ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_attr_rentry_datatype (id, attr_num, entry_num, data_type, status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! in
INTEGER*4       data_type                                               ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_attr_rentry_numelems (id, attr_num, entry_num, num_elems, status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! in
INTEGER*4       num_elems                                               ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_attr_scope (id, attr_num, scope, status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       scope                                                   ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_attr_zrentry  (id, attr_num, entry_num,  value,  status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! in
<type>          value                                                   ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_attr_zentry_datatype (id, attr_num, entry_num, data_type, status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! in
INTEGER*4       data_type                                               ! out
INTEGER*4       status                                                  ! out
```

```
SUBROUTINE CDF_get_attr_zentry_numelems (id, attr_num, entry_num, num_elems, status)
INTEGER*4      id                                                    ! in
INTEGER*4      attr_num                                              ! in
INTEGER*4      entry_num                                             ! in
INTEGER*4      num_elems                                             ! out
INTEGER*4      status                                                ! out

SUBROUTINE CDF_get_cachesize (id, num_buffers, status)
INTEGER*4      id                                                    ! in
INTEGER*4      num_buffers                                           ! out
INTEGER*4      status                                                ! out

SUBROUTINE CDF_get_checksum (id, checksum, status)
INTEGER*4      id                                                    ! in
INTEGER*4      checksum                                              ! out
INTEGER*4      status                                                ! out

SUBROUTINE CDF_get_compress_cachesize (id, num_buffers, status)
INTEGER*4      id                                                    ! in
INTEGER*4      num_buffers                                           ! out
INTEGER*4      status                                                ! out

SUBROUTINE CDF_get_compression (id, ctype, cparms, cpercent, status)
INTEGER*4      id                                                    ! in
INTEGER*4      ctype                                                 ! out
INTEGER*4      cparms(*)                                             ! out
INTEGER*4      cpercent                                              ! out
INTEGER*4      status                                                ! out

SUBROUTINE CDF_get_compression_info (cdf_name, compress_type, compress_parms,
1                                    compres_size, decompress_size, status)
CHARACTER      cdf_name*(*)                                          ! in
INTEGER*4      compress_type                                         ! out
INTEGER*4      compress_parms(*)                                     ! out
INTEGER*8      compress_size                                         ! out
INTEGER*8      decompress_size                                       ! out
INTEGER*4      status                                                ! out

SUBROUTINE CDF_get_copyright (id, copyright, status)
INTEGER*4      id                                                    ! in
CHARACTER      copyright*(*)                                         ! out
INTEGER*4      status                                                ! out

SUBROUTINE CDF_get_datatype_size (data_type, size, status)
INTEGER*4      date_type                                             ! in
INTEGER*4      size                                                  ! out
INTEGER*4      status                                                ! out

SUBROUTINE CDF_get_decoding (id, decoding, status)
INTEGER*4      id                                                    ! in
INTEGER*4      decoding                                              ! out
INTEGER*4      status                                                ! out

SUBROUTINE CDF_get_encoding (id, encoding, status)
INTEGER*4      id                                                    ! in
INTEGER*4      encoding                                              ! out
```

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INTEGER*4      status                                                  ! out

SUBROUTINE CDF_get_filebackward (backwwardmode)
INTEGER*4      backwardmode                                            ! out

SUBROUTINE CDF_get_format (id, format, status)
INTEGER*4      id                                                      ! in
INTEGER*4      format                                                  ! out
INTEGER*4      status                                                  ! out

SUBROUTINE CDF_get_leapsecondlastupdated (id, lastupdated, status)
INTEGER*4      id                                                      ! in
INTEGER*4      lastupdated                                             ! out
INTEGER*4      status                                                  ! out

SUBROUTINE CDF_get_lib_copyright (copyright, status)
CHARACTER      copyright*(*)                                           ! out
INTEGER*4      status                                                  ! out

SUBROUTINE CDF_get_lib_version (version, release, increment, sub_increment, status)
INTEGER*4      version                                                 ! out
INTEGER*4      release                                                 ! out
INTEGER*4      increment                                               ! out
CHARACTER      sub_increment*(*)                                       ! out
INTEGER*4      status                                                  ! out

SUBROUTINE CDF_get_majority (id, majority, status)
INTEGER*4      id                                                      ! in
INTEGER*4      majority                                                ! out
INTEGER*4      status                                                  ! out

SUBROUTINE CDF_get_name (id, name, status)
INTEGER*4      id                                                      ! in
CHARACTER      name*(*)                                                ! out
INTEGER*4      status                                                  ! out

SUBROUTINE CDF_get_negtoposfp0_mode (id, negtoposfp0, status)
INTEGER*4      id                                                      ! in
INTEGER*4      negtoposfp0                                             ! out
INTEGER*4      status                                                  ! out

SUBROUTINE CDF_get_num_attrs (id, num_attrs, status)
INTEGER*4      id                                                      ! in
INTEGER*4      num_attrs                                               ! out
INTEGER*4      status                                                  ! out

SUBROUTINE CDF_get_num_gattrs (id, num_attrs, status)
INTEGER*4      id                                                      ! in
INTEGER*4      num_attrs                                               ! out
INTEGER*4      status                                                  ! out

SUBROUTINE CDF_get_num_rvars (id, num_vars, status)
INTEGER*4      id                                                      ! in
INTEGER*4      num_vars                                                ! out
INTEGER*4      status                                                  ! out
```

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SUBROUTINE CDF_get_num_vattrs (id, num_attrs, status)
INTEGER*4       id                                                  ! in
INTEGER*4       num_attrs                                           ! out
INTEGER*4       status                                              ! out

SUBROUTINE CDF_get_num_zvars (id, num_vars, status)
INTEGER*4       id                                                  ! in
INTEGER*4       num_vars                                            ! out
INTEGER*4       status                                              ! out

SUBROUTINE CDF_get_readonly_mode (id, readonly, status)
INTEGER*4       id                                                  ! in
INTEGER*4       readonly                                            ! out
INTEGER*4       status                                              ! out

SUBROUTINE CDF_get_stage_cachesize  (id, num_buffers,  status)
INTEGER*4       id                                                  ! in
INTEGER*4       num_buffers                                         ! out
INTEGER*4       status                                              ! out

SUBROUTINE CDF_get_status_text  (statusid, text,  status)
INTEGER*4       statusid                                            ! in
CHARACTER       text*(*)                                            ! out
INTEGER*4       status                                              ! out

SUBROUTINE CDF_get_var_allrecords_varname (id, var_name, buffer, status)
INTEGER*4       id                                                  ! in
CHARACTER       var_name*(*)                                        ! in
<type>          buffer                                              ! out
INTEGER*4       status                                              ! out

INTEGER*4 FUNCTION CDF_get_var_num  (id, var_name)
INTEGER*4       id                                                  ! in
INTEGER*4       var_name*(*)                                        ! in

SUBROUTINE CDF_get_var_rangerecords_name (id, var_name, start_rec, stop_rec, buffer, status)
INTEGER*4       id                                                  ! in
CHARACTER       var_name*(*)                                        ! in
INTEGER*4       start_rec                                           ! in
INTEGER*4       stop_rec                                            ! in
<type>          buffer                                              ! out
INTEGER*4       status                                              ! out

SUBROUTINE CDF_get_vars_maxwrittenrecnums  (id, max_rvars_recnum,
1                                           max_zvars_recnum,  status)
INTEGER*4       id                                                  ! in
INTEGER*4       max_rvars_recnum                                    ! out
INTEGER*4       max_zvars_recnum                                    ! out
INTEGER*4       status                                              ! out

SUBROUTINE CDF_get_version  (id, version, release, increment,  status)
INTEGER*4       id                                                  ! in
INTEGER*4       version                                             ! out
INTEGER*4       release                                             ! out
INTEGER*4       increment                                           ! out
INTEGER*4       status                                              ! out
```

```
SUBROUTINE CDF_get_zmode  (id, zmode,  status)
INTEGER*4       id                                                  ! in
INTEGER*4       zmode                                               ! out
INTEGER*4       status                                              ! out

SUBROUTINE CDF_get_zvar_allrecords_varid (id, var_num, buffer, status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
<type>          buffer                                              ! out
INTEGER*4       status                                              ! out

SUBROUTINE CDF_get_zvar_allocrecs (id, var_num, num_recs, status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       num_recs                                            ! out
INTEGER*4       status                                              ! out

SUBROUTINE CDF_get_zvar_blockingfactor (id, var_num, bf, status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       bf                                                  ! out
INTEGER*4       status                                              ! out

SUBROUTINE CDF_get_zvar_cachesize (id, var_num, num_buffers, status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       num_buffers                                         ! out
INTEGER*4       status                                              ! out

SUBROUTINE CDF_get_zvar_compression (id, var_num, compress_type, compress_parms,
1                                    compress_percent, status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       compress_type                                       ! out
INTEGER*4       compress_parms(*)                                   ! out
INTEGER*4       compress_percent                                    ! out
INTEGER*4       status                                              ! out

SUBROUTINE CDF_get_zvar_data  (id,  var_num,  rec_num, indices,  value,  status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       rec_num                                             ! in
INTEGER*4       indices(*)                                          ! in
<type>          value                                               ! out
INTEGER*4       status                                              ! out

SUBROUTINE CDF_get_zvar_datatype  (id,  var_num,  data_type,  status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       data_type                                           ! out
INTEGER*4       status                                              ! out

SUBROUTINE CDF_get_zvar_dimsizes  (id,  var_num,  dim_sizes,  status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
```

```
INTEGER*4      dim_sizes(*)                                          ! out
INTEGER*4      status                                                ! out

SUBROUTINE CDF_get_zvar_dimvariances (id, var_num, dim_varys, status)
INTEGER*4      id                                                    ! in
INTEGER*4      var_num                                               ! in
INTEGER*4      dim_varys(*)                                          ! out
INTEGER*4      status                                                ! out

SUBROUTINE CDF_get_zvar_maxallocrecnum (id, var_num, rec_num, status)
INTEGER*4      id                                                    ! in
INTEGER*4      var_num                                               ! in
INTEGER*4      rec_num                                               ! out
INTEGER*4      status                                                ! out

SUBROUTINE CDF_get_zvar_maxwrittenrecnum (id, var_num, rec_num, status)
INTEGER*4      id                                                    ! in
INTEGER*4      var_num                                               ! in
INTEGER*4      rec_num                                               ! out
INTEGER*4      status                                                ! out

SUBROUTINE CDF_get_zvar_name (id, var_num, var_name, status)
INTEGER*4      id                                                    ! in
INTEGER*4      var_num                                               ! in
CHARACTER      var_name*(*)                                          ! out
INTEGER*4      status                                                ! out

SUBROUTINE CDF_get_zvar_numdims (id, var_num, num_dims, status)
INTEGER*4      id                                                    ! in
INTEGER*4      var_num                                               ! in
INTEGER*4      num_dims                                              ! out
INTEGER*4      status                                                ! out

SUBROUTINE CDF_get_zvar_numelems (id, var_num, num_elems, status)
INTEGER*4      id                                                    ! in
INTEGER*4      var_num                                               ! in
INTEGER*4      num_elems                                             ! out
INTEGER*4      status                                                ! out

SUBROUTINE CDF_get_zvar_numrecs (id, var_num, num_recs, status)
INTEGER*4      id                                                    ! in
INTEGER*4      var_num                                               ! in
INTEGER*4      num_recs                                              ! out
INTEGER*4      status                                                ! out

SUBROUTINE CDF_get_zvar_padvalue (id, var_num, pad_value, status)
INTEGER*4      id                                                    ! in
INTEGER*4      var_num                                               ! in
<type>         pad_value                                             ! out
INTEGER*4      status                                                ! out

SUBROUTINE CDF_get_zvar_rangerecords_varid (id, var_num, start_rec, stop_rec, buffer, status)
INTEGER*4      id                                                    ! in
INTEGER*4      var_num                                               ! in
INTEGER*4      start_rec                                             ! in
INTEGER*4      stop_rec                                              ! in
```

```
<type>          buffer                                                  ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_zvar_recorddata (id, var_num, rec_num, record_data, status)
INTEGER*4       id                                                      ! in
INTEGER*4       var_num                                                 ! in
INTEGER*4       rec_num                                                 ! in
<type>          record_data                                             ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_zvar_recvariance (id, var_num, rec_vary, status)
INTEGER*4       id                                                      ! in
INTEGER*4       var_num                                                 ! in
INTEGER*4       rec_vary                                                ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_zvar_reservepercent (id, var_num, reserve_percent, status)
INTEGER*4       id                                                      ! in
INTEGER*4       var_num                                                 ! in
INTEGER*4       reserve_percent                                         ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_zvar_seqdata (id, var_num, value, status)
INTEGER*4       id                                                      ! in
INTEGER*4       var_num                                                 ! in
<type>          value                                                   ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_zvar_seqpos (id, var_num, rec_num, indices, status)
INTEGER*4       id                                                      ! in
INTEGER*4       var_num                                                 ! in
INTEGER*4       rec_num                                                 ! out
INTEGER*4       indices(*)                                              ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_zvars_maxwrittenrecnum (id, rec_num, status)
INTEGER*4       id                                                      ! in
INTEGER*4       rec_num                                                 ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_zvar_sparserecords (id, var_num, srecords, status)
INTEGER*4       id                                                      ! in
INTEGER*4       var_num                                                 ! in
INTEGER*4       srecords                                                ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_get_zvars_recorddata (id, num_var, var_nums, rec_num,
1                                    buffer, status)
INTEGER*4       id                                                      ! in
INTEGER*4       num_var                                                 ! in
INTEGER*4       var_nums(*)                                             ! in
INTEGER*4       rec_num                                                 ! in
<type>          buffer                                                  ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_hyper_get_zvar_data (id, var_num, rec_start, rec_count, rec_interval,
```

```
1                                                   indices,  counts, intervals,  buffer,  status)
INTEGER*4       id;                                                                         ! in
INTEGER*4       var_num                                                                     ! in
INTEGER*4       rec_start                                                                   ! in
INTEGER*4       rec_count                                                                   ! in
INTEGER*4       rec_interval                                                                ! in
INTEGER*4       indices(*)                                                                  ! in
INTEGER*4       counts(*)                                                                   ! in
INTEGER*4       intervals(*)                                                                ! in
<type>          buffer                                                                      ! out
INTEGER*4       status                                                                      ! out

SUBROUTINE CDF_hyper_put_zvar_data  (id,  var_num,  rec_start,  rec_count,  rec_interval,
1                                                   indices,  counts, intervals,  buffer,  status)
INTEGER*4       id                                                                          ! in
INTEGER*4       var_num                                                                     ! in
INTEGER*4       rec_start                                                                   ! in
INTEGER*4       rec_count                                                                   ! in
INTEGER*4       rec_interval                                                                ! in
INTEGER*4       indices(*)                                                                  ! in
INTEGER*4       counts(*)                                                                   ! in
INTEGER*4       intervals(*)                                                                ! in
<type>          buffer                                                                      ! in
INTEGER*4       status                                                                      ! out

SUBROUTINE CDF_inquire_attr  (id, attr_num, attr_name, attr_scope,  max_gentry,
1                                   max_rentry, max_zentry,  status)
INTEGER*4       id                                                                          ! in
INTEGER*4       attr_num                                                                    ! in
CHARACTER       attr_name*(*)                                                               ! out
INTEGER*4       attr_scope                                                                  ! out
INTEGER*4       max_gentry                                                                  ! out
INTEGER*4       max_rentry                                                                  ! out
INTEGER*4       max_zentry                                                                  ! out
INTEGER*4       status                                                                      ! out

SUBROUTINE CDF_inquire_attr_gentry  (id, attr_num, entry_num, data_type, num_elements,
1                                                   status)
INTEGER*4       id                                                                          ! in
INTEGER*4       attr_num                                                                    ! in
INTEGER*4       entry_num                                                                   ! in
INTEGER*4       data_type                                                                   ! out
INTEGER*4       num_elements                                                                ! out
INTEGER*4       status                                                                      ! out

SUBROUTINE CDF_inquire_attr_rentry  (id, attr_num, entry_num, data_type, num_elements,
1                                                   status)
INTEGER*4       id                                                                          ! in
INTEGER*4       attr_num                                                                    ! in
INTEGER*4       entry_num                                                                   ! in
INTEGER*4       data_type                                                                   ! out
INTEGER*4       num_elements                                                                ! out
INTEGER*4       status                                                                      ! out

SUBROUTINE CDF_inquire_attr_zentry  (id, attr_num, entry_num, data_type, num_elements,
1                                                   status)
```

```
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! in
INTEGER*4       data_type                                               ! out
INTEGER*4       num_elements                                            ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_inquire_cdf (id, num_dims, dim_sizes, encoding, majority, max_rrec,
1                           num_rvars, max_zrec, num_zvars, num_attrs,  status)
INTEGER*4       id                                                      ! in
INTEGER*4       num_dims                                                ! out
INTEGER*4       dim_sizes(CDF_MAX_DIMS)                                 ! out
INTEGER*4       encoding                                                ! out
INTEGER*4       majority                                                ! out
INTEGER*4       max_rrec                                                ! out
INTEGER*4       num_rvars                                               ! out
INTEGER*4       max_zrec                                                ! out
INTEGER*4       num_zvars                                               ! out
INTEGER*4       num_attrs                                               ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_inquire_zvar  (id,  var_num,  var_name, data_type,  num_elements,  num_dims,
1                             dim_sizes, rec_variance, dim_variances,  status)
INTEGER*4       id                                                      ! in
INTEGER*4       var_num                                                 ! in
CHARACTER       var_name*(CDF_VAR_NAME_LEN256)                          ! out
INTEGER*4       data_type                                               ! out
INTEGER*4       num_elements                                            ! out
INTEGER*4       num_dims                                                ! out
INTEGER*4       dim_sizes(CDF_MAX_DIMS)                                 ! out
INTEGER*4       rec_variance                                            ! out
INTEGER*4       dim_variances(CDF_MAX_DIMS)                             ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_open_cdf (CDF_name, id, status)
CHARACTER       CDF_name*(*)                                            ! in
INTEGER*4       id                                                      ! out
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_select_cdf (id, status)
INTEGER*4       id                                                      ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_put_attr_gentry  (id, attr_num, entry_num, data_type,  num_elements, value,
1                                status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! in
INTEGER*4       data_type                                               ! in
INTEGER*4       num_elements                                            ! in
<type>          value                                                   ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_put_attr_rentry  (id, attr_num, entry_num, data_type,  num_elements, value,
1                                status)
INTEGER*4       id                                                      ! in
```

```
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! in
INTEGER*4       data_type                                               ! in
INTEGER*4       num_elements                                            ! in
<type>          value                                                   ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_put_attr_zentry  (id, attr_num, entry_num, data_type,  num_elements, value,
1                                status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! in
INTEGER*4       data_type                                               ! in
INTEGER*4       num_elements                                            ! in
<type>          value                                                   ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_put_var_allrecords_varname  (id,  var_name, num_recs, value,  status)
INTEGER*4       id                                                      ! in
CHARACTER       var_name*(*)                                            ! in
INTEGER*4       num_recs                                                ! in
<type>          value                                                   ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_put_var_rangerecords_name  (id,  var_name, start_rec, stop_rec, value,  status)
INTEGER*4       id                                                      ! in
CHARACTER       var_name*(*)                                            ! in
INTEGER*4       start_rec                                               ! in
INTEGER*4       stop_rec                                                ! in
<type>          value                                                   ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_put_zvar_allrecords_varid  (id,  var_num, num_recs, value,  status)
INTEGER*4       id                                                      ! in
INTEGER*4       var_num                                                 ! in
INTEGER*4       num_recs                                                ! in
<type>          value                                                   ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_put_zvar_data  (id,  var_num,  rec_num, indices,  value,  status)
INTEGER*4       id                                                      ! in
INTEGER*4       var_num                                                 ! in
INTEGER*4       rec_num                                                 ! in
INTEGER*4       indices(*)                                              ! in
<type>          value                                                   ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_put_zvar_rangerecords_varid  (id,  var_num, start_rec, stop_rec, value,  status)
INTEGER*4       id                                                      ! in
INTEGER*4       var_num                                                 ! in
INTEGER*4       start_rec                                               ! in
INTEGER*4       stop_reci                                               ! in
<type>          value                                                   ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_put_zvar_recorddata  (id,  var_num,  rec_num, values,  status)
```

```
INTEGER*4       id                                                      ! in
INTEGER*4       var_num                                                 ! in
INTEGER*4       rec_num                                                 ! in
<type>          values                                                  ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_put_zvar_seqdata  (id,  var_num, value,  status)
INTEGER*4       id                                                      ! in
INTEGER*4       var_num                                                 ! in
<type>          value                                                   ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_put_zvars_recorddata (id,  num_var,  var_nums,  rec_num,
1                                    buffer,  status)
INTEGER*4       id                                                      ! in
INTEGER*4       num_var                                                 ! in
INTEGER*4       var_nums(*)                                             ! in
INTEGER*4       rec_num                                                 ! in
<type>          buffer                                                  ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_rename_attr (id, attr_num, attr_name, status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
CHARACTER       attr_name*(*)                                           ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_rename_zvar (id,  var_num,  var_name,  status)
INTEGER*4       id                                                      ! in
INTEGER*4       var_num                                                 ! in
CHARACTER       var_name*(*)                                            ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_set_attr_gentry_dataspec  (id,  attr_num, entry_num, data_type, status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! in
INTEGER*4       data_type                                               ! in
INTEGER*4       num_elems                                               ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_set_attr_rentry_dataspec  (id,  attr_num, entry_num, data_type, status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       entry_num                                               ! in
INTEGER*4       data_type                                               ! in
INTEGER*4       num_elems                                               ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_set_attr_scope  (id,  attr_num, scope, status)
INTEGER*4       id                                                      ! in
INTEGER*4       attr_num                                                ! in
INTEGER*4       scope                                                   ! in
INTEGER*4       status                                                  ! out

SUBROUTINE CDF_set_attr_zenty_dataspec  (id,  attr_num, entry_num, data_type, status)
```

```
INTEGER*4       id                                                  ! in
INTEGER*4       attr_num                                            ! in
INTEGER*4       entry_num                                           ! in
INTEGER*4       data_type                                           ! in
INTEGER*4       num_elems                                           ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_cachesize  (id,  num_buffers, status)
INTEGER*4       id                                                  ! in
INTEGER*4       num_buffers                                         ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_checksum  (id,  checksum, status)
INTEGER*4       id                                                  ! in
INTEGER*4       checksum                                            ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_compress_cachesize  (id,  num_buffers, status)
INTEGER*4       id                                                  ! in
INTEGER*4       num_buffers                                         ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_compression  (id,  compress_type, compress_parms, status)
INTEGER*4       id                                                  ! in
INTEGER*4       compress_type                                       ! in
INTEGER*4       compress_parms(*)                                   ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_decoding  (id, decoding, status)
INTEGER*4       id                                                  ! in
INTEGER*4       decoding                                            ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_encoding  (id, encoding, status)
INTEGER*4       id                                                  ! in
INTEGER*4       encoding                                            ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_filebackward  (backwardmode)
INTEGER*4       backwardmode                                        ! in

SUBROUTINE CDF_set_format  (id, format, status)
INTEGER*4       id                                                  ! in
INTEGER*4       format                                              ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_leapsecondlastupdated  (id, lastupdated, status)
INTEGER*4       id                                                  ! in
INTEGER*4       lastupdated                                         ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_majority  (id, majority, status)
INTEGER*4       id                                                  ! in
INTEGER*4       majority                                            ! in
INTEGER*4       status                                              ! out
```

```
SUBROUTINE CDF_set_negtoposfp0_mode  (id, negtoposfp0, status)
INTEGER*4       id                                                  ! in
INTEGER*4       negtoposfp0                                         ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_readonly_mode  (id, readonly, status)
INTEGER*4       id                                                  ! in
INTEGER*4       readonly                                            ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_stage_cachesize  (id, num_buffers, status)
INTEGER*4       id                                                  ! in
INTEGER*4       num_buffers                                         ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_validate  (validate)
INTEGER*4       validate                                            ! in

SUBROUTINE CDF_set_zmode  (id, zmode, status)
INTEGER*4       id                                                  ! in
INTEGER*4       zmode                                               ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_zvar_allocblockrecs  (id, var_num, start_rec, end_rec, status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       start_rec                                           ! in
INTEGER*4       end_rec                                             ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_zvar_allocrecs  (id, var_num, num_recs, status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       num_recs                                            ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_zvar_blockingfactor  (id, var_num, bf, status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       bf                                                  ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_zvar_cachesize  (id, var_num, num_buffers, status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       num_buffers                                         ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_zvar_compression  (id, var_num, compress_type, compress_parms, status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       compress_type                                       ! in
INTEGER*4       compress_parms(*)                                   ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_zvar_dataspec  (id, var_num, data_type, status)
```

```
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       data_type                                           ! in
INTEGER*4       num_elems                                           ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_zvar_dimvariances  (id, var_num, dimvarys, status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       dimvarys(*)                                         ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_zvar_initialrecs  (id, var_num, num_recs, status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       num_recs                                            ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_zvar_padvalue  (id, var_num, value, status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
<type>          value                                               ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_zvar_recvariance  (id, var_num, rec_vary, status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       rec_vary                                            ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_zvar_reservepercent  (id, var_num, reserve_percent, status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       reserve_percent                                     ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_zvars_cachesize  (id, num_buffers, status)
INTEGER*4       id                                                  ! in
INTEGER*4       num_buffers                                         ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_zvar_seqpos  (id, var_num, rec_num, indices, status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       rec_num                                             ! in
INTEGER*4       indices(*)                                          ! in
INTEGER*4       status                                              ! out

SUBROUTINE CDF_set_zvar_sparserecords  (id, var_num, sparse_records, status)
INTEGER*4       id                                                  ! in
INTEGER*4       var_num                                             ! in
INTEGER*4       sparse_records                                      ! in
INTEGER*4       status                                              ! out
```

B.3 Internal Interface

```
INTEGER*4  FUNCTION CDF_lib  (fnc, ..., status)
INTEGER*4  fnc                                                          ! in
.
.
INTEGER*4  status                                                       ! out
        CLOSE_
                CDF_
                rVAR_
                zVAR_

        CONFIRM_
                ATTR_                   INTEGER*4   attr_num            ! out
                ATTR_EXISTENCE_         CHARACTER   attr_name*(*)       ! in
                CDF_                    INTEGER*4   id                  ! out
                CDF_ACCESS_
                CDF_CACHESIZE_          INTEGER*4   num_buffers         ! out
                CDF_DECODING_           INTEGER*4   decoding            ! out
                CDF_NAME_               CHARACTER   CDF_name*(CDF_PATHNAME_LEN)
                                                                        ! out
                CDF_NEGtoPOSfp0_MODE_   INTEGER*4   mode                ! out
                CDF_READONLY_MODE_      INTEGER*4   mode                ! out
                CDF_STATUS_             INTEGER*4   status              ! out
                CDF_zMODE_              INTEGER*4   mode                ! out
                COMPRESS_CACHESIZE_     INTEGER*4   num_buffers         ! out
                CURgENTRY_EXISTENCE_
                CURrENTRY_EXISTENCE_
                CURzENTRY_EXISTENCE_
                gENTRY_                 INTEGER*4   entry_num           ! out
                gENTRY_EXISTENCE_       INTEGER*4   entry_num           ! in
                rENTRY_                 INTEGER*4   entry_num           ! out
                rENTRY_EXISTENCE_       INTEGER*4   entry_num           ! in
                rVAR_                   INTEGER*4   var_num             ! out
                rVAR_CACHESIZE_         INTEGER*4   num_buffers         ! out
                rVAR_EXISTENCE_         CHARACTER   var_name*(*)        ! in
                rVAR_PADVALUE_
                rVAR_RESERVEPERCENT_    INTEGER*4   percent             ! out
                rVAR_SEQPOS_            INTEGER*4   rec_num             ! out
                                        INTEGER*4   indices(CDF_MAX_DIMS)  ! out
                rVARs_DIMCOUNTS_        INTEGER*4   counts(CDF_MAX_DIMS)   ! out
                rVARs_DIMINDICES_       INTEGER*4   indices(CDF_MAX_DIMS)  ! out
                rVARs_DIMINTERVALS_     INTEGER*4   intervals(CDF_MAX_DIMS)  ! out
                rVARs_RECCOUNT_         INTEGER*4   rec_count           ! out
                rVARs_RECINTERVAL_      INTEGER*4   rec_interval        ! out
                rVARs_RECNUMBER_        INTEGER*4   rec_num             ! out
                STAGE_CACHESIZE_        INTEGER*4   num_buffers         ! out
                zENTRY_                 INTEGER*4   entry_num           ! out
                zENTRY_EXISTENCE_       INTEGER*4   entry_num           ! in
                zVAR_                   INTEGER*4   var_num             ! out
```

```
        zVAR_CACHESIZE_             INTEGER*4   num_buffers                 ! out
        zVAR_DIMCOUNTS_             INTEGER*4   counts(CDF_MAX_DIMS)        ! out
        zVAR_DIMINDICES_            INTEGER*4   indices(CDF_MAX_DIMS)       ! out
        zVAR_DIMINTERVALS_          INTEGER*4   intervals(CDF_MAX_DIMS)     ! out
        zVAR_EXISTENCE_             CHARACTER   var_name*(*)                ! in
        zVAR_PADVALUE_
        zVAR_RECCOUNT_              INTEGER*4   rec_count                   ! out
        zVAR_RECINTERVAL_           INTEGER*4   rec_interval                ! out
        zVAR_RECNUMBER_             INTEGER*4   rec_num                     ! out
        zVAR_RESERVEPERCENT_        INTEGER*4   percent                     ! out
        zVAR_SEQPOS_                INTEGER*4   rec_num                     ! out
                                    INTEGER*4   indices(CDF_MAX_DIMS)       ! out

CREATE_
        ATTR_                       CHARACTER   attr_name*(*)               ! in
                                    INTEGER*4   scope                       ! in
                                    INTEGER*4   attr_num                    ! out

        CDF_                        CHARACTER   CDF_name*(*)                ! in
                                    INTEGER*4   num_dims                    ! in
                                    INTEGER*4   dim_sizes(*)                ! in
                                    INTEGER*4   id                          ! out

        rVAR_                       CHARACTER   var_name*(*)                ! in
                                    INTEGER*4   data_type                   ! in
                                    INTEGER*4   num_elements                ! in
                                    INTEGER*4   rec_vary                    ! in
                                    INTEGER*4   dim_varys(*)                ! in
                                    INTEGER*4   var_num                     ! out

        zVAR_                       CHARACTER   var_name*(*)                ! in
                                    INTEGER*4   data_type                   ! in
                                    INTEGER*4   num_elements                ! in
                                    INTEGER*4   num_dims                    ! in
                                    INTEGER*4   dim_sizes(*)                ! in
                                    INTEGER*4   rec_vary                    ! in
                                    INTEGER*4   dim_varys(*)                ! in
                                    INTEGER*4   var_num                     ! out

DELETE_
        ATTR_
        CDF_
        gENTRY_
        rENTRY_
        rVAR_
        rVAR_RECORDS_               INTEGER*4   first_record                ! in
                                    INTEGER*4   last_record                 ! in
        rVAR_RECORDS_RENUMBER_      INTEGER*4   first_record                ! in
                                    INTEGER*4   last_record                 ! in
        zENTRY_
        zVAR_
        zVAR_RECORDS_               INTEGER*4   first_record                ! in
                                    INTEGER*4   last_record                 ! in
        zVAR_RECORDS_RENUMBER_      INTEGER*4   first_record                ! in
                                    INTEGER*4   last_record                 ! in
```

```
GET_
        ATTR_MAXgENTRY_         INTEGER*4   max_entry                       ! out
        ATTR_MAXrENTRY_         INTEGER*4   max_entry                       ! out
        ATTR_MAXzENTRY_         INTEGER*4   max_entry                       ! out
        ATTR_NAME_              CHARACTER   attr_name*(CDF_ATTR_NAME_LEN256)
                                                                            ! out
        ATTR_NUMBER_            CHARACTER   attr_name*(*)                   ! in
                                INTEGER*4   attr_num                        ! out
        ATTR_NUMgENTRIES_       INTEGER*4   num_entries                     ! out
        ATTR_NUMrENTRIES_       INTEGER*4   num_entries                     ! out
        ATTR_NUMzENTRIES_       INTEGER*4   num_entries                     ! out
        ATTR_SCOPE_             INTEGER*4   scope                           ! out
        CDF_CHECKSUM_           INTEGER*4   checksum                        ! out
        CDF_COMPRESSION_        INTEGER*4   c_type                          ! out
                                INTEGER*4   c_parms(CDF_MAX_PARMS)          ! out
                                INTEGER*4   c_pct                           ! out
        CDF_COPYRIGHT_          CHARACTER   copy_right*(CDF_COPYRIGHT_LEN)
                                                                            ! out
        CDF_ENCODING_           INTEGER*4   encoding                        ! out
        CDF_FORMAT_             INTEGER*4   format                          ! out
        CDF_INCREMENT_          INTEGER*4   increment                       ! out
        CDF_INFO_               CHARACTER   CDF_name*(*)                    ! in
                                INTEGER*4   c_type                          ! out
                                INTEGER*4   c_parms(CDF_MAX_PARMS)          ! out
                                INTEGER*8   c_size                          ! out
                                INTEGER*8   u_size                          ! out
        CDF_MAJORITY_           INTEGER*4   majority                        ! out
        CDF_NUMATTRS_           INTEGER*4   num_attrs                       ! out
        CDF_NUMgATTRS_          INTEGER*4   num_attrs                       ! out
        CDF_NUMrVARS_           INTEGER*4   num_vars                        ! out
        CDF_NUMvATTRS_          INTEGER*4   num_attrs                       ! out
        CDF_NUMzVARS_           INTEGER*4   num_vars                        ! out
        CDF_RELEASE_            INTEGER*4   release                         ! out
        CDF_VERSION_            INTEGER*4   version                         ! out
        DATATYPE_SIZE_          INTEGER*4   data_type                       ! in
                                INTEGER*4   num_bytes                       ! out
        gENTRY_DATA_            <type>      value                           ! out
        gENTRY_DATATYPE_        INTEGER*4   data_type                       ! out
        gENTRY_NUMELEMS_        INTEGER*4   num_elements                    ! out
        LIB_COPYRIGHT_          CHARACTER   copy_right*(CDF_COPYRIGHT_LEN)
                                                                            ! out
        LIB_INCREMENT_          INTEGER*4   increment                       ! out
        LIB_RELEASE_            INTEGER*4   release                         ! out
        LIB_subINCREMENT_       CHARACTER   subincrement*1                  ! out
        LIB_VERSION_            INTEGER*4   version                         ! out
        rENTRY_DATA_            <type>      value                           ! out
        rENTRY_DATATYPE_        INTEGER*4   data_type                       ! out
        rENTRY_NUMELEMS_        INTEGER*4   num_elements                    ! out
        rVAR_ALLOCATEDFROM_     INTEGER*4   start_record                    ! in
                                INTEGER*4   next_record                     ! out
        rVAR_ALLOCATEDTO_       INTEGER*4   start_record                    ! in
                                INTEGER*4   last_record                     ! out
        rVAR_BLOCKINGFACTOR_    INTEGER*4   blocking_factor                 ! out
        rVAR_COMPRESSION_       INTEGER*4   c_type                          ! out
                                INTEGER*4   c_parms(CDF_MAX_PARMS)          ! out
                                INTEGER*4   c_pct                           ! out
```

```
rVAR_DATA_              <type>      value                                ! out
rVAR_DATATYPE_          INTEGER*4   data_type                            ! out
rVAR_DIMVARYS_          INTEGER*4   dim_varys(CDF_MAX_DIMS)              ! out
rVAR_HYPERDATA_         <type>      buffer                               ! out
rVAR_MAXallocREC_       INTEGER*4   max_rec                              ! out
rVAR_MAXREC_            INTEGER*4   max_rec                              ! out
rVAR_NAME_              CHARACTER   var_name*(CDF_VAR_NAME_LEN256)
                                                                         ! out
rVAR_nINDEXENTRIES_     INTEGER*4   num_entries                          ! out
rVAR_nINDEXLEVELS_      INTEGER*4   num_levels                           ! out
rVAR_nINDEXRECORDS_     INTEGER*4   num_records                          ! out
rVAR_NUMallocRECS_      INTEGER*4   num_records                          ! out
rVAR_NUMBER_            CHARACTER   var_name*(*)                         ! in
                        INTEGER*4   var_num                              ! out
rVAR_NUMELEMS_          INTEGER*4   num_elements                         ! out
rVAR_NUMRECS_           INTEGER*4   num_records                          ! out
rVAR_PADVALUE_          <type>      value                                ! out
rVAR_RECVARY_           INTEGER*4   rec_vary                             ! out
rVAR_SEQDATA_           <type>      value                                ! out
rVAR_SPARSEARRAYS_      INTEGER*4   s_arrays_type                        ! out
                        INTEGER*4   a_arrays_parms(CDF_MAX_PARMS)
                                                                         ! out
                        INTEGER*4   a_arrays_pct                         ! out
rVAR_SPARSERECORDS_     INTEGER*4   s_records_type                       ! out
rVARs_DIMSIZES_         INTEGER*4   dim_sizes(CDF_MAX_DIMS)              ! out
rVARs_MAXREC_           INTEGER*4   max_rec                              ! out
rVARs_NUMDIMS_          INTEGER*4   num_dims                             ! out
rVARs_RECDATA_          INTEGER*4   num_vars                             ! in
                        INTEGER*4   var_nums(*)                          ! in
                        <type>      buffer                               ! out
STATUS_TEXT_            CHARACTER   text*(CDF_STATUSTEXT_LEN)            ! out
zENTRY_DATA_            <type>      value                                ! out
zENTRY_DATATYPE_        INTEGER*4   data_type                            ! out
zENTRY_NUMELEMS_        INTEGER*4   num_elements                         ! out
zVAR_ALLOCATEDFROM_     INTEGER*4   start_record                         ! in
                        INTEGER*4   next_record                          ! out
zVAR_ALLOCATEDTO_       INTEGER*4   start_record                         ! in
                        INTEGER*4   last_record                          ! out
zVAR_BLOCKINGFACTOR_    INTEGER*4   blocking_factor                      ! out
zVAR_COMPRESSION_       INTEGER*4   c_type                               ! out
                        INTEGER*4   c_parms(CDF_MAX_PARMS)               ! out
                        INTEGER*4   c_pct                                ! out
zVAR_DATA_              <type>      value                                ! out
zVAR_DATATYPE_          INTEGER*4   data_type                            ! out
zVAR_DIMSIZES_          INTEGER*4   dim_sizes(CDF_MAX_DIMS)              ! out
zVAR_DIMVARYS_          INTEGER*4   dim_varys(CDF_MAX_DIMS)              ! out
zVAR_HYPERDATA_         <type>      buffer                               ! out
zVAR_MAXallocREC_       INTEGER*4   max_rec                              ! out
zVAR_MAXREC_            INTEGER*4   max_rec                              ! out
zVAR_NAME_              CHARACTER   var_name*(CDF_VAR_NAME_LEN256)
                                                                         ! out
zVAR_nINDEXENTRIES_     INTEGER*4   num_entries                          ! out
zVAR_nINDEXLEVELS_      INTEGER*4   num_levels                           ! out
zVAR_nINDEXRECORDS_     INTEGER*4   num_records                          ! out
zVAR_NUMallocRECS_      INTEGER*4   num_records                          ! out
zVAR_NUMBER_            CHARACTER   var_name*(*)                         ! in
```

```
                                INTEGER*4   var_num                          ! out
        zVAR_NUMDIMS_           INTEGER*4   num_dims                         ! out
        zVAR_NUMELEMS_          INTEGER*4   num_elements                     ! out
        zVAR_NUMRECS_           INTEGER*4   num_records                      ! out
        zVAR_PADVALUE_          <type>      value                            ! out
        zVAR_RECVARY_           INTEGER*4   rec_vary                         ! out
        zVAR_SEQDATA_           <type>      value                            ! out
        zVAR_SPARSEARRAYS_      INTEGER*4   s_arrays_type                    ! out
                                INTEGER*4   a_arrays_parms(CDF_MAX_PARMS)
                                                                             ! out
                                INTEGER*4   a_arrays_pct                     ! out
        zVAR_SPARSERECORDS_     INTEGER*4   s_records_type                   ! out
        zVARs_MAXREC_           INTEGER*4   max_rec                          ! out
        zVARs_RECDATA_          INTEGER*4   num_vars                         ! in
                                INTEGER*4   var_nums(*)                      ! in
                                <type>      buffer                           ! out
NULL_

OPEN_
        CDF_                    CHARACTER   CDF_name*(*)                     ! in
                                INTEGER*4   id                               ! out
PUT__
        ATTR_NAME_              CHARACTER   attr_name*(*)                    ! in
        ATTR_SCOPE_             INTEGER*4   scope                            ! in
        CDF_CHECKSUM_           INTEGER*4   checksum                         ! in
        CDF_COMPRESSION_        INTEGER*4   cType                            ! in
                                INTEGER*4   c_parms(*)                       ! in
        CDF_ENCODING_           INTEGER*4   encoding                         ! in
        CDF_FORMAT_             INTEGER*4   format                           ! in
        CDF_MAJORITY_           INTEGER*4   majority                         ! in
        gENTRY_DATA_            INTEGER*4   data_type                        ! in
                                INTEGER*4   num_elements                     ! in
                                <type>      value                            ! in
        gENTRY_DATASPEC_        INTEGER*4   data_type                        ! in
                                INTEGER*4   num_elements                     ! in
        rENTRY_DATA_            INTEGER*4   data_type                        ! in
                                INTEGER*4   num_elements                     ! in
                                <type>      value                            ! in
        rENTRY_DATASPEC_        INTEGER*4   data_type                        ! in
                                INTEGER*4   num_elements                     ! in
        rVAR_ALLOCATEBLOCK_     INTEGER*4   first_record                     ! in
                                INTEGER*4   last_record                      ! in
        rVAR_ALLOCATERECS_      INTEGER*4   numRecords                       ! in
        rVAR_BLOCKINGFACTOR_    INTEGER*4   blockingFactor                   ! in
        rVAR_COMPRESSION_       INTEGER*4   cType                            ! in
                                INTEGER*4   c_parms(*)                       ! in
        rVAR_DATA_              <type>      value                            ! in
        rVAR_DATASPEC_          INTEGER*4   data_type                        ! in
                                INTEGER*4   num_elements                     ! in
        rVAR_DIMVARYS_          INTEGER*4   dim_varys(*)                     ! in
        rVAR_HYPERDATA_         <type>      buffer                           ! in
        rVAR_INITIALRECS_       INTEGER*4   num_records                      ! in
        rVAR_NAME_              CHARACTER   var_name*(*)                     ! in
        rVAR_PADVALUE_          <type>      value                            ! in
        rVAR_RECVARY_           INTEGER*4   rec_vary                         ! in
        rVAR_SEQDATA_           <type>      value                            ! in
```

```
        rVAR_SPARSEARRAYS_      INTEGER*4   s_arrays_type           ! in
                                INTEGER*4   a_arrays_parms(*)       ! in
        rVAR_SPARSERECORDS_     INTEGER*4   s_records_type          ! in
        rVARs_RECDATA_          INTEGER*4   num_vars                ! in
                                INTEGER*4   var_nums(*)             ! in
                                <type>      buffer                  ! in
        zENTRY_DATA_            INTEGER*4   data_type               ! in
                                INTEGER*4   num_elements            ! in
                                <type>      value                   ! in
        zENTRY_DATASPEC_        INTEGER*4   data_type               ! in
                                INTEGER*4   num_elements            ! in
        zVAR_ALLOCATEBLOCK_     INTEGER*4   first_record            ! in
                                INTEGER*4   last_record             ! in
        zVAR_ALLOCATERECS_      INTEGER*4   numRecords              ! in
        zVAR_BLOCKINGFACTOR_    INTEGER*4   blockingFactor          ! in
        zVAR_COMPRESSION_       INTEGER*4   cType                   ! in
                                INTEGER*4   c_parms(*)              ! in
        zVAR_DATA_              <type>      value                   ! in
        zVAR_DATASPEC_          INTEGER*4   data_type               ! in
                                INTEGER*4   num_elements            ! in
        zVAR_DIMVARYS_          INTEGER*4   dim_varys(*)            ! in
        zVAR_INITIALRECS_       INTEGER*4   num_records             ! in
        zVAR_HYPERDATA_         <type>      buffer                  ! in
        zVAR_NAME_              CHARACTER   var_name                ! in
        zVAR_PADVALUE_          <type>      value                   ! in
        zVAR_RECVARY_           INTEGER*4   rec_vary                ! in
        zVAR_SEQDATA_           <type>      value                   ! in
        zVAR_SPARSEARRAYS_      INTEGER*4   s_arrays_type           ! in
                                INTEGER*4   a_arrays_parms(*)       ! in
        zVAR_SPARSERECORDS_     INTEGER*4   s_records_type          ! in
        zVARs_RECDATA_          INTEGER*4   num_vars                ! in
                                INTEGER*4   var_nums(*)             ! in
                                <type>      buffer                  ! in
SELECT_
        ATTR_                   INTEGER*4   attr_num                ! in
        ATTR_NAME_              CHARACTER   attr_name*(*)           ! in
        CDF_                    INTEGER*4   id                      ! in
        CDF_CACHESIZE_          INTEGER*4   num_buffers             ! in
        CDF_DECODING_           INTEGER*4   decoding                ! in
        CDF_NEGtoPOSfp0_MODE_   INTEGER*4   mode                    ! in
        CDF_READONLY_MODE_      INTEGER*4   mode                    ! in
        CDF_SCRATCHDIR_         CHARACTER   dir_name*(*)            ! in
        CDF_STATUS_             INTEGER*4   status                  ! in
        CDF_zMODE_              INTEGER*4   mode                    ! in
        COMPRESS_CACHESIZE_     INTEGER*4   num_buffers             ! in
        gENTRY_                 INTEGER*4   entry_num               ! in
        rENTRY_                 INTEGER*4   entry_num               ! in
        rENTRY_NAME_            CHARACTER   var_name*(*)            ! in
        rVAR_                   INTEGER*4   var_num                 ! in
        rVAR_CACHESIZE_         INTEGER*4   num_buffers             ! in
        rVAR_NAME_              CHARACTER   var_name*(*)            ! in
        rVAR_RESERVEPERCENT_    INTEGER*4   percent                 ! in
        rVAR_SEQPOS_            INTEGER*4   rec_num                 ! in
                                INTEGER*4   indices(*)              ! in
        rVARs_CACHESIZE_        INTEGER*4   num_buffers             ! in
        rVARs_DIMCOUNTS_        INTEGER*4   counts(*)               ! in
```

```
rVARs_DIMINDICES_          INTEGER*4   indices(*)          ! in
rVARs_DIMINTERVALS_        INTEGER*4   intervals(*)        ! in
rVARs_RECCOUNT_            INTEGER*4   rec_count           ! in
rVARs_RECINTERVAL_         INTEGER*4   rec_interval        ! in
rVARs_RECNUMBER_           INTEGER*4   rec_num             ! in
STAGE_CACHESIZE_           INTEGER*4   num_buffers         ! in
zENTRY_                    INTEGER*4   entry_num           ! in
zENTRY_NAME_               CHARACTER   var_name*(*)        ! in
zVAR_                      INTEGER*4   var_num             ! in
zVAR_CACHESIZE_            INTEGER*4   num_buffers         ! in
zVAR_DIMCOUNTS_            INTEGER*4   counts(*)           ! in
zVAR_DIMINDICES_           INTEGER*4   indices(*)          ! in
zVAR_DIMINTERVALS_         INTEGER*4   intervals(*)        ! in
zVAR_NAME_                 CHARACTER   var_name*(*)        ! in
zVAR_RECCOUNT_             INTEGER*4   rec_count           ! in
zVAR_RECINTERVAL_          INTEGER*4   rec_interval        ! in
zVAR_RECNUMBER_            INTEGER*4   rec_num             ! in
zVAR_RESERVEPERCENT_       INTEGER*4   percent             ! in
zVAR_SEQPOS_               INTEGER*4   rec_num             ! in
                           INTEGER*4   indices(*)          ! in
zVARs_CACHESIZE_           INTEGER*4   num_buffers         ! in
zVARs_RECNUMBER_           INTEGER*4   rec_num             ! in
```

B.4 EPOCH Utility Routines

```
SUBROUTINE compute_EPOCH (year, month, day, hour, minute, second, msec, epoch)
INTEGER*4  year                                                    ! in
INTEGER*4  month                                                   ! in
INTEGER*4  day                                                     ! in
INTEGER*4  hour                                                    ! in
INTEGER*4  minute                                                  ! in
INTEGER*4  second                                                  ! in
INTEGER*4  msec                                                    ! in
REAL*4     epoch                                                   ! out

SUBROUTINE EPOCH_breakdown (epoch, year, month, day, hour, minute, second, msec)
REAL*4     epoch                                                   ! in
INTEGER*4  year                                                    ! out
INTEGER*4  month                                                   ! out
INTEGER*4  day                                                     ! out
INTEGER*4  hour                                                    ! out
INTEGER*4  minute                                                  ! out
INTEGER*4  second                                                  ! out
INTEGER*4  msec                                                    ! out

SUBROUTINE toencode_EPOCH (epoch, style, epString)
REAL*8         epoch                                               ! in
INTEGER*4       style                                              ! in
CHARACTER  epString*(EPOCH_STRING_LEN)                             ! out

SUBROUTINE encode_EPOCH (epoch, epString)
REAL*8         epoch                                               ! in
CHARACTER  epString*(EPOCH_STRING_LEN)                             ! out

SUBROUTINE encode_EPOCH1 (epoch, epString)
REAL*8         epoch                                               ! in
CHARACTER  epString*(EPOCH1_STRING_LEN)                            ! out

SUBROUTINE encode_EPOCH2 (epoch, epString)
REAL*8         epoch                                               ! in
CHARACTER  epString*(EPOCH2_STRING_LEN)                            ! out

SUBROUTINE encode_EPOCH3 (epoch, epString)
REAL*8         epoch                                               ! in
CHARACTER  epString*(EPOCH3_STRING_LEN)                            ! out

SUBROUTINE encode_EPOCH4 (epoch, epString)
REAL*8         epoch                                               ! in
CHARACTER  epString*(EPOCH4_STRING_LEN)                            ! out

SUBROUTINE encode_EPOCHx (epoch, format, epString)
REAL*8          epoch                                              ! in
CHARACTER    format*(EPOCHx_FORMAT_MAX)                            ! in
```

```
CHARACTER   epString*(EPOCHx_STRING_MAX)                                  ! out

SUBROUTINE  toparse_EPOCH  (epString, epoch)
CHARACTER   epString*(EPOCH_STRING_LEN)                                  ! in
REAL*8          epoch                                                    ! out

SUBROUTINE  parse_EPOCH  (epString, epoch)
CHARACTER   epString*(EPOCH_STRING_LEN)                                  ! in
REAL*8          epoch                                                    ! out

SUBROUTINE  parse_EPOCH1  (epString, epoch)
CHARACTER   epString*(EPOCH1_STRING_LEN)                                 ! in
REAL*8          epoch                                                    ! out

SUBROUTINE  parse_EPOCH2  (epString, epoch)
CHARACTER   epString*(EPOCH2_STRING_LEN)                                 ! in
REAL*8          epoch                                                    ! out

SUBROUTINE  parse_EPOCH3  (epString, epoch)
CHARACTER   epString*(EPOCH3_STRING_LEN)                                 ! in
REAL*8          epoch                                                    ! out

SUBROUTINE  parse_EPOCH4  (epString, epoch)
CHARACTER   epString*(EPOCH4_STRING_LEN)                                 ! in
REAL*8          epoch                                                    ! out

SUBROUTINE  compute_EPOCH16 (year, month, day, hour, minute, second, msec, epoch)
INTEGER*4  year                                                          ! in
INTEGER*4  month                                                         ! in
INTEGER*4  day                                                           ! in
INTEGER*4  hour                                                          ! in
INTEGER*4  minute                                                        ! in
INTEGER*4  second                                                        ! in
INTEGER*4  msec                                                          ! in
REAL*4      epoch(2)                                                     ! out

SUBROUTINE  EPOCH16_breakdown (epoch, year, month, day, hour, minute, second, msec)
REAL*4      epoch(2)                                                     ! in
INTEGER*4  year                                                          ! out
INTEGER*4  month                                                         ! out
INTEGER*4  day                                                           ! out
INTEGER*4  hour                                                          ! out
INTEGER*4  minute                                                        ! out
INTEGER*4  second                                                        ! out
INTEGER*4  msec                                                          ! out

SUBROUTINE  toencode_EPOCH16 (epoch, style, epString)
REAL*8          epoch(2)                                                 ! in
INTEGER*4       style                                                    ! in
CHARACTER   epString*(EPOCH16_STRING_LEN)                                ! out

SUBROUTINE  encode_EPOCH16 (epoch, epString)
REAL*8          epoch(2)                                                 ! in
CHARACTER   epString*(EPOCH16_STRING_LEN)                                ! out

SUBROUTINE  encode_EPOCH16_1 (epoch, epString)
```

```
REAL*8         epoch(2)                                  ! in
CHARACTER   epString*(EPOCH16_1_STRING_LEN)              ! out

SUBROUTINE  encode_EPOCH16_2  (epoch,  epString)
REAL*8         epoch(2)                                  ! in
CHARACTER   epString*(EPOCH16_2_STRING_LEN)              ! out

SUBROUTINE  encode_EPOCH16_3  (epoch,  epString)
REAL*8         epoch(2)                                  ! in
CHARACTER   epString*(EPOCH16_3_STRING_LEN)              ! out

SUBROUTINE  encode_EPOCH16_4  (epoch,  epString)
REAL*8         epoch(2)                                  ! in
CHARACTER   epString*(EPOCH16_4_STRING_LEN)              ! out

SUBROUTINE  encode_EPOCH16_x  (epoch,  format,  epString)
REAL*8         epoch(2)                                  ! in
CHARACTER   format*(EPOCHx_FORMAT_MAX)                   ! in
CHARACTER   epString*(EPOCHx_STRING_MAX)                 ! out

SUBROUTINE  toparse_EPOCH16  (epString, epoch)
CHARACTER   epString*(EPOCH16_STRING_LEN)                ! in
REAL*8         epoch(2)                                  ! out

SUBROUTINE  parse_EPOCH16  (epString, epoch)
CHARACTER   epString*(EPOCH16_STRING_LEN)                ! in
REAL*8         epoch(2)                                  ! out

SUBROUTINE  parse_EPOCH16_1  (epString, epoch)
CHARACTER   epString*(EPOCH16_1_STRING_LEN)              ! in
REAL*8         epoch(2)                                  ! out

SUBROUTINE  parse_EPOCH16_2  (epString, epoch)
CHARACTER   epString*(EPOCH16_2_STRING_LEN)              ! in
REAL*8         epoch                                     ! out

SUBROUTINE  parse_EPOCH16_3  (epString, epoch)
CHARACTER   epString*(EPOCH16_3_STRING_LEN)              ! in
REAL*8         epoch(2)

SUBROUTINE  parse_EPOCH16_4  (epString, epoch)
CHARACTER   epString*(EPOCH16_4_STRING_LEN)              ! in
REAL*8         epoch(2)                                  ! out

SUBROUTINE EPOCH_to_UnixTime  (epoch, unixtime, numtimes)
REAL*8         epoch                                     ! in
REAL*8         unixtime                                  ! out
INTEGER        numtimes                                  ! in

SUBROUTINE EPOCH16_to_UnixTime  (epoch, unixtime, numtimes)
REAL*8         epoch                                     ! in
REAL*8         unixtime                                  ! out
INTEGER        numtimes                                  ! in

SUBROUTINE UnixTime_to_EPOCH  (unixtime, epoch, numtimes)
REAL*8         unixtime                                  ! in
```

```
REAL*8          epoch                                                   ! out
INTEGER         numtimes                                                ! in

SUBROUTINE UnixTime_to_EPOCH16  (unixtime, epoch, numtimes)
REAL*8          unixtime                                                ! in
REAL*8          epoch                                                   ! out
INTEGER         numtimes                                                ! in
```

B.5 TT2000 Utility Routines

```
SUBROUTINE  compute_TT2000  (year,  month,  day,  hour,  minute,  second,  msec, epoch)
INTEGER*4  year                                                                  ! in
INTEGER*4  month                                                                 ! in
INTEGER*4  day                                                                   ! in
INTEGER*4  hour                                                                  ! in
INTEGER*4  minute                                                                ! in
INTEGER*4  second                                                                ! in
INTEGER*4  msec                                                                  ! in
INTEGER*4  usec                                                                  ! in
INTEGER*4  nsec                                                                  ! in
INTEGER*8  tt2000                                                                ! out

SUBROUTINE  TT2000_breakdown  (tt2000,  year,  month,  day,  hour,  minute,  second,  msec)
INTEGER*8  tt2000                                                                ! in
INTEGER*4  year                                                                  ! out
INTEGER*4  month                                                                 ! out
INTEGER*4  day                                                                   ! out
INTEGER*4  hour                                                                  ! out
INTEGER*4  minute                                                                ! out
INTEGER*4  second                                                                ! out
INTEGER*4  msec                                                                  ! out
INTEGER*4  usec                                                                  ! out
INTEGER*4  nsec                                                                  ! out

SUBROUTINE  toencode_TT2000  (tt2000, style, epString)
INTEGER*8  tt2000                                                                ! in
INTEGER*4  style                                                                 ! in
CHARACTER  epString*(TT2000_*_STRING_LEN)                                        ! out

SUBROUTINE  encode_TT2000  (tt2000, style, epString)
INTEGER*8  tt2000                                                                ! in
INTEGER*4  style,                                                                ! in
CHARACTER  epString*(TT2000_*_STRING_LEN)                                        ! out

SUBROUTINE  parse_TT2000  (epString, tt2000)
CHARACTER    epString*(TT2000_*_STRING_LEN)                                      ! in
INTEGER*8      tt2000                                                            ! out

SUBROUTINE  toparse_TT2000  (epString, tt2000)
CHARACTER    epString*(TT2000_*_STRING_LEN)                                      ! in
INTEGER*8      tt2000                                                            ! out

SUBROUTINE TT2000_to_EPOCH  (tt2000, epoch)
INTEGER*8  tt2000                                                                ! in
REAL*8       epoch,                                                              ! out

SUBROUTINE TT2000_from_EPOCH  (epoch, tt2000)
REAL*8       epoch                                                               ! in
INTEGER*8  tt2000                                                                ! out

SUBROUTINE TT2000_to_EPOCH16  (tt2000, epoch16)
```

```
INTEGER*8  tt2000                                                    ! in
REAL*8     epoch16(2)                                                ! out

SUBROUTINE TT2000_from_EPOCH16  (epoch16, tt2000)
REAL*8     epoch16(2)                                                ! in
INTEGER*8 tt2000                                                     ! out

SUBROUTINE TT2000_to_UnixTime  (tt2000, unixtime, numtimes)
INTEGER*8  tt2000                                                    ! in
REAL*8     unixtime                                                  ! out
INTEGER    numtimes                                                  ! in

SUBROUTINE UnixTime_to_TT2000  (unixtime, tt2000, numtimes)
REAL*8     unixtime                                                  ! in
INTEGER*8  tt2000                                                    ! out
INTEGER    numtimes                                                  ! in
```

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