ieee_exceptions: IEEE exceptions module

March 8, 2024

1 Name

`ieee_exceptions` — Intrinsic module providing access to IEEE exceptions

2 Usage

USE,INTRINSIC :: IEEE_EXCEPTIONS

This module provides types, parameters and procedures for using IEEE exception flags. Its contents conform to technical report ISO/IEC TR 15580:1998(E).

3 Synopsis

Derived Types
  IEEE_FLAG_TYPE, IEEE_STATUS_TYPE.

Parameters
  IEEE_ALL, IEEE_DIVIDE_BY_ZERO, IEEE_INEXACT, IEEE_INVALID, IEEE_OVERFLOW, IEEE_UNDERFLOW, IEEE_USUAL.

Procedures
  IEEE_GET_FLAG, IEEE_GET_HALTING_MODE, IEEE_GET_STATUS, IEEE_SET_FLAG, IEEE_SET_HALTING_MODE, IEEE_SET_STATUS, IEEE_SUPPORT_FLAG, IEEE_SUPPORT_HALTING.

4 Derived-Type Description

```
TYPE IEEE_FLAG_TYPE
  PRIVATE
  ...
END TYPE
```

This type is provided for the purpose of specifying IEEE exception flags; a value of this type indicates each particular flag.

```
TYPE IEEE_STATUS_TYPE
  PRIVATE
  ...
END TYPE
```

This type is provided to allow the user to save (and restore) the current floating-point status. The floating-point status includes the state (quiet or signalling) of each IEEE exception flag, and the current rounding mode.

5 Parameter Description

```
TYPE(IEEE_FLAG_TYPE),PARAMETER :: IEEE_ALL = &
    (/ IEEE_USUAL,IEEE_UNDERFLOW,IEEE_INEXACT /)
```

Array specifying all IEEE exception flags.

```
TYPE(IEEE_FLAG_TYPE),PARAMETER :: IEEE_DIVIDE_BY_ZERO
```

Specifies the division-by-zero exception flag.

```
TYPE(IEEE_FLAG_TYPE),PARAMETER :: IEEE_INEXACT
```

Specifies the inexact exception flag.

```
TYPE(IEEE_FLAG_TYPE),PARAMETER :: IEEE_INVALID
```

Specifies the invalid exception flag.

```
TYPE(IEEE_FLAG_TYPE),PARAMETER :: IEEE_OVERFLOW
```

Specifies the overflow exception flag.

```
TYPE(IEEE_FLAG_TYPE),PARAMETER :: IEEE_UNDERFLOW
```

Specifies the underflow exception flag.

```
TYPE(IEEE_FLAG_TYPE),PARAMETER :: IEEE_USUAL = &
    (/ IEEE_OVERFLOW,IEEE_DIVIDE_BY_ZERO,IEEE_INVALID /)
```

Array specifying the most commonly desired subset of exception flags.

6 Procedure Description

```
ELEMENTAL SUBROUTINE IEEE_GET_FLAG(FLAG,FLAG_VALUE)

TYPE(IEEE_FLAG_TYPE),INTENT(IN) :: FLAG
LOGICAL,INTENT(OUT) :: FLAG_VALUE
```

Sets FLAG_VALUE to .TRUE. if the specified IEEE exception flag is signalling, and to .FALSE. otherwise. From Fortran 2018, `FLAG_VALUE` may be any kind of `LOGICAL`.

```
ELEMENTAL SUBROUTINE IEEE_GET_HALTING_MODE(FLAG,HALTING)

TYPE(IEEE_FLAG_TYPE),INTENT(IN) :: FLAG
LOGICAL,INTENT(OUT) :: HALTING
```

Sets HALTING to .TRUE. if an occurrence of the specified exception will cause program termination, and to .FALSE. otherwise. From Fortran 2018, `HALTING` may be any kind of `LOGICAL`.

```
SUBROUTINE IEEE_GET_STATUS(STATUS_VALUE)

TYPE(IEEE_STATUS_TYPE),INTENT(OUT) :: STATUS_VALUE
```

Stores the current floating-point status in STATUS_VALUE.

```
ELEMENTAL SUBROUTINE IEEE_SET_FLAG(FLAG,FLAG_VALUE)

TYPE(IEEE_FLAG_TYPE),INTENT(IN) :: FLAG
LOGICAL,INTENT(IN) :: INTENT(IN) :: FLAG_VALUE
```

Sets the specified exception flag to signalling if FLAG_VALUE is .TRUE., and to quiet otherwise. From Fortran 2018, `FLAG_VALUE` may be any kind of `LOGICAL`.

```
ELEMENTAL SUBROUTINE IEEE_SET_HALTING_MODE(FLAG,HALTING)

TYPE(IEEE_FLAG_TYPE),INTENT(IN) :: FLAG
LOGICAL,INTENT(IN) :: HALTING
```

Sets the halting mode for exception FLAG to true if HALTING is .TRUE., and to false otherwise. If the halting mode for an exception is true, an occurrence of that exception will cause program termination. From Fortran 2018, `HALTING` may be any kind of `LOGICAL`.

```
SUBROUTINE IEEE_SET_STATUS(STATUS_VALUE)

TYPE(IEEE_STATUS_TYPE),INTENT(IN) :: STATUS_VALUE
```

Restores the current floating-point status to that saved by a preceding invocation of IEEE_GET_STATUS.

```
LOGICAL FUNCTION IEEE_SUPPORT_FLAG(FLAG,X)

TYPE(IEEE_FLAG_TYPE),INTENT(IN) :: FLAG
REAL(any kind),OPTIONAL :: X
```

Returns .TRUE. if detection of the specified exception is supported; either for all real kinds (if X is absent), or for reals of the same kind as X.

```
LOGICAL FUNCTION IEEE_SUPPORT_HALTING(FLAG)

TYPE(IEEE_FLAG_TYPE),INTENT(IN) :: FLAG
```

Returns .TRUE. if IEEE_SET_HALTING can be used to alter the halting mode of the specified exception, for all real kinds for which IEEE_SUPPORT_FLAG returns .TRUE..

7   See Also

nagfor(1), **ieee_arithmetic**(3), **ieee_features**(3), **intro**(3), **nag_modules**(3).

8   Bugs

Please report any bugs found to 'support@nag.co.uk' or 'support@nag.com', along with any suggestions for improvements.