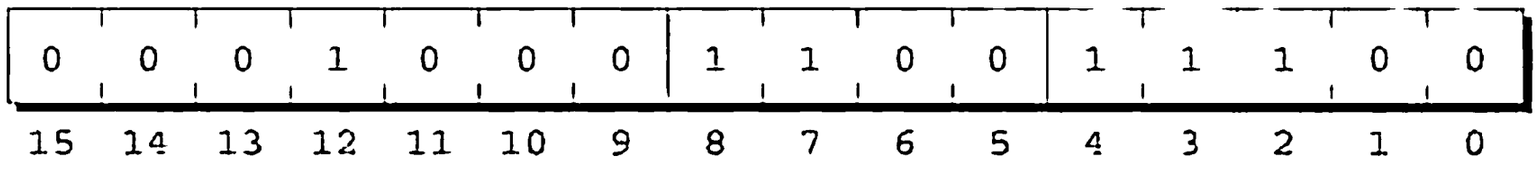
according to Microsoft). After these assignments, the `fd` variable will have the following appearance:



We could have used the bitwise operators to accomplish the same effect; using these operators might even make the program a little faster. However, having a readable program is usually more important than gaining a few microseconds.

Bit-fields do have one restriction that doesn't apply to other members of a structure. Since bit-fields don't have addresses in the usual sense, C doesn't allow us to apply the address operator (`&`) to a bit-field. Because of this rule, functions such as `scanf` can't store data directly in a bit-field:

```
scanf("%d", &fd.day);    /*** WRONG ***/
```

Of course, we can always use `scanf` to read input into an ordinary variable and then assign it to `fd.day`.

How Bit-Fields Are Stored

Let's take a close look at how a compiler processes the declaration of a structure that has bit-field members. As we'll see, the C standard allows the compiler considerable latitude in choosing how it stores bit-fields.

The rules concerning how the compiler handles bit-fields depend on the notion of "storage units." The size of a storage unit is implementation-defined: typical values are 8 bits, 16 bits, and 32 bits. As it processes a structure declaration, the compiler packs bit-fields one by one into a storage unit, with no gaps between the fields, until there's not enough room for the next field. At that point, some compilers skip to the beginning of the next storage unit, while others split the bit-field across the storage units. (Which one occurs is implementation-defined.) The order in which bit-fields are allocated (left to right or right to left) is also implementation-defined.

Our `file_date` example assumes that storage units are 16 bits long. (An 8-bit storage unit would also be acceptable, provided that the compiler splits the `month` field across two storage units.) We also assume that bit-fields are allocated from right to left (with the first bit-field occupying the low-order bits).

C allows us to omit the name of any bit-field. Unnamed bit-fields are useful as "padding" to ensure that other bit fields are properly positioned. Consider the time associated with a DOS file, which is stored in the following way:

```
struct file_time {
  unsigned int seconds: 5;
  unsigned int minutes: 6;
  unsigned int hours: 5;
};
```