

WUN2K FOR LECTURE 25

These are notes summarizing the main concepts you need to understand and be able to apply.

- Flip-flops can be used to produce specific delays. A *one-shot* device is an unstable flip-flop that produces a pulse of length specified by an RC circuit time constant; two of them in series can produce two pulses separated by a specific length of time. These should be used sparingly, as they can be flaky. A more reliable way to make a specific delay is with a *ripple counter*, which has flip-flops arranged to count up in binary as a clock input ticks.
- Experimental data-taking usually involves conversion of analog signals (with physical information) to bits, which can be manipulated by computers. A typical digitization circuit involves:
 - A “front-end” that takes the data signal and removes noise, amplifies, or otherwise shapes it (often involving a “pre-amplifier”).
 - A “comparator” or “discriminator”. This is a device that provides a logic signal output whenever the input exceeds a threshold—it’s a 1-bit ADC (analog-to-digital converter). A comparator is usually implemented using an op-amp *without* feedback, in which output is driven high or low given a small difference on the inputs.
 - Often, a “sample-and-hold”. This is a circuit that stores an analog voltage for later digitization.
 - An ADC device. This is a circuit that converts an analog voltage level into bits. It can be implemented using comparators in parallel to compare the voltage to reference voltages in a divider, plus some logic gates.

- Usually, some kind of “trigger” or control logic that uses input signals to decide whether to go ahead and digitize a signal.
- A data acquisition or “DAQ” that processes the digitized signal bits in registers and hands them off to a computer.