US Army Corps
of Engineers
Hydrologic Engineering Center

ExportSHEF

SHEF Formatted Data Exporter for the Corps Water Management System

User's Manual

Version 1.3
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1 Description

ExportSHEF is a utility for the Corps Water Management System (CWMS) that allows time series data to be retrieved from the CWMS database and formatted in the Standard Hydrometeorological Exchange Format (SHEF). ExportSHEF version 1.3 uses SHEF version is 2.0. Portions of this specification are included in Section 6 (SHEF Standards) for convenience.

2 Installation

As of version 1.3 the ExportSHEF program is distributed as a Jython program file named exportSHEF.py. As of CWMS version 2.1, the exportSHEF.py program file is distributed with the server setup. Other environments may download the exportSHEF.py program file from the CWMS Wiki.

3 Usage

- **CWMS 2.1+ Server Environment**. Beginning with CWMS 2.1 the server environment contains not only the exportSHEF.py program file but also convenience scripts to execute it. The program is executed simply by executing the command `ExportSHEF` or `exportshef`.

- **Other Environments**. On CWMS 2.0 servers or any CWMS client, ExportSHEF is executed by running the CWMS Jython interpreter and passing the full pathname of the exportSHEF.py program file as the first parameter.

A number of parameters may be passed to the program from the command line, although none are required. All parameters that can be passed on the command line can also be specified in the input file, with the exception of the input, output, and log files.

3.1 Execution Line

The execution line used to invoke ExportSHEF is:

CWMS 2.1+ Server Only
`ExportSHEF [`*`parameter`*`] [`*`parameter`*`]…`

Other Environments
`jython `*`pathname_to_program/`*`exportSHEF.py [`*`parameter`*`] [`*`parameter`*`]…`

Each *`parameter`* consists of a *`name`* part and a *`value`* part that can be expressed in any of the following manners:

- *`name=value`*
- *`-name value`*
- *`/name value`*

In each case, if the value portion of the parameter contains one or more spaces, the entire value portion should be enclosed in quotation marks. Each parameter is either a file parameter or a command parameter.

3.1.1 File Parameters

Valid file parameter names are `IN`, `OUT` and `LOG`. Unlike command parameters, file parameter names cannot be abbreviated.

3.1.1.1 IN

The `IN` parameter specifies the pathname of the main input file. If the specified input file contains `INCLUDE` commands without absolute pathnames, the names of the included files will be relative to the main input file. If not specified, ExportSHEF reads it input from the standard input device, which may be connected to a file using the input redirection character (`<`) or to the output of another command using the pipe character (`|`).

3.1.1.2 OUT

The `OUT` parameter specifies the pathname of the output file, which will receive the results (SHEF messages) of the ExportSHEF program. If not specified, ExportSHEF writes its results to the standard output device, which may be connected to a file using output redirection (`>` for overwrite, `>>` for append) or to the input of another command using the pipe character (`|`).

3.1.1.3 LOG

The `LOG` parameter specifies the pathname of the log file, which will receive debug and error messages. If not specified, ExportSHEF writes its debug and error messages to the standard error device, which may be connected to a file using error redirection (`2>` for overwrite, `2>>` for append) or redirected into the standard output device using `2>&1`. Note that redirecting the standard error device is not supported by the C shell (`csh`) but is supported by other shells (e.g., `sh`, `ksh`, `bash`), as well as the Windows command interpreter.

3.1.2 Command Parameters

Valid command parameter names are the following subset of ExportSHEF commands:

```
DB          DBI          DEBUG       DELIMITER   FORMAT
GROUP       LINEWIDTH    MISSING     QUALITY     REVISED
SYSTEM      TIMEWINDOW   TYPE        TZONE
```

As with input file command lines, the minimum number of characters necessary to specify a particular command parameter is the minimum number required to uniquely identify it. For example, only `F` is required to specify the `FORMAT` command, since no other commands begin with the letter "F", the `DEBUG` command requires at least `DEB` and the `DELIMITER` command requires at least `DEL`. Valid value portions of the available command parameters are specified in Section 4 (Commands).

3.2 Input File

ExportSHEF reads its input on a line-oriented basis, whether from a specified input file or from the standard input (redirected or piped input). Like a POSIX shell script, the hash character (#) on a line in the input file designates the remainder of the line to be a comment, not to be processed by ExportSHEF. If the hash character should not indicate a comment (e.g. used on an `OUTPUT` command line), placing a backslash character (\) immediately before the hash character will cause the removal of the backslash character only. Also like a POSIX shell script, input file lines may reference environment variables by using `$`*`name`*, where *`name`* is the name of the environment variable. The ExportSHEF input file is comprised of four types of lines: empty lines, environment variable assignment lines, command lines, and export lines.

3.2.1 Environment Variables

ExportSHEF input file lines may refer to environment variables as discussed in the previous section. The environment variables so referenced may be assigned prior to executing – and inherited by – ExportSHEF, or they may be assigned during the execution of ExportSHEF as discussed in Section 3.2.3 (Environment Variable Assignment Lines). If a referenced environment variable has been assigned during the execution of ExportSHEF, its value resolves to that assignment. If a referenced environment variable has not been assigned during the execution of ExportSHEF, its value resolves to the value assigned prior to the execution of ExportSHEF. If a referenced environment variable has not been assigned either prior to or during the execution of ExportSHEF, its value resolves to an empty string (“”). Environment variables assigned during the execution of ExportSHEF have no effect after the program terminates.

3.2.2 Empty Lines

Any line in the input file that contains only white space (space, tab, carriage return, or line feed characters) after any comments are removed is an empty line and has no effect on the program output. Empty lines may be used to improve the human readability of the input file.

3.2.3 Environment Variable Assignment Lines

Environment variables can be defined using the syntax *`name=value`*, which specifies that the text `$`*`name`* later in the input file will resolve to *`value`*. Only one variable may be assigned on a line. Unlike the execution line, quotation marks are not necessary to assign a *`value`* containing spaces.

3.2.4 Command Lines

A command line contains a valid ExportSHEF command, which may be expressed in one of the following manners:

- *`command=parameter`*
- *`command parameter`*

In either case, *command* is a valid ExportSHEF command, and *parameter* is a valid parameter for that particular command. The minimum number of characters necessary to

specify a particular command is the minimum number required to be able to distinguish one command from another. For example, only `F` is required to specify the `FORMAT` command, since no other commands begin with the letter "F", while the `DBI` command requires at least `DB`, the `DEBUG` command requires at least `DEB` and the `DELIMITER` command requires at least `DEL`. Valid commands are listed in Section 4 (Commands).

3.2.5 Export Lines

Export commands cause ExportSHEF to retrieve time series values from the database and insert them into a SHEF message. The DBI and time window must have been previously specified. Export lines have the following format:

time-series_definition[;*modifiers*]

The *time-series_definition* is the CWMS six-part period-delimited time series definition used to identify the data in the CWMS database (i.e., *location.parameter.parameter-type.interval.duration.version*).
In the absence of *modifiers*, the SHEF message is generated using default or previously specified values for the location, parameter code, time zone and units. If specified, *modifiers* has the following format:

name=*value*[,*name*=*value*[,…]]

Note that the semicolon is used to separate modifiers from the time series definition, and the comma is used to separate modifiers from each other. The minimum number of characters necessary to specify a particular modifier is the minimum number required to uniquely identify it. Valid modifier names are `LOCATION`, `PARAMETER`, `TZONE`, `UNITS`, and `FACTOR`.

3.2.5.1 LOCATION Modifier

The `LOCATION` export modifier specifies the SHEF location identifier to be used in the SHEF message output. Valid SHEF location identifiers are three to eight characters in length, comprised of letters, digits, and the underscore character (_). If not specified, the previously mapped location, if any is used. If no location is mapped, the location portion of the time-series definition is transformed into the nearest matching valid SHEF location identifier.

3.2.5.2 PARAMETER Modifier

The `PARAMETER` export modifier specifies the SHEF parameter code to be used in the SHEF message output. The parameter code may be the full seven-character code as described in Section 6.2 (SHEF Parameters), or a portion thereof. If not specified, the SHEF parameter is generated using previously mapped values for the physical element code, as well as the type and source code, combined with default mappings of the duration, extremum and probability codes. If no physical element or type and source codes are mapped, defaults mappings for those portions of the parameter are used. If only a portion of the SHEF parameter code is specified by the `PARAMETER` export modifier, the remainder of the code is generated as mentioned above. If no `PARAMETER`

export modifier is specified, and no previous mappings exist for the physical element and type and source codes, ExportSHEF may fail to properly map the time series definition to a SHEF parameter code. In this case, ExportSHEF will write the following BASIC level debug message to the log output:

```
CWMS description xxx has no corresponding SHEF parameter
```

3.2.5.3 TZONE Modifier

The `TZONE` export modifier specifies the SHEF time zone to be used in the SHEF message output. This time zone is independent of any time zone specified on the `TIMEWINDOW` command. Valid SHEF time zones are listed in Section 6.4 (SHEF Time Zones).

3.2.5.4 UNITS Modifier

The `UNITS` export modifier specifies the units to be used in the SHEF message output. This modifier should only be used to specify the units where the SHEF parameter code contains a non-standard physical element code. Units for standard SHEF physical element codes are listed in Section 6.3 (SHEF Units). The units output for standard SHEF physical element codes can be overridden using this modifier, but note that messages using other non-standard units will not meet the SHEF standard and will be misinterpreted by standard SHEF decoders. If specified, this modifier uses standard CWMS transformations to convert from the units stored in the database to the specified units. This modifier may not be used with the `FACTOR` export modifier.

3.2.5.5 FACTOR Modifier

The `FACTOR` export modifier specifies a value by which to multiply CWMS database values to generate data values in the SHEF message output. This modifier should only be used where the SHEF parameter code contains a non-standard physical element code. Units for standard SHEF physical element codes are listed in Section 6.3 (SHEF Units). The units output for standard SHEF physical element codes can be overridden using this modifier, but note that messages using other non-standard units will not meet the SHEF standard and will be misinterpreted by standard SHEF decoders. If specified, this modifier causes ExportSHEF to multiply data values received from the CWMS database by the specified factor before outputting to the SHEF message. This modifier may not be used with the `UNITS` export modifier.

3.2.5.6 OFFSET Modifier

The `OFFSET` export modifier specifies a value by which to increment the data values retrieved from the CWMS database, and is useful mainly for creating SHEF messages containing stages when only elevations are stored in the database, or vice versa. The `OFFSET` export modifier does not affect the units of the resulting SHEF messages since the data are only translated and not scaled. As such, it may be used in conjunction with the `UNITS` export modifier. Whether used with or without the `UNITS` export modifier, the increment specified is always in the units of the resulting SHEF message.

If the OFFSET export modifier is used in conjunction with the FACTOR export modifier, all restrictions for the FACTOR export modifier remain in effect, and the increment specified is in scaled database units (e.g. SHEF value = (database value * FACTOR) + OFFSET).

4 Commands

The following commands are used to control how ExportSHEF generates its results from export lines later in the input file.

4.1 DB Command

The DB command is used to connect to CWMS 2.x databases and specifies which CWMS database to connect to for retrieving time series data from the database.
Parameter Format:

- LOCAL
- *user/pass@sid*
- *user/pass@host/sid*
- *user/pass@host:port/sid*

If the parameter is specified as LOCAL, ExportSHEF will try to connect to the database specified on the line that begins with

```
cwms.dbi.connectUsingUrl=
```

in the file

```
$CWMS_HOME/config/properties/dbi.properties.
```

This format is useful for executing the program on a CWMS server and using the locally defined database.

Otherwise, the parameter must be specified as a valid Oracle connection string where *user* and *pass* specify the user credentials, *host* specifies the network address or name of the system hosting the database, *port* is the Oracle listener port on the host (usually 1521), and *sid* is the Oracle system identifier of the database.

For CWMS 2.x production databases, the connection string

user/pass@*xxx*-cwmsdb1.*xxx*.usace.army.mil:1521/*YY*CWMSP1

can be used, where *xxx* is the office identifier (e.g., lrh, swf) and *YY* is the corresponding EROC for the same office (e.g., H1, M2).

By default, the database is undefined in ExportSHEF.

4.2 DBI Command

The `DBI` command is used to connect to CWMS 1.5 databases and specifies which CWMS database interface (DBI) to connect to for retrieving time series data from the database.

Parameter Format:

- `LOCAL`
- `rmi://`*`host`*`:`*`port`*`/DbiHandler`

If the parameter is specified as `LOCAL`, ExportSHEF will try to locate the DBI specified on the line that begins with

```
wcds.dbi.server=
```

in the file

```
$CWMS_HOME/config/properties/cwms.properties
```

This format is useful for executing the program on a CWMS server and using the locally defined DBI.

Otherwise, the parameter must be specified as a Java RMI URI where *`host`* is the internet address of the computer executing the DBI, and *`port`* is the DBI's port number. In order for ExportSHEF to successfully accesses a DBI on a remote computer, the remote DBI's access control list (ACL) must include an entry for the combination of the user name and computer from which ExportSHEF is executed.

By default, the DBI is undefined in ExportSHEF.

4.3 DEBUG Command

The `DEBUG` command sets the maximum level of debug messages that will be written to the log output.

Parameter Format:

- `{NONE | BASIC | DETAILED | VERBOSE}`
- `{ 0 | 1 | 2 | 3 }`

Either the text or numeric form may be used as a parameter.

If the debug level is set to `NONE/0`, no debug messages will be written to the log output.

If the debug level is set to `BASIC/1`, only `BASIC` debug messages will be written to the log output.

If the debug level is set to `DETAILED/2`, only `BASIC` and `DETAILED` debug messages will be written to the log output.

If the debug level is set to `VERBOSE/3`, `BASIC`, `DETAILED` and `VERBOSE` debug messages will be written to the log output.

Debug messages and their associated levels are listed in Section 5 (Troubleshooting).

By default, ExportSHEF has the debug level set to `BASIC`.

4.4 DELIMITER Command

The `DELIMITER` command specifies the delimiter used to separate portions of the SHEF messages written to the output.

Parameter Format:

`"/", " /", "/ ", " / "`, etc…

The slash character (`/`) is used to delimit portions of a SHEF message. This command allows the user to specify a number of spaces before and after the slash character. The parameter requires quotation marks in order to determine the intended number of spaces on each side of the slash character. Keep in mind that 15 consecutive spaces will cause a SHEF parser to terminate processing of a SHEF message

By default, ExportSHEF has the delimiter set to `"/ "` (one space on each side of the slash character).

4.5 FORMAT Command

The `FORMAT` command specifies the numeric format of data values in the SHEF messages written to the output, by physical element code.

Parameter Format:

pe`([`*s*`][/]`*fmt*`])[,`*pe*`([`*s*`][/]`*fmt*`)][,…]`

Where:

- ***pe*** (required) is a SHEF physical element code, or an asterisk (`*`)
- ***s*** (optional) is the maximum number of significant digits
- **/** is required only if *s* and *fmt* are both specified
- ***fmt*** (optional) is `[+|-]`*w*`.`*p*`[Q]`

  Where:

  - **+** (optional) specifies to always output the sign of the data value

- **-** (optional) specifies to output the sign for negative data values, and a space in the sign place for non-negative data values
- ***w*** (required) specifies the total width of the numeric portion of the data value, including the decimal point
- ***p*** (required) specifies the number of decimal places to the right of the decimal point
- **Q** specifies reserving a place for the data value quality code, even if a quality code is not attached to this value. See Section 4.12 (QUALITY Command) for a discussion of using SHEF quality codes.

If no format has been specified for a particular physical element code, data values output for that code will be formatted using the default format.

If a data value is formatted according to a format specification that includes only the maximum number of significant digits (no *fmt* specified), the value will include no more than the specified number of significant digits, will have trailing zeros to the right of the decimal point truncated, and will have no leading or trailing spaces. This is referred to as a packed format.

If a data value is formatted according to a format specification that includes no maximum number of significant digits (only *fmt* specified), the value will contain no more than the maximum number of significant digits of the default format.

If the asterisk (*) is specified for the physical element code, formats for all physical element codes are cleared, and the default format is set to the specified format. Thus the default format should be set prior to setting formats for specific physical element codes.

If the specified default format does not include a maximum number of significant digits, the default maximum number of significant digits is set to the program default.

Either the maximum number of significant digits or a format are required unless the asterisk (*) is specified for the physical element code, where neither are required. The special command **FORMAT *()** clears the format for all physical element codes and resets the default format to the program default.

By default, ExportSHEF has all formats for all physical elements cleared, and a default packed format with a maximum number of significant digits of five.

4.6 GROUP Command

The GROUP command specifies the message accumulation mode of the ExportSHEF program.

Parameter Format:

- {TRUE | FALSE}
- { YES | NO }

- { ON | OFF }
- { 1 | 0 }

If the message accumulation mode is turned on, ExportSHEF will attempt to accumulate data from multiple export lines into a single SHEF message.

ExportSHEF will accumulate multiple SHEF into a single message only if:

- all messages are would result in **.**A type messages
- all messages are for the same location
- all message are output with the same time zone

If the accumulation mode is turned on and a particular message cannot be accumulated with one or more previous ones, the previously accumulated messages are written to the output and the new message begins a new accumulation.

If accumulation mode is turned off, a SHEF message is written to the output for each export line, regardless of whether the message can be accumulated.

The following commands will cause the immediate output of any accumulated messages, but will not alter the accumulation mode:

```
DELIMITER   FORMAT      GROUP       LINEWIDTH   LOCATION
MISSING     OUTPUT      PE          QUALITY     REVISED
SYSTEM      TS          TZONE
```

By default, ExportSHEF has the message accumulation mode turned on.

4.7 INCLUDE Command

The `INCLUDE` command causes ExportSHEF to process the contents of the specified input file before processing the next line of the current input file.

Parameter Format:

pathname

If *pathname* is a relative path name, it is resolved with respect to the directory of the current input file.

Input files may be included more than once, but ExportSHEF will not process an input file recursively (e.g. an input file may not be included while it is still opened for processing).

4.8 LINEWIDTH Command

The `LINEWIDTH` command specifies the maximum width (length) of lines written to the output.

Parameter Format:

integer

ExportSHEF will not accept line maximum width specifications greater than 1000 characters, since that is the maximum specified in the current SHEF standard.

If ExportSHEF attempts to write a line via the `OUTPUT` command that is wider than the specified maximum line width, the line is split into multiple lines with each not exceeding the specified maximum width.

If ExportSHEF attempts to output a SHEF message that is wider than the specified maximum line width, the message is split into a multi-line message, with each line not exceeding the specified maximum width.

By default, ExportSHEF has the maximum line width set to 80.

4.9 LOCATION Command

The `LOCATION` command maps a CWMS location or location mask to a SHEF location identifier.

Parameter Format:

CWMS=SHEF

Where:

- *CWMS* is the entire location portion of a CWMS time series definition (including sub-location, if any) or a mask to match multiple CWMS locations, similar to a file name mask, where the wildcard characters '*' and '?' match 0+ characters and 0-1 characters, respectively .
- *SHEF* is the SHEF identifier (three to eight letters, digits or underscore characters).

A *direct* mapping is one in which an entire CWMS location is mapped to a SHEF location identifier (no mask is used). A CWMS location can be directly mapped to only one SHEF location identifier.

An *indirect* mapping is one in which a CWMS location is mapped to a SHEF location identifier by using a mask. A CWMS location can possibly be indirectly mapped to many SHEF location identifiers.

If both direct and indirect mappings exist for a CWMS location, the direct mapping is used.

If no direct mapping exists for a CMWS location, and multiple indirect mappings exist, it is indeterminate which SHEF location identifier will be used.

By default, ExportSHEF does not map any CWMS locations to SHEF location identifiers.

4.10 MISSING Command

The `MISSING` command specifies which valid SHEF missing value code to output in SHEF messages.

Parameter Format:

- `+`
- `m`
- `M`
- `-9999`
- `-9002`

By default ExportSHEF uses "`M`" for missing values in SHEF messages.

4.11 OUTPUT Command

The `OUTPUT` command causes ExportSHEF to write literal text to the program output.

Parameter Format:

`text`

Unlike other commands, the number of spaces between the command and parameter is significant.

If an equals sign (`=`) follows the command with no intervening spaces, the text written to the output starts at the character position following the equal sign.

If the command is separated from the parameter only by spaces, the text written to the output starts after the first space following the command.

Quotation marks have no special meaning for this command, and are treated as any other character.

Although the colon character (`:`) can be the first character of text written to the output, SHEF does not require it, since SHEF decoders treat any line of text that does not begin with `.A`, `.B` or `.E` and is not in the body of a `.B`-type message as clear text and ignores it.

4.12 PE Command

The `PE` command maps CWMS parameter / parameter type combinations to SHEF standard physical element codes. Non-standard codes require the use of the `PARAMETER` export modifier.

Parameter Format:

param.*param_type*=*pe*

Where:

- *param* is a CWMS parameter or parameter mask
- *param_type* is a CWMS parameter type or parameter type mask
- *pe* is a SHEF physical element code

Parameter masks and parameter type masks are like file name masks; they use the wildcard characters '?' and '*' to match 0-1 and 0+ characters, respectively.

ExportSHEF uses the mappings created by the PE command to generate the physical element portion of the SHEF parameter code for export lines that do not have a PARAMETER export modifier.

A *direct* mapping is one in which an entire CWMS parameter and parameter type are mapped to a SHEF physical element code (no masks are used). A CWMS parameter and parameter type can be directly mapped to only one SHEF physical element code.

An *indirect* mapping is one in which a CWMS parameter and parameter type are mapped to a SHEF physical element code by using a mask. A CWMS parameter and parameter type can possibly be indirectly mapped to many SHEF physical element codes.

If a direct mapping and an indirect mapping exist for a CWMS parameter and parameter type, the directly mapped SHEF physical element code will be used.

If no direct mapping exists, and multiple indirect mappings exist for a CWMS parameter and parameter type, it is indeterminate which SHEF physical element will be used.

If the CWMS parameter and parameter type for an export line without a PARAMETER export modifier are not mapped to a SHEF physical element code, ExportSHEF will output the following BASIC level debug message:

CWMS description *xxx* has no corresponding SHEF parameter

By default, ExportSHEF does not map any CWMS parameter / parameter type combinations to SHEF physical element codes.

4.13 QUALITY Command

The QUALITY command specifies which SHEF data quality codes, if any, will be attached to the data values output in SHEF messages.

Parameter Format:

[+|-]*flag*[,[+|-]*flag*[,...]]

Where:

flag is one of:

- {BAD|ESTIMATED|GOOD|MANUAL|QUESTIONED|REJECTED|SCREENED|UNKNOWN}
- { B | E | G | M | Q | R | S | Z }
- ALL
- NONE

If the format +*flag* is used, the specified *flag* is added to the current list of quality flags. If the format -*flag* is used, the specified *flag* is removed from the current list of quality flags. If used, the + or – signs apply to all following flags, until another + or – sign is encountered. If no + or – sign is used, the listed *flag* s replace the current list of quality flags.

Data values that have SHEF quality flags among those specified with the QUALITY command will have the SHEF quality flags appended to the data values in the SHEF message. Data values that have SHEF quality flags *not* among those specified with the QUALITY command will not have the SHEF quality flags appended to the values in the SHEF message.

ExportSHEF always outputs data value quality by appending to the data values; it does not generate the DQ*q* SHEF data string qualifier.

The manner in which a SHEF quality code is appended to the data value is controlled by the format specification used to format the data value as described in Section 4.4 (FORMAT Command). For formats without a Q specification (packed or otherwise), the quality code extends the data value string when appended. For (non-packed) formats with a Q specification, any quality code is placed in the last space of the data value string, which has been reserved for a quality code.

The command QUALITY ALL is equivalent to the command QUALITY B,E,G,M,Q,R,S,Z. The command QUALITY NONE causes ExportSHEF to never append SHEF quality codes to data values.

ExportSHEF generates SHEF quality codes from CWMS quality codes using the methods in the hec.data.tx.QualityTx class in the following manner:

- The quality code is set to **B** if isScreened() and isReject() both return TRUE, and one of isReplaceManualChange() or isReplaceGraphialChange() also returns TRUE, else…
- The quality code is set to **R** if isScreened() and isReject() both return TRUE, else…
- The quality code is set to **Q** if isScreened() and isQuestion() both return TRUE, else…
- The quality code is set to **E** if isScreened() and isReplaceLinearInterpolation() both return TRUE, else…
- The quality code is set to **G** if isScreened() and isRevisedToOriginalAccepted() both return TRUE, or if isScreened() and

`isOkay()` both return `TRUE` and one of `isReplaceManualChange()` or `isReplaceGraphialChange()` also returns `TRUE`, else…

- The quality code is set to **`S`** if `isScreened()` and `isOkay()` both return `TRUE`, else…
- The quality code is set to **`M`** if `isScreened()`returns `TRUE and` one of `isReplaceManualChange()` or `isReplaceGraphialChange()` also returns `TRUE`, else…
- The quality code is set to **`Z`**.

The SHEF data quality codes `V, P, F,` and `T` are never generated by ExportSHEF.

SHEF data quality codes are listed in Section 6.5 (SHEF Data Quality Codes).

By default, ExportSHEF attaches SHEF data quality codes of `B, E, R,` and `Q` to data values output in SHEF messages.

4.14 REVISED Command

The `REVISED` command specifies whether revision mode is turned on.

Parameter Format:

- `{TRUE | FALSE}`
- `{ YES |  NO }`
- `{ ON  | OFF }`
- `{  1  |  0  }`

If revision mode is turned on, ExportSHEF will output `.A`-type messages beginning as message type `.AR` and will output `.E`-type messages beginning as message type `.ER`.

By default ExportSHEF has revision mode turned off.

4.15 SYSTEM Command

The `SYSTEM` command specifies whether ExportSHEF will output SHEF messages in English or SI (metric) units.

Parameter Format:

`{ENGLISH | SI | METRIC}`

If ExportSHEF outputs SHEF message in SI (metric) units, it places the required data string units code `DUS` in the messages.

If ExportSHEF outputs SHEF message in English units, it places the optional data string units code `DUE` in the messages.

By default, ExportSHEF outputs SHEF messages in English units.

4.16 TIMEWINDOW Command

The TIMEWINDOW command specifies the time window for which ExportSHEF will extract data from the database for the creation of SHEF messages.

Parameter Format:

start_time end_time [*time_zone*]

Where:

- *start_time* and *end_time* are {*absolute_time* | *relative_time*}

  Where:

  - absolute_time is [*day*][*month*][*year*] [*hour*][*minute*]

    Where:

    - *day* is the day of the month (01 – 31)
    - *month* is the three-character month abbreviation
    - *year* is the year
    - *hour* is the hour of the day (00 – 24)
    - *minute* is the minute of the hour (00 – 59)

  - *relative_time* is T[{-|+}*nu*]

    Where:

    - T represents the current time
    - *n* is the number of units
    - *u* is the unit of time (H)our, (D)ay, (M)onth, or (Y)ear

- time_zone is {*SHEF_time_zone* | *Java_time_zone*}

  Where:

  - *SHEF_time_zone* is a valid SHEF time zone designation as listed in Section 6.4 (SHEF Time Zones)
  - *Java_time_zone* is a valid Java time zone designation as listed in Section 7.1 (Java Time Zones)

If *start_time* and *end_time* are both relative times, *time_zone* has no meaning, and is ignored.

If *time_zone* is not valid, or is not provided and *start_time* or *end_time* is an absolute time, the time zone used to interpret the absolute time(s) is the default time zone of the computer executing ExportSHEF.

By default, the time window is undefined in ExportSHEF.

4.17 TS Command

The TS command maps CWMS versions to SHEF type and source codes.

Parameter Format:

version=*ts*

Where:

- *version* is a CWMS version or version mask
- *ts* is a SHEF type and source code

Version masks are like file name masks; they use the wildcard characters '?' and '*' to match 0-1 and 0+ characters, respectively.

ExportSHEF uses the mappings created by the TS command to generate the type and source portion of the SHEF parameter code for export lines that do not have a PARAMETER export modifier.

A *direct* mapping is one in which an entire CWMS version is mapped to a SHEF type and source code (no masks are used). A CWMS version can be directly mapped to only one SHEF type and source code.

An *indirect* mapping is one in which a CWMS version is mapped to a SHEF type and source code by using a mask. A CWMS version can possibly be indirectly mapped to many SHEF type and source codes.

If a direct mapping and an indirect mapping exist for a CWMS version, the directly mapped SHEF type and source code will be used.

If no direct mapping exists, and multiple indirect mappings exist for a CWMS version, it is indeterminate which SHEF type and source code will be used.

If the CWMS version for an export line without a PARAMETER export modifier is not mapped to a SHEF type and source code, ExportSHEF will output the following BASIC level debug message:

CWMS description *xxx* has no corresponding SHEF parameter

By default, ExportSHEF maps the following CWMS version to the specified SHEF type and source codes:

CWMS Version	SHEF Type and Source
DCP	RG
DROT	RG
LRGS	RG
DRGS	RG
GOES	RG
FCST	FZ

4.18 TYPE Command

The `TYPE` command specifies the preferred SHEF message type for regular-interval data.

Parameter Format:

```
{.A | .E}
```

ExportSHEF will only output `.E`-type messages for CWMS regular interval time series definitions (e.g. interval portion is not "0"); data from CWMS irregular time series definitions (e.g. interval portion is "0") will always be output in `.A`-type messages.

By default, the preferred SHEF message type for regular-interval data is `.E`.

4.19 TZONE Command

The `TZONE` command specifies the SHEF time zone used in SHEF messages.

Parameter Format:

tz

Where:

tz is a valid SHEF time zone designation as listed in Section 6.4 (SHEF Time Zones)

By default, ExportSHEF outputs SHEF messages using the time zone `Z`.

5 Troubleshooting

5.1 Error Messages

The following messages indicate error conditions in the operation of ExportSHEF, and will be written to the log output with `BASIC` debug level.

- `Cannot convert from database units "<text>" to intermediate units "<text>"` – units conversion error
- `Cannot convert from database units "<text>" to SHEF units "<text>"` – units conversion error

- `Cannot specify UNITS and FACTOR for same data` – `UNITS` and `FACTOR` export modifiers are specified on the same export line
- `Command "<text>" is ambiguous. It matches <text>` – specified command is too short; it matches more than one valid command
- `Command "<text>" not recognized` – invalid command
- `Could not connect to DBI "<text>"` – cannot connect to DBI specified on `DBI` command line
- `Could not open "<text>" to determine default DBI, exiting` – cannot locate or open $CWMS_HOME/config/properties/cwms.properties when processing a `DBI LOCAL` command
- `CWMS description "<text>" has no corresponding SHEF parameter` – no SHEF parameter can be generated from the associated CWMS time-series definition; add mappings with `PE` and `TS` commands, or provide a `PARAMETER` export modifier
- `Error converting from database units "<text>" to intermediate units "<text>"` – units conversion error
- `Error converting from first intermediate units "<text>" to second intermediate units "<text>"` – units conversion error
- `Error converting from intermediate units "<text>" to SHEF units "<text>"` – units conversion error
- `Expected ".A" or ".E", got "<text>"` – invalid `TYPE` command line
- `Expected IntType or StringType, got <text>` - internal error
- `Expected StringType, got <text>` – internal error
- `Export modifier "<text>" is ambiguous. It matches <text>` – export modifier is too short; it matches more than one valid modifier
- `Export modifier "<text>" specified more than once` – an export modifier is specified more than once on an export line
- `File "<text>" does not contain property "wcds.dbi.server", exiting` – the file $CWMS_HOME/config/properties/cwms.properties does not contain the expected property when processing a `DBI LOCAL` command
- `File <text> cannot be processed recursively` – attempted to recursively process an input file
- `Grouping flag "<integer>" not recognized, must be 1 or 0` – invalid `GROUP` command line
- `Grouping flag text "<text>" not recognized, must be "TRUE", "FALSE", "YES", "NO", "ON", or "OFF"` – invalid `GROUP` command line
- `Invalid delimiter <<text>>, must be "/" with optional spaces (up to 14) between quotes and slash` – invalid `DELIMITER` command line
- `Invalid export modifier: "<text>"` – invalid modifier specified on export line
- `Invalid factor string`: "<text>" – invalid `FACTOR` export modifier
- `Invalid format "<text>", must be "pe([s][/][+|-]w.p[Q])"` – invalid `FORMAT` command line
- `Invalid line width: "<text>"` – non-integer specified on `LINEWIDTH` command line

- `Invalid line width: <integer>` – 0 specified on `LINEWIDTH` command line
- `Invalid location "<text>", must be 3-8 characters long` – invalid `LOCATION` command line or export modifier
- `Invalid missing value "<text>", must be "+", "m", "M", "-9999", or "-9002"` – invalid `MISSING` command line
- `Invalid offset string`: "<text>" – invalid `OFFSET` export modifier
- `Invalid parameter "<text>", must be 2-7 characters long` – invalid `PARAMETER` export modifier
- `Invalid PE code "<text>", must be 2 characters long` – invalid `PE` command line
- `Invalid quality flag "<text>", must be "G", "E", "M", "Q", "Z", "R", "B", "S", "GOOD", "ESTIMATED", "MANUAL", "QUESTIONED", "UNKNOWN", "REJECTED", "BAD" or "SCREENED"` – invalid `QUALITY` command line
- `Invalid time window: "<text>"` – time window cannot be interpreted
- `Invalid time window: "<text>", start time is not after end time` – specified time window is not in correct order
- `Invalid time zone: "<text>"` – invalid `TZONE` command or export modifier
- `Invalid TS code "<text>", must be 2 characters long` – invalid `TS` command line
- `Invalid units system "<text>", should be "ENGLISH", "SI", or "METRIC"` – invalid `SYSTEM` command
- `Invalid units: "<text>"` – invalid `UNITS` export modifier
- `Invalid variable assignment` – invalid variable assignment line
- `Line width of <integer> is too small for minimum message line of "<text>"` – line width specified on `LINEWIDTH` command is too small for the current SHEF message
- `Line width of <integer> exceeds SHEF maximum of 1000` – integer greater than 1000 specified on `LINEWIDTH` command line
- `Log level text "<text>" not recognized; must be one of "None", "Basic", "Detailed", or "Verbose"` – invalid `DEBUG` command line
- `No data returned for "<text>" (<text> <text>)` – no data retrieved from the CWMS database for the export line
- `No DBI is currently open` – attempted to process an export line before opening a DBI
- `No SHEF parameter for "<text>"` – no SHEF parameter can be generated from the associated CWMS time-series definition; add mappings with `PE` and `TS` commands, or provide a `PARAMETER` export modifier
- `No time window is currently defined` – attempted to process an export line before setting a time window
- `Parameter "<text>" contains non-SHEF duration "<text>"` – invalid `PARAMETER` export modifier

- `Parameter "<text>" contains SHEF duration ("<text>") which differs from that computed from CWMS description ("<text>")` – `PARAMETER` export modifier contains valid parameter, but is invalid for the associated CWMS time-series definition
- `Revision flag "<integer>" not recognized, must be 1 or 0` – invalid `REVISED` command line
- `Revision flag text "<text>" not recognized, must be "TRUE", "FALSE", "YES", "NO", "ON", or "OFF"` – invalid `REVISED` command line
- `Unbalanced parentheses : <text>` – badly formed variable assignment line, expected the form $($name)
- `You do not have access permissions at DBI "<text>"` – connected to DBI specified on `DBI` command line, but DBI access control list does not permit access of the current user / computer combination.

5.2 BASIC Level Messages

The following messages do not indicate error conditions in the operation of ExportSHEF, and will be written to the log output with `BASIC` debug level.

- `Aborting input file <text> due to fatal error` – this message accompanies messages pertaining to non-recoverable errors
- `Error processing command at line <integer> of file <text>` – this message accompanies some error messages pertaining to invalid command lines
- `Error processing export at line <integer> of file <text>` – this message accompanies error messages pertaining to export lines
- `Invalid command at line <integer> of file <text>` – this message accompanies some error messages pertaining to invalid command lines
- `Invalid units: "<text>", using best guess: "<text>"` – invalid `UNITS` export modifier, but ExportSHEF thinks it found what was meant
- `Offsetting retrieved data by <number> for PE code "<text>"` – retrieved data is modified by the `OFFSET` export modifier
- `Outputting non-standard units "<text>" instead of standard units "<text>" for PE code "<text>"` – output of SHEF standard units is overridden by non-standard `UNITS` export modifier
- `Outputting unknown units (database units * <number>) instead of standard units "<text>" for PE code "<text>"` – output of SHEF standard units is overridden by `FACTOR` export modifier
- `Outputting unknown units (database units * <number> {-|+} <number>) instead of standard units "<text>" for PE code "<text>"` – output of SHEF standard units is overridden by `FACTOR` and `OFFSET` export modifiers
- `Processing input file <text>` – displays name of newly opened input file

5.3 DETAILED Level Messages

The following messages will be written to the log output with `DETAILED` debug level. Most are status notifications output after successful operations, but some are notices of benign failures, while a few provide additional information for error messages that will subsequently be output.

- `Accessing default DBI specified in "<text>"`
- `Connected to DBI "<text>" as "<text>" for office "<text>"`
- `CWMS location "<text>" already mapped to SHEF location "<text>" CWMS location "<text>" previously mapped to SHEF location "<text>", changed to "<text>"`
- `CWMS location "<text>" mapped to SHEF location "<text>"`
- `CWMS locations matching "<text>" already mapped to SHEF location "<text>".`
- `CWMS locations matching "<text>" mapped to SHEF location "<text>"`
- `CWMS locations matching "<text>" previously mapped to SHEF location "<text>", changed to "<text>"`
- `CWMS param "<text>" with type "<text>" already mapped to SHEF PE code "<text>"`
- `CWMS param "<text>" with type "<text>" mapped to SHEF PE code "<text>"`
- `CWMS param "<text>" with type "<text>" previously mapped to SHEF PE code "<text>", changed to "<text>"`
- `CWMS param "<text>" with types matching "<text>" already mapped to SHEF PE code "<text>"`
- `CWMS param "<text>" with types matching "<text>" mapped to SHEF PE code "<text>"`
- `CWMS param "<text>" with types matching "<text>" previously mapped to SHEF PE code "<text>", changed to "<text>"`
- `CWMS params matching "<text>" with type "<text>" already mapped to SHEF PE code "<text>"`
- `CWMS params matching "<text>" with type "<text>" mapped to SHEF PE code "<text>"`
- `CWMS params matching "<text>" with type "<text>" previously mapped to SHEF PE code "<text>", changed to "<text>"`
- `CWMS params matching "<text>" with types matching "<text>" already mapped to SHEF PE code "<text>"`
- `CWMS params matching "<text>" with types matching "<text>" mapped to SHEF PE code "<text>"`
- `CWMS params matching "<text>" with types matching "<text>" previously mapped to SHEF PE code "<text>", changed to "<text>"`
- `CWMS version "<text>" already mapped to SHEF TS code "<text>"`
- `CWMS version "<text>" mapped to SHEF TS code "<text>"`
- `CWMS version "<text>" previously mapped to SHEF TS code "<text>", changed to "<text>"`
- `CWMS versions matching "<text>" already mapped to SHEF TS code "<text>"`
- `CWMS versions matching "<text>" mapped to SHEF TS code "<text>"`
- `CWMS versions matching "<text>" previously mapped to SHEF TS code "<text>", changed to "<text>"`
- `Data will be exported in <text> units`
- `Data will be exported time-stamped as <text> (<text>)`
- `Delimiter set to "<text>"`

- Duration "<text>" has no corresponding SHEF duration code
- Finished processing input file <text>
- Grouping set to <integer> (<text>)
- Line width set to <integer>
- Missing value format set to "<text>"
- Output data quality set to "<text>"
- Output data quality set to "NONE"
- Parameter "<text>" has no corresponding SHEF PE code
- Parameter "<text>", sub-parameter "<text>" has no corresponding SHEF PE code
- Preferred regular time-series message type set to <text>
- Revised flag set to <integer> (<text>)
- Set output data format for "<text>" to "<text>"
- Time window set to "<text>", "<text>" UTC

5.4 VERBOSE Level Messages

The following messages will be written to the log output with VERBOSE debug level. All provide specific information of the progress of functions within ExportSHEF.

- DBI module version is <text>
- Parameter "<text>" has SHEF PE code keyed to the parameter type
- Parameter "<text>" has SHEF PE code keyed to the sub-parameter
- Parameter "<text>" split into "<text>" and "<text>"
- Parameter type "<text>", duration "<text>" has no corresponding SHEF Extremum code
- Splitting <text> into components
- Version "<text>" has no corresponding SHEF location, using "<text>"
- Version "<text>" has no corresponding SHEF TS code

6 SHEF Standards

6.1 SHEF Message Types

SHEF defines three message types: .A, .B, and .E.

.A messages are restricted to a single location, may have multiple parameters, and are not restricted to regular time-series. These messages are often used to transmit one or more parameters for a single time and single station.

.B messages may have multiple locations and multiple parameters, and are not restricted to regular time-series. These messages are header driven, and are often used to transmit one or more parameters for multiple stations and a single time. These messages can be crafted into reports that are highly human readable in addition to being machine decodable.

`.E` messages are single location, single parameter, regular time-series.

ExportSHEF generates `.A` and `.E` messages only.

6.2 SHEF Parameters

The seven-character SHEF parameter codes are comprised of five components, often labeled PEDTSEP. The components are PE (physical element), D (duration), TS (type and source), E (extremum) and P (probability). PE and TS use two-character codes, while the remainders use one-character codes. The constituent portions of a SHEF parameter code are described in the following tables.

6.2.1 SHEF Physical Element Codes

SHEF defines codes to represent physical elements, as describe in the following table. The SHEF standard indicates that non-standard codes defined for local use should begin with "Y". Since six standard SHEF physical element codes also start with "Y", the local user is left with 20 codes with which to represent non-standard physical elements. If 20 local codes are not enough, more can be utilized. Since there are only 210 SHEF standard physical element codes defined, any of the remaining 466 two-alphabetic-character codes may be used for local purposes as long as the SHEFPARM file used with the decoder contains the appropriate information.

Code	Description
AD	Reserved
AF	Surface Frost Intensity
AG	Percent of Green Vegetation
AM	Surface Dew Intensity
AT	Time Below Critical Temperature
AU	Time Below Critical Temperature
AW	Time with Leaf Wetness
BA	Solid Portion of Water Equivalent
BB	Heat deficit
BC	Liquid water storage
BD	Temperature index
BE	Maximum water equivalent since snow began to accumulate
BF	Areal water equivalent just prior to new snowfall
BG	Areal extent of snow cover from the areal depletion curve just prior to the new snowfall
BH	Amount of water equivalent above which 100 percent areal snow cover temporarily exists
BI	Excess liquid water in storage
BJ	Areal extent of snow cover adjustment
BK	Lagged excess liquid water for interval 1
BL	Lagged excess liquid water for interval 2
BM	Lagged excess liquid water for interval 3
BN	Lagged excess liquid water for interval 4
BO	Lagged excess liquid water for interval 5

Code	Description
BP	Lagged excess liquid water for interval 6
BQ	Lagged excess liquid water for interval 7
CA	Upper zone tension water contents
CB	Upper zone free water contents
CC	Lower zone tension water contents
CD	Lower zone free water supplementary storage contents
CE	Lower zone free water primary storage contents
CF	Additional impervious area contents
CG	Antecedent precipitation index
CH	Soil moisture index deficit
CI	Base flow storage contents
CJ	Base flow index
CK	First quadrant index antecedent evaporation index (AEI)
CL	First quadrant antecedent temperature index (ATI)
CM	Frost index
CN	Frost efficiency index
CO	Indicator of first quadrant index (AEI or ATI)
CP	Storm total rainfall
CQ	Storm total runoff
CR	Storm antecedent index
CS	Current antecedent index
CT	Storm period counter
CU	Average air temperature
CV	Current corrected synthetic temperature
CW	Storm antecedent evaporation (AEI)
CX	Current AEI
CY	Current API
CZ	Climate index (SOI, MEI, WPI, NAO)
EA	Evaporation Potential
ED	Evaporation, Pan Depth
EM	Evapotranspiration
EP	Evaporation, Pan Increment
ER	Evaporation Rate
ET	Evapotranspiration Total
EV	Evaporation, Lake
FA	Fish, Shad
FB	Fish, Sockeye
FC	Fish, Chinook
FE	Fish, Chum
FK	Fish, Coho
FL	Fish, Ladder
FP	Fish, Pink
FS	Fish, Steelhead

Code	Description
FT	Fish Type
FZ	Fish, Count of all types combined
GD	Frost, Depth of Frost Penetration
GR	Frost Report, Structure
GS	Ground State
GT	Frost, Depth of Surface Frost Thawed
HA	Height of Reading
HB	Depth of Reading
HC	Height, Ceiling
HD	Height, Head
HE	Height, Regulating Gate
HF	Elevation, Project Powerhouse Forebay
HG	Height, River Stage
HH	Height of Reading
HI	Stage Trend Indicator
HJ	Height, Spillway Gage
HK	Height, Lake Above a Specified Datum
HL	Elevation, Natural Lake
HM	Height of Tide
HO	Height, Flood Stage
HP	Elevation, Pool
HQ	Distance from a Ground Reference Point to River Level
HR	Elevation, Lake or Reservoir Rule Curve
HS	Elevation, Spillway Forebay
HT	Elevation, Project Tailwater Stage
HU	Cautionary Stage
HW	Height, Spillway Tailwater
HZ	Elevation, Freezing Level
IC	Ice Cover, River
IE	Extent of Ice from Reporting Area
IO	Extent of Open Water from Reporting Area
IR	Ice Report
IT	Ice Thickness
LA	Lake Surface Area
LC	Lake Storage Volume Change
LS	Lake Storage Volume
MD	Moisture, Soil Dielectric Constant
MI	Moisture, Soil Index or API
ML	Moisture, Lower Zone Storage
MM	Fuel Moisture, Wood
MN	Moisture, Soil Salinity
MS	Moisture, Soil
MT	Fuel Temperature, Wood Probe

Code	Description
MU	Moisture, Upper Zone Storage
MV	Moisture, Volume of Water
MW	Moisture, Soil, Percent by Weight
NC	River Control Switch
NG	Total of Gate Openings
NL	Number of Large Flash Boards Down
NN	Number of the Spillway Gate Reported
NO	Gate Opening for a Specified Gate
NS	Number of Small Flash Boards Down
PA	Pressure, Atmospheric
PC	Precipitation, Accumulator
PD	Pressure, Net Change During Last 3 Hours
PE	Pressure, Characteristic, NWS Handbook #7, Table 10.7
PL	Pressure, Sea Level
PM	Probability of Measurable Precipitation
PN	Precipitation, Normal
PP	Precipitation, Actual Increment
PR	Precipitation Rate
PT	Precipitation Type
QA	Runoff Volume, Adjusted for Storage at Projects(s)
QB	Runoff Depth
QC	Runoff Volume
QD	Discharge, Canal Diversion
QE	Discharge, Percent of Flow Diverted from Channel
QF	Discharge Velocity
QG	Discharge from Power Generation
QI	Discharge, Inflow
QL	Discharge, Rule Curve
QM	Discharge, Pre-project Conditions in Basin
QP	Discharge, Pumping
QR	Discharge, River
QS	Discharge, Spillway
QT	Discharge, Computed Total Project Outflow
QU	Discharge, Controlled by Regulating Outlet
QV	Cumulative Volume Increment
RA	Radiation, Albedo
RI	Radiation, Accumulated Incoming Solar Over Specified duration in Langleys
RN	Radiation, Net Radiation
RP	Radiation, Sunshine Percent of Possible
RT	Radiation, Sunshine Hours
SA	Snow, Areal Extent of Basin Snow Cover
SD	Snow, Depth
SF	Snow, Depth (New Snowfall)

Code	Description
SI	Snow, Depth on top of River or Lake Ice
SL	Snow, Elevation of Snow Line
SR	Snow Report
SS	Snow Density
ST	Snow Temperature
SW	Snow, Water Equivalent
TA	Temperature, Air (Dry Bulb)
TB	Temperature, Bare Soil at Specified Depths
TC	Temperature, Degree Days of Cooling
TD	Temperature, Dew Point
TE	Temperature, Air
TF	Temperature, Degree Days of Freezing
TH	Temperature, Degree Days of Heating
TM	Temperature, Air (Wet Bulb)
TP	Temperature, Pan Water
TS	Temperature, Bare Soil
TV	Temperature, Vegetated Soil at Specified Depths
TW	Temperature, Water
UC	Wind, Accumulated Wind Travel
UD	Wind, Direction
UG	Wind, Gust at Observation Time
UL	Wind, Travel Length Accumulated Over Specified Duration
UP	Peak Wind Speed
UQ	Wind Direction and Speed Combined
UR	Peak Wind Direction Associated with Peak Wind Speed
US	Wind, Speed
VB	Voltage, Battery
VC	Generation, Surplus Capacity of Units On Line
VE	Generation, Energy Total
VG	Generation, Pumped Water, Power Produced
VH	Generation, Time
VJ	Generation, Energy Produced from Pumped Water
VK	Generation, Energy Stored in Reservoir Only
VL	Generation, Storage Due to Natural Flow Only
VM	Generation, Losses Due to Spill and Other Water Losses
VP	Generation, Pumping Use, Power Used
VQ	Generation, Pumping Use, Total Energy Used
VR	Generation, Stored in Reservoir Plus Natural Flow
VS	Generation, Station Load, Energy Used
VT	Generation, Power Total
VU	Generator Status
VW	Generation, Station Load, Power Used
WA	Water, Dissolved Nitrogen and Argon

Code	Description
WC	Water, Conductance
WD	Water, Water Depth
WG	Water, Dissolved Total Gasses, Pressure
WH	Water, Dissolved Hydrogen Sulfide
WL	Water, Suspended Sediment
WO	Water, Dissolved Oxygen
WP	Water, PH
WT	Water, Turbidity
WV	Water, Velocity
XC	Total Sky Cover
XG	Lightning, Number of Strikes per Grid Box
XL	Lightning, Point Strike
XP	Weather, Past
XR	Humidity, Relative
XU	Humidity, Absolute
XV	Weather, Visibility
XW	Weather, Present
YA	Number of 15-Minute Periods a River Has Been Above a Specfied Critical Level
YC	DCP Random Report Sequence Number
YF	Forward Power
YR	Reflected Power
YS	DCP Transmission Sequence Number
YT	Number of 15-Minute Periods Since Random

6.2.2 SHEF Duration Codes

Code	Numerical Representation in SHEFIT Output	Description
A	1008	8 Hours
B	1002	2 Hours
C	15	15 Minutes
D	2001	1 Day
F	1004	4 Hours
H	1001	1 Hour
I	0	Instantaneous
J	30	30 Minutes
K	1012	12 Hours
L	1018	18 Hours
M	3001	1 Month
N	2015	Mid Month (1st - 15th)
P	5004	Previous 7 a.m. local to time of observation
Q	1006	6 Hours
R	5002	Period of Record
S	5001	Seasonal (partial period, e.g. Jan 1 to current date)

Code	Numerical Representation in SHEFIT Output	Description
T	1003	3 Hours
U	1	1 Minute
V	5003	Variable, duration defined separately
W	2007	1 Week
X	5005	Unknown Duration
Y	4001	1 Year
Z	5000	Default Duration for Physical Element

6.2.3 SHEF Type and Source Codes

Code	Description
C1	Contingency 1
C2	Contingency 2
C3	Contingency 3
C4	Contingency 4
C5	Contingency 5
C6	Contingency 6
C7	Contingency 7
C8	Contingency 8
C9	Contingency 9
CA	Contingency A
CB	Contingency B
CC	Contingency C
CD	Contingency D
CE	Contingency E
CF	Contingency for Flash Flood Guidance
CG	Contingency G
CH	Contingency H
CI	Contingency I
CJ	Contingency J
CK	Contingency K
CL	Contingency L
CM	Contingency M
CN	Contingency N
CO	Contingency O
CP	Contingency P
CQ	Contingency Q
CR	Contingency R
CS	Contingency S
CT	Contingency T
CU	Contingency U
CV	Contingency V
CW	Contingency W

Code	Description
CX	Contingency X
CY	Contingency Y
CZ	Nonspecific Contingency
FA	Forecast, Adjusted Model 1
FB	Forecast, Adjusted Model 2
FC	Forecast, Adjusted Model 3
FD	Forecast, Adjusted Model 4
FE	Forecast, Public Version, External
FF	Forecast, Includes QPF
FG	Reservoir Release Forecast
FM	Forecast, Manual Method 1
FN	Forecast, Manual Method 2
FP	Forecast, Manual Method 3
FQ	Forecast, Manual Method 4
FU	Forecast, Unadjusted Model 1
FV	Forecast, Unadjusted Model 2
FW	Forecast, Unadjusted Model 3
FX	Forecast, Unadjusted Model 4
FZ	Nonspecific Forecast
HA	Reserved for Historical Data Use
HB	Reserved for Historical Data Use
HC	Reserved for Historical Data Use
HD	Reserved for Historical Data Use
HE	Reserved for Historical Data Use
HF	Reserved for Historical Data Use
HG	Reserved for Historical Data Use
HH	Reserved for Historical Data Use
HI	Reserved for Historical Data Use
HJ	Reserved for Historical Data Use
HK	Reserved for Historical Data Use
HL	Reserved for Historical Data Use
HM	Reserved for Historical Data Use
HN	Reserved for Historical Data Use
HO	Reserved for Historical Data Use
HP	Reserved for Historical Data Use
HQ	Reserved for Historical Data Use
HR	Reserved for Historical Data Use
HS	Reserved for Historical Data Use
HT	Reserved for Historical Data Use
HU	Reserved for Historical Data Use
HV	Reserved for Historical Data Use
HW	Reserved for Historical Data Use
HX	Reserved for Historical Data Use

Code	Description
HY	Reserved for Historical Data Use
HZ	Reserved for Historical Data Use
MA	Continuous Antecedent Precipitation Index (API) Model
MC	Cincinnati (OHRFC) Event API Model
MH	Harrisburg (MARFC) Event API Model
MK	Kansas City (MBRFC) Event API Model
MS	Sacramento Soil Moisture Accounting Model
MT	Hartford (NERFC) Event API Model
MW	Snow-17 Snow Accumulation and Ablation Model
PA	Process 1
PB	Process 2
PC	Process 3
PD	Process 4
PE	Process 5
PF	Process 6
PG	Process 7
PH	Process 8
PI	Process 9
PJ	Process 10
PK	Process 11
PL	Process 12
PM	Processed Mean Areal Data
PN	Process 13
PO	Process 14
PP	Process 15
PQ	Process 16
PR	Process 17
PS	Process 18
PT	Process 19
PU	Process 20
PV	Process 21
PW	Process 22
PX	Process 23
PY	Process 24
PZ	Nonspecific Processed Data
R2	2nd order sensor for same data previously specified in same messagewith TS code RF through RZ
R3	3rd order sensor for same data previously specified in same messagewith TS code RF through RZ
R4	4th order sensor for same data previously specified in same messagewith TS code RF through RZ
R5	5th order sensor for same data previously specified in same messagewith TS code RF through RZ

Code	Description
R6	6th order sensor for same data previously specified in same messagewith TS code RF through RZ
R7	7th order sensor for same data previously specified in same messagewith TS code RF through RZ
R8	8th order sensor for same data previously specified in same messagewith TS code RF through RZ
R9	9th order sensor for same data previously specified in same messagewith TS code RF through RZ
RA	Reading, Best Quality (retrieve code, not for transmission)
RB	Reading, 2nd Best (retrieve code, not for transmission)
RC	Reading, 3rd Best (retrieve code, not for transmission)
RD	Reading, 4th Best (retrieve code, not for transmission)
RF	Reading, Airborne
RG	Reading, GOES
RM	Reading, Meteor Burst
RP	Reading, Phone ASCII (DARDC/LARC)
RR	Reading, Radio 1
RS	Reading, Radio 2
RT	Reading, Phone Audio (Telemark/BDT)
RV	Reading, Visual/Manual 1
RW	Reading, Visual/Manual 2
RX	Reading, Visual/Manual 3
RZ	Nonspecific Observed Reading
ZZ	Nonspecific (filler)

6.2.4 SHEF Extremum Codes

Code	Description
D	Maximum of 1 Hour
E	Maximum of 3 Hours
F	Minimum of 1 Hour
G	Minimum of 3 Hours
H	Minimum of 6 Hours
I	Minimum of 18 Hours
J	Minimum of Record
K	Minimum of Year (calendar)
L	Minimum of Month
M	Minimum of Week
N	Minimum of Day
P	Minimum of 12 Hours
R	Maximum of 6 Hours
S	Maximum of 18 Hours
T	Maximum of Record
U	Maximum of Year (calendar)

Code	Description
V	Maximum of Month
W	Maximum of Week
X	Maximum of Day
Y	Maximum of 12 Hours
Z	No Extremum (filler)

6.2.5 SHEF Probability Codes

Code	Description
1	.1 chance value is at or below the specified value
2	.2 chance value is at or below the specified value
3	.3 chance value is at or below the specified value
4	.4 chance value is at or below the specified value
5	.5 chance value is at or below the specified value
6	.6 chance value is at or below the specified value
7	.7 chance value is at or below the specified value
8	.8 chance value is at or below the specified value
9	.9 chance value is at or below the specified value
A	.002 chance value is at or below the specified value
B	.004 chance value is at or below the specified value
C	.01 chance value is at or below the specified value
D	.02 chance value is at or below the specified value
E	.04 chance value is at or below the specified value
F	.05 chance value is at or below the specified value
G	.25 chance value is at or below the specified value
H	.75 chance value is at or below the specified value
J	.0013 chance value below specified: -3 standard deviations
K	.0228 chance value below specified: -2 standard deviations
L	.1587 chance value below specified: -1 standard deviations
M	Mean (expected value)
N	.8413 chance value below specified: +1 standard deviations
P	.9772 chance value below specified: +2 standard deviations
Q	.9987 chance value below specified: +3 standard deviations
T	.95 chance value is at or below the specified value
U	.96 chance value is at or below the specified value
V	.98 chance value is at or below the specified value
W	.99 chance value is at or below the specified value
X	.996 chance value is at or below the specified value
Y	.998 chance value is at or below the specified value
Z	Probability Not Applicable (filler)

6.3 SHEF Units

SHEF defines standard units for both the English and SI units systems. SHEF messages do not specify units, but implicitly or explicitly specify the units system. Therefore, data

values for each physical element code in SHEF messages are expected to be in the standard units for the units system of the message. Physical element codes are defined in Section 6.2.1 (SHEF Physical Element Codes).

Some physical element codes represent ratios or other properties that are describe as a pure magnitude. They are indicated in this table with units of <none>.

Some physical element codes represent are combinations of actual physical elements, or other situations where the data value does not reflect a simple physical element. They are represented in this table with units of <coded>.

Physical Element Code	Standard English Units	Standard SI (Metric) Units
AD	<none>	<none>
AF	<coded>	<coded>
AG	percent	percent
AM	<coded>	<coded>
AT	<coded>	<coded>
AU	<coded>	<coded>
AW	<coded>	<coded>
BA	inches	millimeters
BB	inches	millimeters
BC	inches	millimeters
BD	degrees-F	degrees-C
BE	inches	millimeters
BF	inches	millimeters
BG	percent	percent
BH	inches	millimeters
BI	inches	millimeters
BJ	inches	millimeters
BK	inches	millimeters
BL	inches	millimeters
BM	inches	millimeters
BN	inches	millimeters
BO	inches	millimeters
BP	inches	millimeters
BQ	inches	millimeters
CA	inches	millimeters
CB	inches	millimeters
CC	inches	millimeters
CD	inches	millimeters
CE	inches	millimeters
CF	inches	millimeters
CG	inches	millimeters
CH	inches	millimeters
CI	inches	millimeters

Physical Element Code	Standard English Units	Standard SI (Metric) Units
CJ	inches	millimeters
CK	inches	millimeters
CL	degrees-F	degrees-C
CM	degrees-F	degrees-C
CN	percent	percent
CO	<none>	<none>
CP	inches	millimeters
CQ	inches	millimeters
CR	inches	millimeters
CS	inches	millimeters
CT	<none>	<none>
CU	degrees-F	degrees-C
CV	degrees-F	degrees-C
CW	inches	millimeters
CX	inches	millimeters
CY	inches	millimeters
CZ	<none>	<none>
EA	inches	millimeters
ED	inches	millimeters
EM	inches	millimeters
EP	inches	millimeters
ER	inches/day	millimeters/day
ET	inches	millimeters
EV	inches	millimeters
FA	<none>	<none>
FB	<none>	<none>
FC	<none>	<none>
FE	<none>	<none>
FK	<none>	<none>
FL	<none>	<none>
FP	<none>	<none>
FS	<none>	<none>
FT	<none>	<none>
FZ	<none>	<none>
GD	inches	millimeters
GR	<coded>	<coded>
GS	<coded>	<coded>
GT	inches	millimeters
HA	feet	meters
HB	feet	meters
HC	feet	meters
HD	feet	meters
HE	feet	meters

Physical Element Code	Standard English Units	Standard SI (Metric) Units
HF	feet	meters
HG	feet	meters
HH	feet	meters
HI	<coded>	<coded>
HJ	feet	meters
HK	feet	meters
HL	feet	meters
HM	feet	meters
HO	feet	meters
HP	feet	meters
HQ	feet	meters
HR	feet	meters
HS	feet	meters
HT	feet	meters
HU	feet	meters
HW	feet	meters
HZ	1000-feet	kilometers
IC	percent	percent
IE	miles	kilometers
IO	feet	meters
IR	<coded>	<coded>
IT	inches	centimeters
LA	1000-acres	square-kilometers
LC	1000-acre-feet	million-cubic-meters
LS	1000-acre-feet	million-cubic-meters
MD	<coded>	<coded>
MI	inches	centimeters
ML	inches	centimeters
MM	percent	percent
MN	<coded>	<coded>
MS	inches	millimeters
MT	degrees-F	degrees-C
MU	inches	centimeters
MV	<coded>	<coded>
MW	percent	percent
NC	<coded>	<coded>
NG	feet	meters
NL	<none>	<none>
NN	<none>	<none>
NO	<coded>	<coded>
NS	<none>	<none>
PA	inches-mercury	kilopascals
PC	inches	millimeters

Physical Element Code	Standard English Units	Standard SI (Metric) Units
PD	inches-mercury	kilopascals
PE	inches-mercury	kilopascals
PL	inches-mercury	kilopascals
PM	<coded>	<coded>
PN	inches	millimeters
PP	inches	millimeters
PR	inches/day	millimeters/day
PT	<coded>	<coded>
QA	1000-cubic-feet/second	cubic-meters/second
QB	inches	millimeters
QC	1000-acre-feet	million-cubic-meters
QD	1000-cubic-feet/second	cubic-meters/second
QE	percent	percent
QF	miles/hour	kilometers/hour
QG	1000-cubic-feet/second	cubic-meters/second
QI	1000-cubic-feet/second	cubic-meters/second
QL	1000-cubic-feet/second	cubic-meters/second
QM	1000-cubic-feet/second	cubic-meters/second
QP	1000-cubic-feet/second	cubic-meters/second
QR	1000-cubic-feet/second	cubic-meters/second
QS	1000-cubic-feet/second	cubic-meters/second
QT	1000-cubic-feet/second	cubic-meters/second
QU	1000-cubic-feet/second	cubic-meters/second
QV	1000-acre-feet	million-cubic-meters
RA	percent	percent
RI	langleys	langleys
RN	watts/square-meter	watts/square-meter
RP	percent	percent
RT	hours	hours
SA	percent	percent
SD	inches	centimeters
SF	inches	centimeters
SI	inches	centimeters
SL	1000-feet	meters
SR	<coded>	<coded>
SS	<none>	<none>
MD	<coded>	<coded>
ST	inches	millimeters
TA	degrees-F	degrees-C
TB	<coded>	<coded>
TC	degrees-F	degrees-C
TD	degrees-F	degrees-C
TE	<coded>	<coded>

Physical Element Code	Standard English Units	Standard SI (Metric) Units
TF	degrees-F	degrees-C
TH	degrees-F	degrees-C
TM	degrees-F	degrees-C
TP	degrees-F	degrees-C
TS	degrees-F	degrees-C
TV	degrees-F	degrees-C
TW	degrees-F	degrees-C
UC	miles	kilometers
UD	10-degrees	10-degrees
UG	miles/hour	meters/second
UL	miles	kilometers
UP	miles/hour	meters/second
UQ	<coded>	<coded>
UR	10-degrees	10-degrees
US	miles/hour	meters/second
VB	volts	volts
VC	megawatts	megawatts
VE	megawatt-hours	megawatt-hours
VG	megawatts	megawatts
VH	hours	hours
VJ	megawatt-hours	megawatt-hours
VK	<coded>	<coded>
VL	<coded>	<coded>
VM	<coded>	<coded>
VP	megawatts	megawatts
VQ	megawatt-hours	megawatt-hours
VR	<coded>	<coded>
VS	megawatt-hours	megawatt-hours
VT	megawatts	megawatts
VU	<coded>	<coded>
VW	megawatts	megawatts
WA	parts/million	milligrams/liter
WC	micromhos/centimeter	micromhos/centimeter
WD	inches	centimeters
WG	inches-mercury	millimeters-mercury
WH	parts/million	milligrams/liter
WL	parts/million	milligrams/liter
WO	parts/million	milligrams/liter
WP	<none>	<none>
WT	jackson-turbidty-units	jackson-turbidty-units
WV	feet/second	meters/second
XC	tenths	tenths
XG	<none>	<none>

Physical Element Code	Standard English Units	Standard SI (Metric) Units
XL	<none>	<none>
XP	<coded>	<coded>
XR	percent	percent
XU	grams/cubic-foot	grams/cubic-meter
XV	miles	Kilometers
XW	<coded>	<coded>
YA	<none>	<none>
YC	<none>	<none>
YF	watts	watts
YR	watts	watts
YS	<none>	<none>
YT	<none>	<none>

6.4 SHEF Time Zones

Only certain time zones can be specified in SHEF messages. If unspecified, SHEF defines the default time zone to be `Z`. ExportSHEF always explicitly declares the time zone. ExportSHEF will not accept the SHEF time zoned code of `BD`, as it appears to no longer be a valid time zone.

Code	Description
A	Atlantic Local Time
AD	Atlantic Daylight Time
AS	Atlantic Standard Time
B	Bering Local Time
BD	Bering Daylight Time (no longer valid?)
BS	Bering Standard Time
C	Central Local Time
CD	Central Daylight Time
CS	Central Standard Time
E	Eastern Local Time
ED	Eastern Daylight Time
ES	Eastern Standard Time
H	Hawaiian Local Time
HS	Hawaiian Standard Time
J	China
L	Alaskan Local Time
LD	Alaskan Daylight Time
LS	Alaskan Standard Time
M	Mountain Local Time
MD	Mountain Daylight Time
MS	Mountain Standard Time
N	Newfoundland Local Time

Code	Description
NS	Newfoundland Standard Time
P	Pacific Local Time
PD	Pacific Daylight Time
PS	Pacific Standard Time
Y	Yukon Local Time
YD	Yukon Daylight Time
YS	Yukon Standard Time
Z	Zulu Time (GMT, UTC)

6.5 SHEF Data Quality Codes

ExportSHEF will append the following data quality codes, with the exception of V, P, F, and T, to data values in SHEF messages, as specified with the `FORMAT` command. CWMS has no mechanism to specify how many levels of verification a data value passed, whether the data value was flagged at the sensor level, nor whether the data value triggered subsequent processing.

Code	Description
B	Bad, Manual QC
E	Estimated
F	Flagged by sensor or telemetry (parity error, etc…)
G	Good, Manual QC
M	Manual Edit
P	Passed level 1, level 2 and level 3
Q	Questioned in level 2 or level 3
R	Rejected by level 1
S	Screened level 1 (passed preliminary criteria)
T	Triggered (tells database to start some additional function)
V	Verified level 1and level 2 (passed more rigorous criteria than level 1)
Z	Filler (no qualification)

7 Other

7.1 Java Time Zones

In addition to the SHEF time zone codes listed in in Section 6.4 (SHEF Time Zones), the following Java time zone identifiers may be used for the time zone portion of the `TIMEWINDOW` command.

ACT	AET	AGT	ART
AST	Africa/Abidjan	Africa/Accra	Africa/Addis_Ababa
Africa/Algiers	Africa/Asmera	Africa/Bamako	Africa/Bangui
Africa/Banjul	Africa/Bissau	Africa/Blantyre	Africa/Brazzaville
Africa/Bujumbura	Africa/Cairo	Africa/Casablanca	Africa/Ceuta
Africa/Conakry	Africa/Dakar	Africa/Dar_es_Salaam	Africa/Djibouti

Africa/Douala
Africa/El_Aaiun
Africa/Freetown
Africa/Gaborone
Africa/Harare
Africa/Johannesburg
Africa/Kampala
Africa/Khartoum
Africa/Kigali
Africa/Kinshasa
Africa/Lagos
Africa/Libreville
Africa/Lome
Africa/Luanda
Africa/Lubumbashi
Africa/Lusaka
Africa/Malabo
Africa/Maputo
Africa/Maseru
Africa/Mbabane
Africa/Mogadishu
Africa/Monrovia
Africa/Nairobi
Africa/Ndjamena
Africa/Niamey
Africa/Nouakchott
Africa/Ouagadougou
Africa/Porto-Novo
Africa/Sao_Tome
Africa/Timbuktu
Africa/Tripoli
Africa/Tunis
Africa/Windhoek
America/Adak
America/Anchorage
America/Anguilla
America/Antigua
America/Araguaina
America/Aruba
America/Asuncion
America/Atka
America/Barbados
America/Belem
America/Belize
America/Boa_Vista
America/Bogota
America/Boise
America/Buenos_Aires
America/Cambridge_Bay
America/Cancun
America/Caracas
America/Catamarca
America/Cayenne
America/Cayman
America/Chicago
America/Chihuahua
America/Cordoba
America/Costa_Rica
America/Cuiaba
America/Curacao
America/Danmarkshavn
America/Dawson
America/Dawson_Creek
America/Denver
America/Detroit
America/Dominica
America/Edmonton
America/Eirunepe
America/El_Salvador
America/Ensenada
America/Fort_Wayne
America/Fortaleza
America/Glace_Bay
America/Godthab
America/Goose_Bay
America/Grand_Turk
America/Grenada
America/Guadeloupe
America/Guatemala
America/Guayaquil
America/Guyana
America/Halifax
America/Havana
America/Hermosillo
America/Indiana/Indianapolis
America/Indiana/Knox
America/Indiana/Marengo
America/Indiana/Vevay
America/Indianapolis
America/Inuvik
America/Iqaluit
America/Jamaica
America/Jujuy
America/Juneau
America/Kentucky/Louisville
America/Kentucky/Monticello
America/Knox_IN
America/La_Paz
America/Lima
America/Los_Angeles
America/Louisville
America/Maceio
America/Managua
America/Manaus
America/Martinique
America/Mazatlan
America/Mendoza
America/Menominee
America/Merida
America/Mexico_City
America/Miquelon
America/Monterrey
America/Montevideo
America/Montreal
America/Montserrat
America/Nassau
America/New_York
America/Nipigon
America/Nome
America/Noronha
America/North_Dakota/Center
America/Panama
America/Pangnirtung
America/Paramaribo
America/Phoenix
America/Port-au-Prince
America/Port_of_Spain
America/Porto_Acre
America/Porto_Velho
America/Puerto_Rico
America/Rainy_River
America/Rankin_Inlet
America/Recife
America/Regina
America/Rio_Branco
America/Rosario
America/Santiago
America/Santo_Domingo
America/Sao_Paulo
America/Scoresbysund
America/Shiprock
America/St_Johns
America/St_Kitts
America/St_Lucia
America/St_Thomas
America/St_Vincent
America/Swift_Current
America/Tegucigalpa
America/Thule
America/Thunder_Bay
America/Tijuana
America/Tortola
America/Vancouver
America/Virgin
America/Whitehorse
America/Winnipeg
America/Yakutat
America/Yellowknife
Antarctica/Casey
Antarctica/Davis
Antarctica/DumontDUrville
Antarctica/Mawson
Antarctica/McMurdo
Antarctica/Palmer
Antarctica/South_Pole
Antarctica/Syowa
Antarctica/Vostok
Arctic/Longyearbyen
Asia/Aden
Asia/Almaty
Asia/Amman
Asia/Anadyr
Asia/Aqtau
Asia/Aqtobe
Asia/Ashgabat
Asia/Ashkhabad
Asia/Baghdad
Asia/Bahrain
Asia/Baku
Asia/Bangkok
Asia/Beirut
Asia/Bishkek
Asia/Brunei
Asia/Calcutta
Asia/Choibalsan
Asia/Chongqing
Asia/Chungking
Asia/Colombo
Asia/Dacca
Asia/Damascus
Asia/Dhaka
Asia/Dili

Asia/Dubai
Asia/Dushanbe
Asia/Gaza
Asia/Harbin
Asia/Hong_Kong
Asia/Hovd
Asia/Irkutsk
Asia/Istanbul
Asia/Jakarta
Asia/Jayapura
Asia/Jerusalem
Asia/Kabul
Asia/Kamchatka
Asia/Karachi
Asia/Kashgar
Asia/Katmandu
Asia/Krasnoyarsk
Asia/Kuala_Lumpur
Asia/Kuching
Asia/Kuwait
Asia/Macao
Asia/Macau
Asia/Magadan
Asia/Makassar
Asia/Manila
Asia/Muscat
Asia/Nicosia
Asia/Novosibirsk
Asia/Omsk
Asia/Oral
Asia/Phnom_Penh
Asia/Pontianak
Asia/Pyongyang
Asia/Qatar
Asia/Qyzylorda
Asia/Rangoon
Asia/Riyadh
Asia/Riyadh87
Asia/Riyadh88
Asia/Riyadh89
Asia/Saigon
Asia/Sakhalin
Asia/Samarkand
Asia/Seoul
Asia/Shanghai
Asia/Singapore
Asia/Taipei
Asia/Tashkent
Asia/Tbilisi
Asia/Tehran
Asia/Tel_Aviv
Asia/Thimbu
Asia/Thimphu
Asia/Tokyo
Asia/Ujung_Pandang
Asia/Ulaanbaatar
Asia/Ulan_Bator
Asia/Urumqi
Asia/Vientiane
Asia/Vladivostok
Asia/Yakutsk
Asia/Yekaterinburg
Asia/Yerevan
Atlantic/Azores
Atlantic/Bermuda
Atlantic/Canary
Atlantic/Cape_Verde
Atlantic/Faeroe
Atlantic/Jan_Mayen
Atlantic/Madeira
Atlantic/Reykjavik
Atlantic/South_Georgia
Atlantic/St_Helena
Atlantic/Stanley
Australia/ACT
Australia/Adelaide
Australia/Brisbane
Australia/Broken_Hill
Australia/Canberra
Australia/Darwin
Australia/Hobart
Australia/LHI
Australia/Lindeman
Australia/Lord_Howe
Australia/Melbourne
Australia/NSW
Australia/North
Australia/Perth
Australia/Queensland
Australia/South
Australia/Sydney
Australia/Tasmania
Australia/Victoria
Australia/West
Australia/Yancowinna
BET
BST
Brazil/Acre
Brazil/DeNoronha
Brazil/East
Brazil/West
CAT
CET
CNT
CST
CST6CDT
CTT
Canada/Atlantic
Canada/Central
Canada/East-Saskatchewan
Canada/Eastern
Canada/Mountain
Canada/Newfoundland
Canada/Pacific
Canada/Saskatchewan
Canada/Yukon
Chile/Continental
Chile/EasterIsland
Cuba
EAT
ECT
EET
EST
EST5EDT
Egypt
Eire
Etc/GMT
Etc/GMT+0
Etc/GMT+1
Etc/GMT+10
Etc/GMT+11
Etc/GMT+12
Etc/GMT+2
Etc/GMT+3
Etc/GMT+4
Etc/GMT+5
Etc/GMT+6
Etc/GMT+7
Etc/GMT+8
Etc/GMT+9
Etc/GMT-0
Etc/GMT-1
Etc/GMT-10
Etc/GMT-11
Etc/GMT-12
Etc/GMT-13
Etc/GMT-14
Etc/GMT-2
Etc/GMT-3
Etc/GMT-4
Etc/GMT-5
Etc/GMT-6
Etc/GMT-7
Etc/GMT-8
Etc/GMT-9
Etc/GMT0
Etc/Greenwich
Etc/UCT
Etc/UTC
Etc/Universal
Etc/Zulu
Europe/Amsterdam
Europe/Andorra
Europe/Athens
Europe/Belfast
Europe/Belgrade
Europe/Berlin
Europe/Bratislava
Europe/Brussels
Europe/Bucharest
Europe/Budapest
Europe/Chisinau
Europe/Copenhagen
Europe/Dublin
Europe/Gibraltar
Europe/Helsinki
Europe/Istanbul
Europe/Kaliningrad
Europe/Kiev
Europe/Lisbon
Europe/Ljubljana
Europe/London
Europe/Luxembourg
Europe/Madrid
Europe/Malta
Europe/Minsk
Europe/Monaco
Europe/Moscow
Europe/Nicosia
Europe/Oslo
Europe/Paris
Europe/Prague

Europe/Riga
Europe/Rome
Europe/Samara
Europe/San_Marino
Europe/Sarajevo
Europe/Simferopol
Europe/Skopje
Europe/Sofia
Europe/Stockholm
Europe/Tallinn
Europe/Tirane
Europe/Tiraspol
Europe/Uzhgorod
Europe/Vaduz
Europe/Vatican
Europe/Vienna
Europe/Vilnius
Europe/Warsaw
Europe/Zagreb
Europe/Zaporozhye
Europe/Zurich
GB
GB-Eire
GMT
GMT0
Greenwich
HST
Hongkong
IET
IST
Iceland
Indian/Antananarivo
Indian/Chagos
Indian/Christmas
Indian/Cocos
Indian/Comoro
Indian/Kerguelen
Indian/Mahe
Indian/Maldives
Indian/Mauritius
Indian/Mayotte
Indian/Reunion
Iran
Israel
JST
Jamaica
Japan
Kwajalein
Libya
MET
MIT
MST
MST7MDT
Mexico/BajaNorte
Mexico/BajaSur
Mexico/General
Mideast/Riyadh87
Mideast/Riyadh88
Mideast/Riyadh89
NET
NST
NZ
NZ-CHAT
Navajo
PLT
PNT
PRC
PRT
PST
PST8PDT
Pacific/Apia
Pacific/Auckland
Pacific/Chatham
Pacific/Easter
Pacific/Efate
Pacific/Enderbury
Pacific/Fakaofo
Pacific/Fiji
Pacific/Funafuti
Pacific/Galapagos
Pacific/Gambier
Pacific/Guadalcanal
Pacific/Guam
Pacific/Honolulu
Pacific/Johnston
Pacific/Kiritimati
Pacific/Kosrae
Pacific/Kwajalein
Pacific/Majuro
Pacific/Marquesas
Pacific/Midway
Pacific/Nauru
Pacific/Niue
Pacific/Norfolk
Pacific/Noumea
Pacific/Pago_Pago
Pacific/Palau
Pacific/Pitcairn
Pacific/Ponape
Pacific/Port_Moresby
Pacific/Rarotonga
Pacific/Saipan
Pacific/Samoa
Pacific/Tahiti
Pacific/Tarawa
Pacific/Tongatapu
Pacific/Truk
Pacific/Wake
Pacific/Wallis
Pacific/Yap
Poland
Portugal
ROK
SST
Singapore
SystemV/AST4
SystemV/AST4ADT
SystemV/CST6
SystemV/CST6CDT
SystemV/EST5
SystemV/EST5EDT
SystemV/HST10
SystemV/MST7
SystemV/MST7MDT
SystemV/PST8
SystemV/PST8PDT
SystemV/YST9
SystemV/YST9YDT
Turkey
UCT
US/Alaska
US/Aleutian
US/Arizona
US/Central
US/East-Indiana
US/Eastern
US/Hawaii
US/Indiana-Starke
US/Michigan
US/Mountain
US/Pacific
US/Pacific-New
US/Samoa
UTC
Universal
VST
W-SU
WET
Zulu