Electronics
Block Diagrams

Terry Sturtevant

Wilfrid Laurier University

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Introduction

There are many different ways to describe a circuit or a system. One way to describe a circuit is with a schematic diagram. For a large or complex circuit, a schematic diagram may be difficult to understand. A block diagram allows a circuit or system to be described as a set of modules. By identifying the modules, and showing how they are connected, it provides a simple overview. Each module can then be described individually, and its function more easily understood.
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Simple Example

A heating system, such as for a house, requires 3 parts:

- A temperature sensor which measures the temperature of the environment
- A heater which changes the temperature of the environment
- A controller which uses information from the sensor to adjust the heater
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A diagram is simple to make.
Block diagram

Heating System Block Diagram
Can you tell which part is which?
Now can you tell which part is which?
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By indicating signal directions, it makes the flow of control obvious.
By indicating signal *directions*, it makes the flow of control obvious.

The diagram can be easily adapted to more complex systems.
Slightly more complex example

Heating and Cooling System Block Diagram
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To do this, replace heater and A/C with valves on the hot and cold lines.
Adapted example: shower control

Is there anything that needs to change?
Adapted example: shower control

Indicating the type of signal conveys important information.
The original block diagram could also be used for a light control system.
Light control system

Incandescent Light Control
This will work for *incandescent* lights
This will work for *incandescent* lights

What need to change for LED lights?
LED light control system

LED Light Control; not quite done
LED light control system

Complete LED Light Control
So the previous block diagram describes a system with:

- A temperature sensor which produces an analog signal to indicate the light level.
- An LED light which changes the light level.
- A controller which takes in the analog signal from the sensor and produces a pulse-width modulated signal to the LED light.

All of this can be determined without any other documentation.
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Multiple signals and interfaces
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It is easy and useful to have symbols for these as well.
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This process of handling all of the signals yourself is often called **bit-bashing** or **bit-banging**.
Multiple signals

Multiple digital signals
Multiple signals

Multiple analog signals
Multiple signals

Multiple pulse-width modulated signals
Multiple signals

UART interface
What can you tell about the Raspberry Pi?