24.1 The `<assert.h>` Header: Diagnostics

```
void assert(scalar expression);
```

assert

`assert`, which is defined in the `<assert.h>` header, allows a program to monitor its own behavior and detect possible problems at an early stage.

Although `assert` is actually a macro, it's designed to be used like a function. It has one argument, which must be an "assertion"—an expression that we expect to be true under normal circumstances. Each time `assert` is executed, it tests the value of its argument. If the argument has a nonzero value, `assert` does nothing. If the argument's value is zero, `assert` writes a message to `stderr` (the standard error stream) and calls the `abort` function to terminate program execution.

`stderr` stream ➤*22.1*

`abort` function ➤*26.2*

For example, let's say that the file `demo.c` declares an array `a` of length 10. We're concerned that the statement

```
a[i] = 0;
```

in `demo.c` might cause the program to fail because `i` isn't between 0 and 9. We can use `assert` to check this condition before we perform the assignment to `a[i]`:

```
assert(0 <= i && i < 10);    /* checks subscript first */
a[i] = 0;                    /* now does the assignment */
```

If `i`'s value is less than 0 or greater than or equal to `10`, the program will terminate after displaying a message like the following one:

```
Assertion failed: 0 <= i && i < 10, file demo.c, line 109
```

C99

C99 changes `assert` in a couple of minor ways. The C89 standard states that the argument to `assert` must have `int` type. The C99 standard relaxes this requirement, allowing the argument to have any scalar type (hence the word *scalar* in the prototype for `assert`). This change allows the argument to be a floating-point number or a pointer, for example. Also, C99 requires that a failed `assert` display the name of the function in which it appears. (C89 requires only that `assert` display the argument—in text form—along with the name of the source file and the source line number). The suggested form of the message is

```
Assertion failed: expression, function abc, file xyz, line nnn.
```

The exact form of the message produced by `assert` may vary from one compiler to another, although it should always contain the information required by the standard. For example, the GCC compiler produces the following message in the situation described earlier:

```
a.out: demo.c:109: main: Assertion `0 <= i && i < 10' failed.
```