The simplest I/O port on a microcontroller is the parallel port. A parallel I/O port is a simple mechanism that allows the software to interact with external devices. It is called parallel because multiple signals can be accessed all at once. An **input port**, which allows the software to read external digital signals, is read only. That means a read cycle access from the port address returns the values existing on the inputs at that time. In particular, the tristate driver (triangle shaped circuit in Figure 6.5) will drive the input signals onto the data bus during a read cycle from the port address. A write cycle access to an input port usually produces no effect. The digital values existing on the input pins are copied into the microcontroller when the software executes a read from the port address. There are no digital input-only ports on the LM4F/TM4C family of microcontrollers. The LM4F/TM4C family of microcontrollers has 5V-tolerant digital inputs, meaning an input high signal can be any voltage from 2.0 to 5.0 V. On the STMicroelectronics STM32F10xx family, some inputs are 5-V tolerant and others are not.

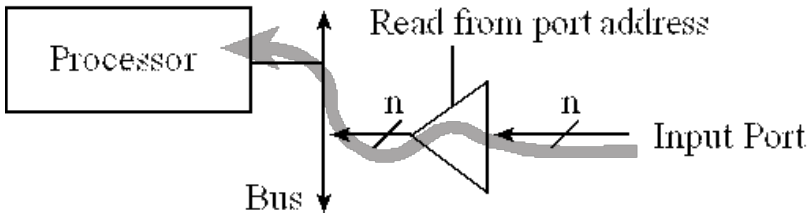

Figure 6.5. A read only input port allows the software to sense external digital signals.

CHECKPOINT 6.1

What happens if the software writes to an input port like Figure 6.5?

Hide Answer

Nothing happens if the software writes to an input port.

While an input device usually just involves the software reading the port, an output port can participate in both the read and write cycles very much like a regular memory. Figure 6.6 describes a **readable output port**. A write cycle to the port address will affect the values on the output pins. In particular, the microcontroller places information on the data bus and that information is clocked into the D flip-flops. Since it is a readable output, a read cycle access from the port address returns the current values existing on the port pins. There are no output-only ports on the LM4F/TM4C family of microcontrollers.

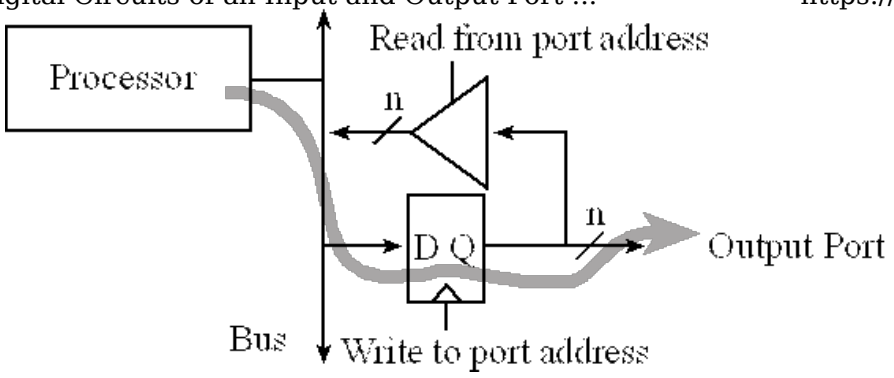

Figure 6.6. A readable output port allows the software to generate external digital signals.

CHECKPOINT 6.2

What happens if the software reads from an output port like Figure 6.6?

Hide Answer

If the software reads this output port it gets the values last written to the port. For example, if the user mistakenly grounded the output pin (very bad thing to do), and the software writes a '1'; when it reads it will get '1'.

Help