

Getting Started with the LogoChip

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Analog vs. Digital

Some preliminaries:

The Analog World - input and output voltages vary continuously

The Digital World- voltages take on discrete values

Binary Logic - a type of digital logic in which there are two discrete states, which we label "0" and "1". These states are represented electronically by two different voltages (actually, two different *ranges* of voltages). For example, in the LogoChip we will have the "1" state be either 5 or 6 volts and the "0" state will be 0 V (ground). Alternatively, we can call the "0" and "1" states "LOW" and "HIGH", respectively. Whether a point in a digital circuit is in the "0" state or the "1" state constitutes a **bit** (binary digit) of information. Binary logic is the basis for virtually all digital electronics in the world today.

Why Digital?

Advantages include:

- noise immunity - signal is reborn at each stage
- allows stored program computing - this is, ahem, fairly significant

Disadvantages of digital approach:

- complexity - more lines required to carry the same information
- speed - more time needed to process the numbers that encode the information

These disadvantages explain, for example, why we've had analog television for ~ 50 years, while all-digital television is only just now coming to market.

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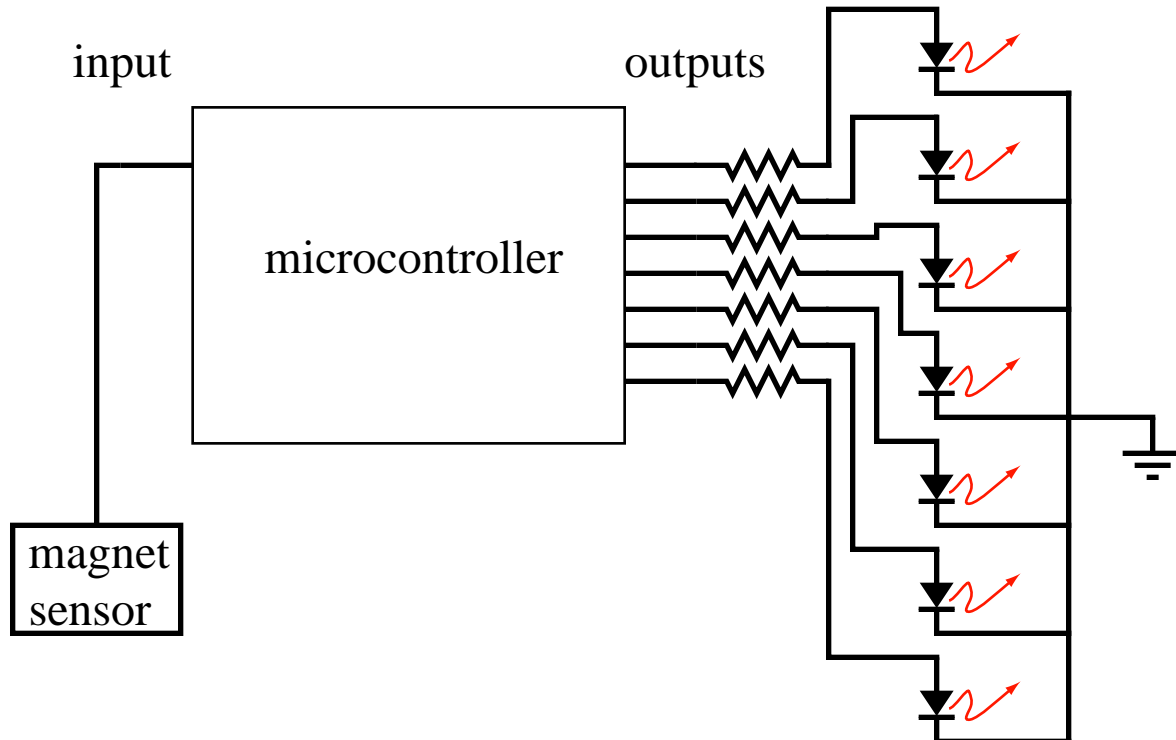
Microcontrollers

Microcontrollers – a programmable device with inputs and outputs.

Example: The LogoChip Bike speedometer

The problem: We wish to sense when the magnet sensor passes a stationary magnet and use this information to control exact when each of the 7 LEDs turns on and off.

Schematically we can represent the kind of circuit we want to build:



Microcontroller implementation of a bike speedometer

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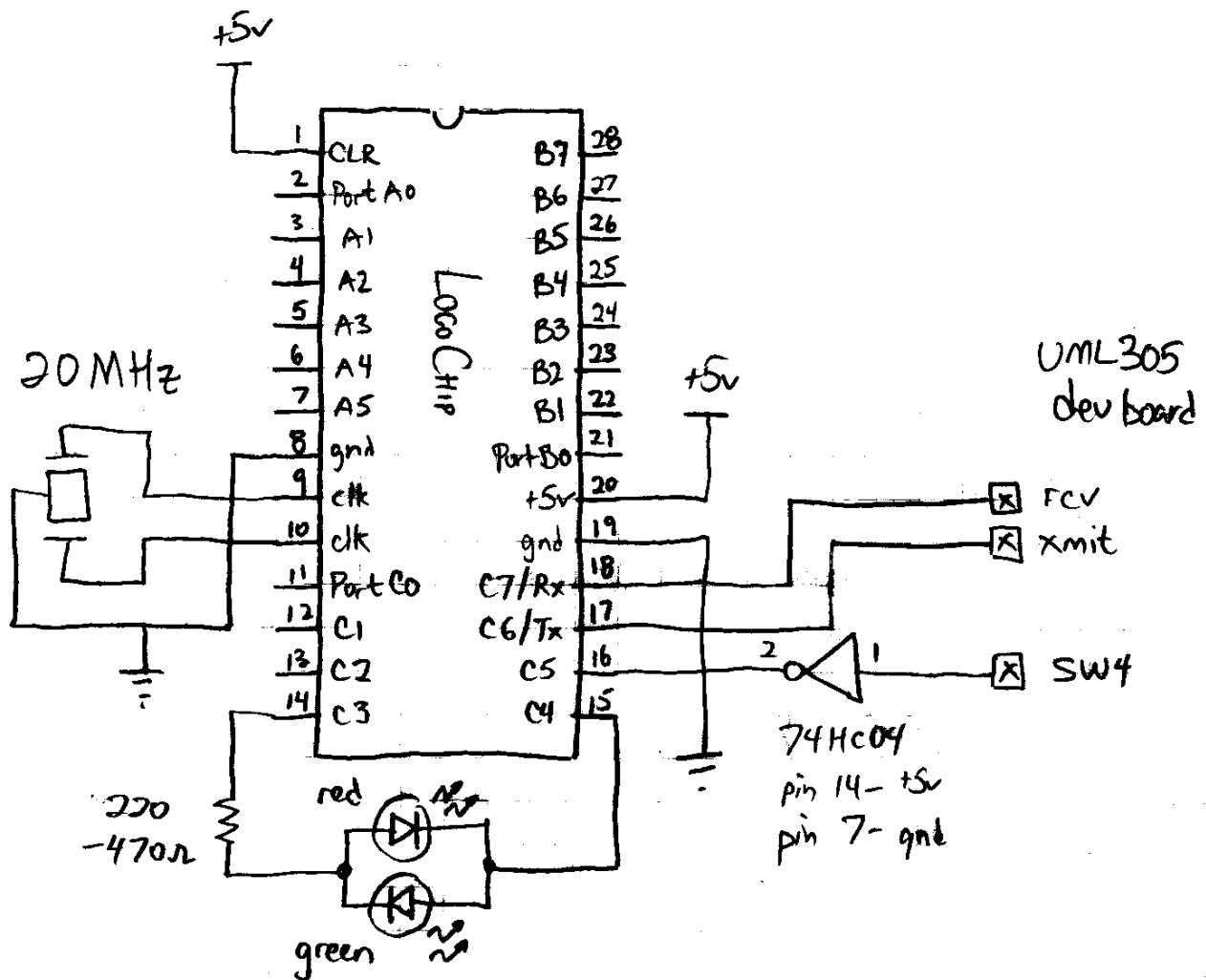
Building the LogoChip

In this course we are going to use a new kind of microcontroller called the LogoChip that is both powerful and easy to use.

Here's a "hello world" exercise for getting started with the LogoChip:

1) Build the LogoChip Build the LogoChip on a small breadboard following the schematic below. Use the UML305DEV board to provide power to the circuit.

LOGOCHIP BOOT DIAGRAM



LogoChip Hardware. Port A, most of Port B, and Port C0-2 can be configured by users as digital inputs or outputs.

The exceptions are Port A, bit 4, which, as an output, and only drive low, and Port B, bit 0, which is reserved

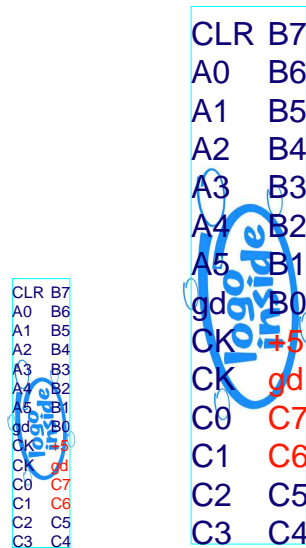
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for communications with Handy Cricket Bus Devices.

When the LogoChip boots up, Port A is configured as analog inputs; this can be changed to a mixture of analog and digital functions by writing to the ADCON1 register.

Construction notes:

Use the handy sticker below to simplify your task.



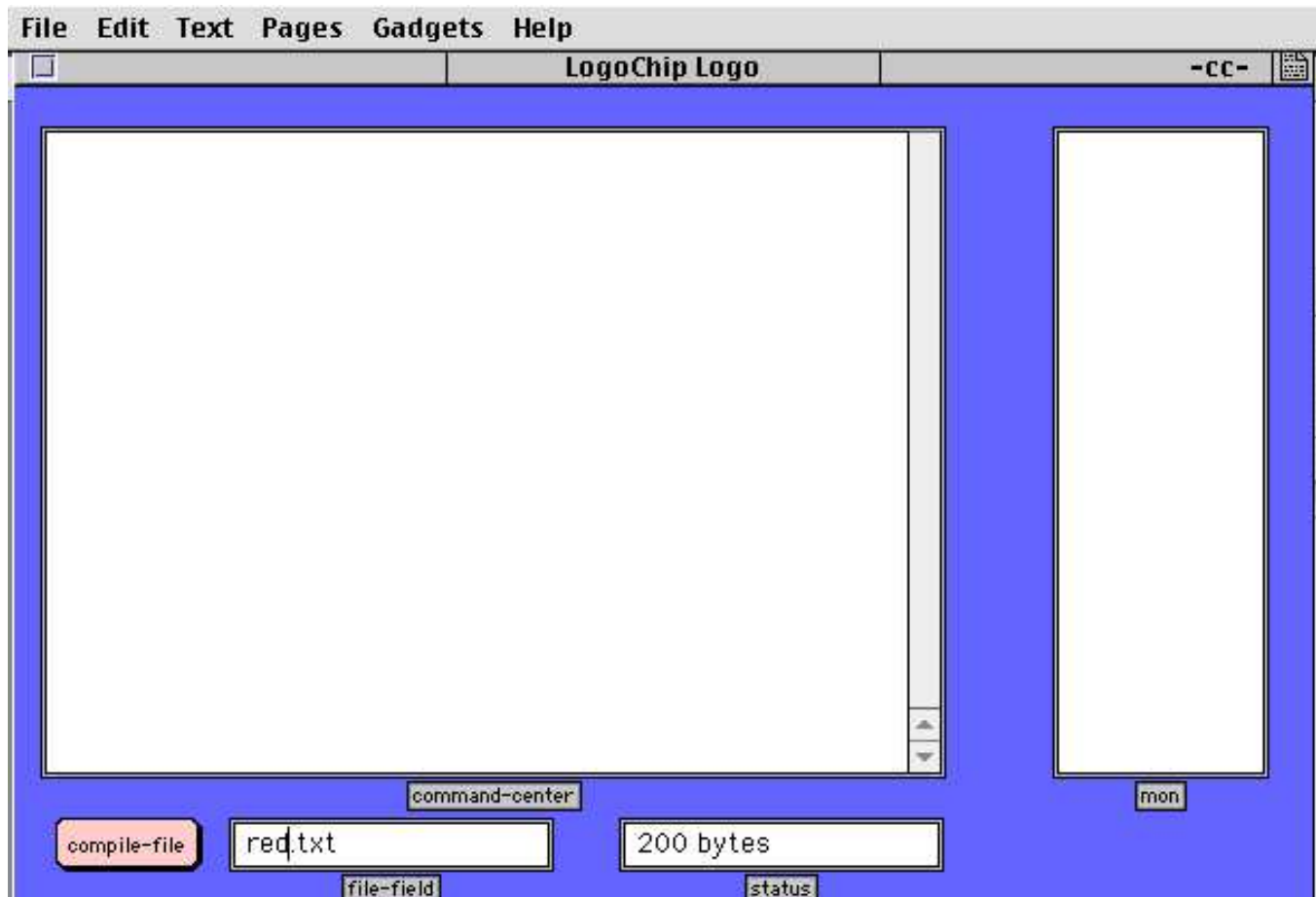
- Make use of the strips on either side of the breadboard to make power and ground “buses.”
- It is especially important to keep the wires connecting the resonator to the LogoChip’s CLK inputs as short as possible. Connect the ground of the resonator (the center pin) to one of the LogoChip grounds (pin 8 or pin 19), **not** to the ground bus. Then connect from the LogoChip ground to the bus ground. (Make sure to ground both ground pins.)
- Add a 0.1 μ F bypass capacitor across the power and ground leads of the LogoChip, and across one or more of the power and ground busses.
- Do not turn on the power until the last step, when you’re pretty sure the wiring is correct. If everything is correct, apply power. You should see the indicator LED “boot flash”—a rapid flash red and green a few times just as you add power. It’s the LogoChip’s way of saying “I’m alive.”

2) Talk to the LogoChip Connect the LogoChip to the UML305DEV board. The LogoChip’s Rx (pin 18) goes to the pin labeled rcv on the dev board. The LogoChip’s Tx (pin 17) goes to the pin labeled xmt. Connect a ground between the LogoChip and the dev board.

Now, use a DB9 cable to connect the dev board to COM1 of the PC. Open **LogoChip Logo**. The user LC Logo interface is shown below. Type the command `flash` in the command-center and hit the <enter> button on the keyboard. The red/green indicator LED should flash just as it did upon powering up.

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Hello World!



To see if your LogoChip is working properly, try typing the following commands in the command-center:

✓flash

The red /green indicator LED flashes!

✓flash wait 20 flash

Flashes, waits 20 tenths of a second, & flashes again.

✓repeat 4 [flash wait 20]

wait grabs control

Repeats flash/wait 4 times

✓loop [flash wait 20]

Repeats flash/wait infinitely

✓

press START/STOP button to stop loop (or any LogoChip Logo program).