Special Topics:
Simple Robots and
Microprocessors

ECE 292
Lecture Notes 2

Reading: Chapter 7, 8

Quiz 2

1. Your Name

2. Your lab partner's name

3. How many bits of data can be output to a Parallel Port?

4. What kind of solder joint is preferred: Dull or shiny?

5. What does a ULN2803 have inside that is so useful?

Today's Topics

- Re-examine Nitinol
- Review electronics and schematic symbols
- Examine the parallel port controller schematic
- Steps to build the controller
- Soldering skills
- Testing the controller
- Instrumentation
- Meter
- Oscilloscope
- Logic Analyzer
- Power Supply
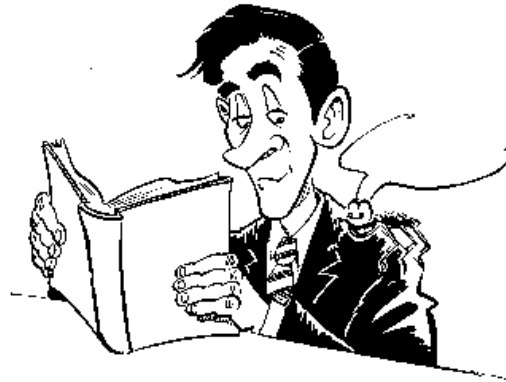
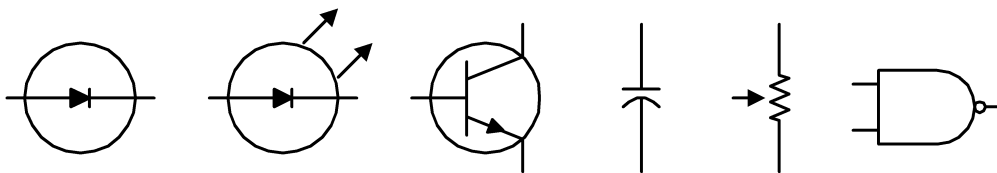NC STATE UNIVERSITY

Nitinol - What Is It?

Length   martensite   2   1   austenite

$M_t = 45°C$ $A_t = 70°C$

Temperature
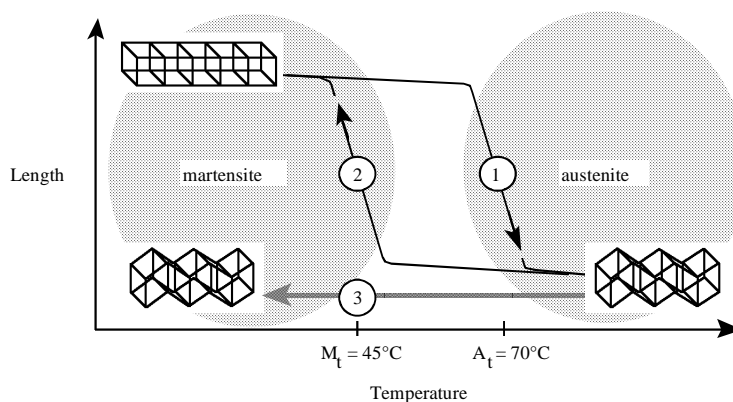
- Alloy of nickel and titanium, contracts when heated
- When cooled, must be "stretched" back to its original size
- Lasts millions of cycles
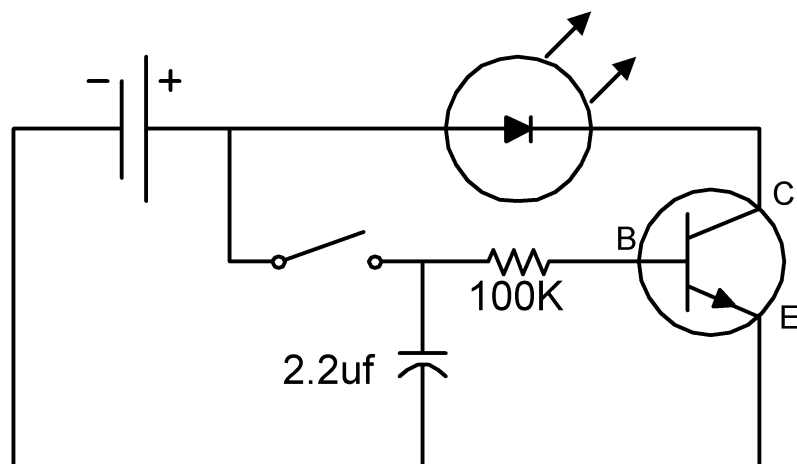- Cycle time depends on "how hot" you make it

NC STATE UNIVERSITY

Review of Schematic Symbols

- Resistor, Battery, Switch
- Diode
- Light Emitting Diode (LED)
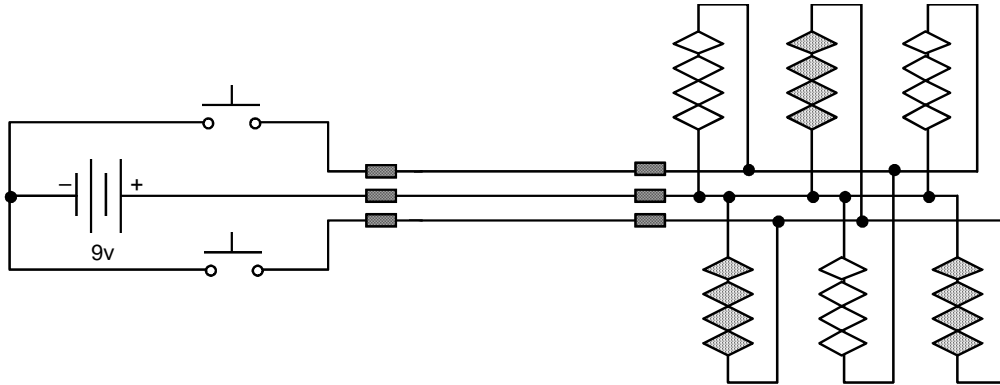- Transistor
- Capacitor
- Potentiometer
- Logic Gate

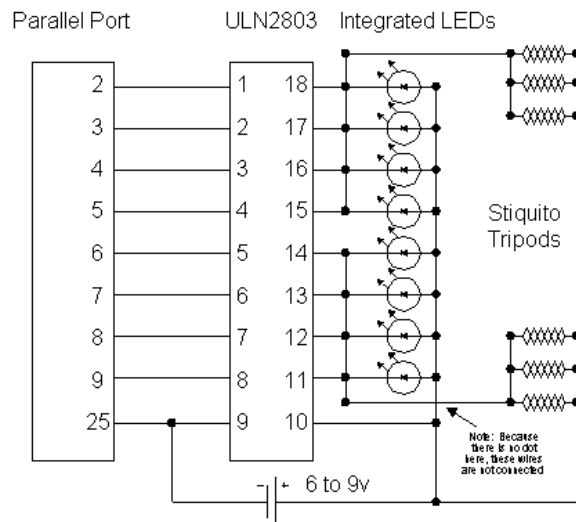# Review (or Introduction) of Some Electronics

100K

2.2uf

B

C

E

Controlling Stiquito Manually

Simple operation, no components, two switches, requires tether

Controlling Stiquito - PC Parallel Port

• Attach Stiquito to a PC's Parallel port via a tether

• Provide a separate power source from the PC

• Program via C, BASIC, or Assembler

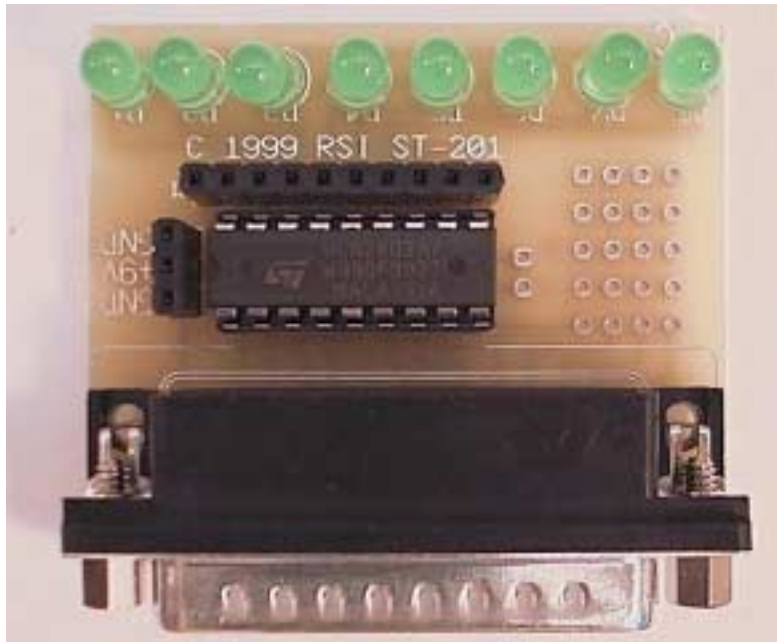• Simple circuit, easier to change program

The Parallel Port Controller

ECE 292 - Notes - Parallel Port Controller;   9
Hardware Skills
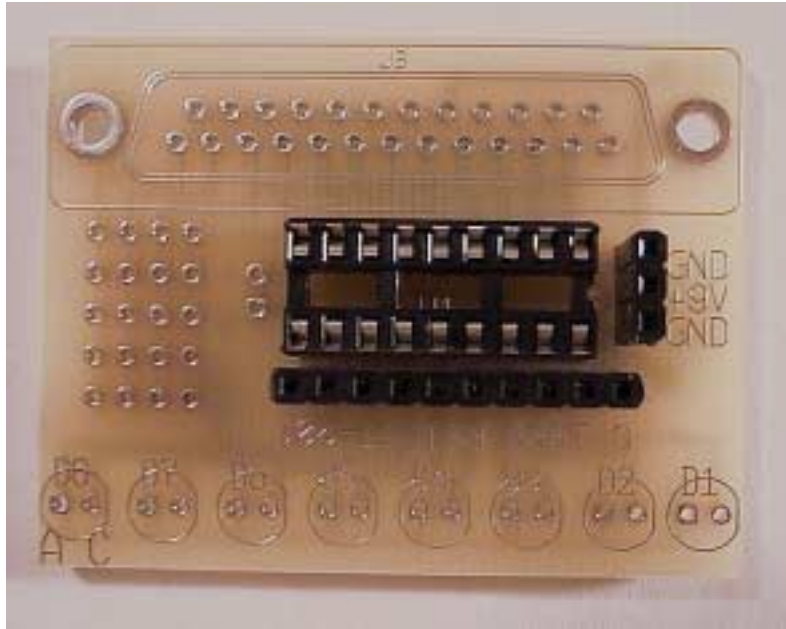
The Completed Parallel Port Controller

ECE 292 - Notes - Parallel Port Controller;   10
Hardware Skills
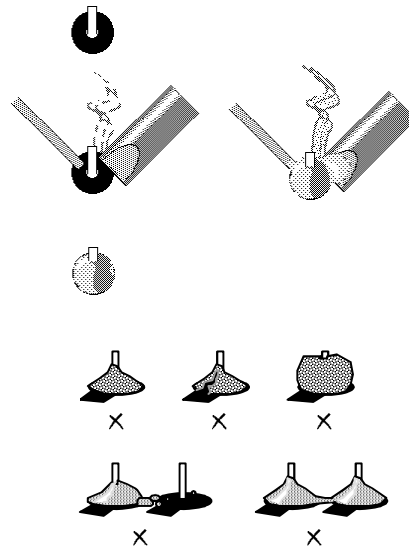
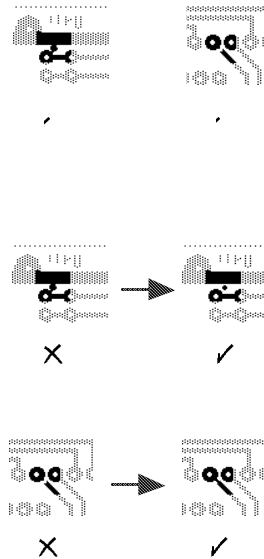# Total Package - Controlling Stiquito
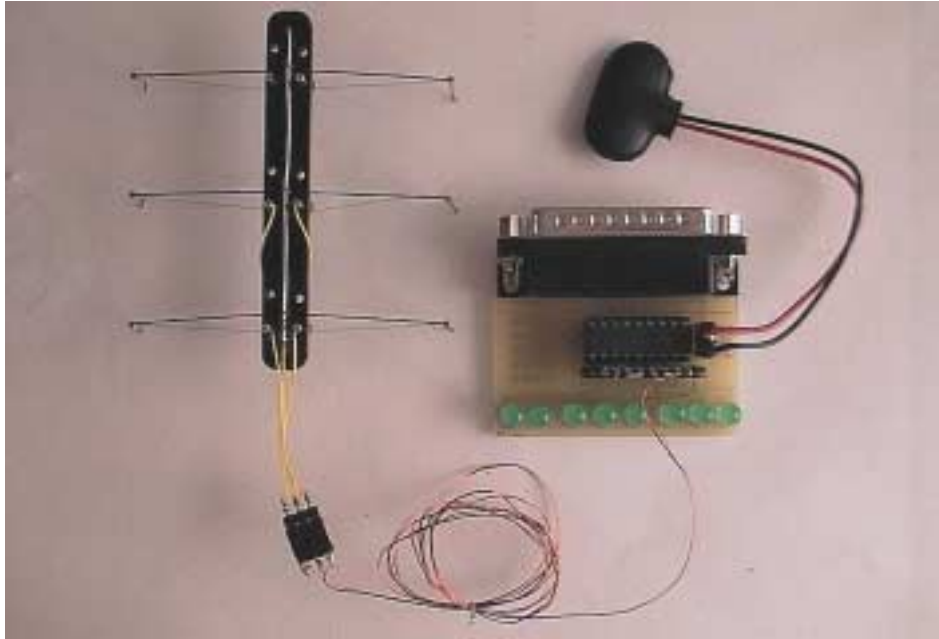
Soldering Skills

✓ Use the soldering iron's tip to heat the **pad**, not the integrated circuit pin. When the pad is hot, touch the solder to the heated pad, and the solder will flow onto the pad and the pin.

✓ Use just enough solder to wet the pin and cover the pad.

✓ Each solder joint should be bright, shiny, and have flowed evenly around the pin on the pad. The solder on adjacent pads must not touch.

✗ A solder joint should **not** be dull, cracked, or beaded up on the pad.

✗ A solder joint must **not** cross between two pads, or a pad and a trace. This will create a short circuit. Your interface card will almost certainly **not work correctly**.
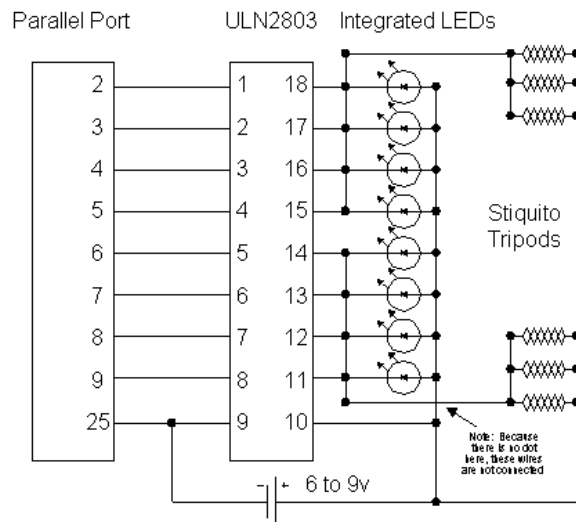
Soldering Skills (Cont.)

✓ Examine the wiring side of the interface board. Look at places where one trace (wires on board) or pad (round circle on board) is near another; check that they do not touch. Look at long traces and near bends; check that the trace is not broken at that point.

✓ If traces or pads touch, but they should not, use the knife to cut the unwanted connection.

✎ If a trace is broken, lightly sand it on either side of the trace, then solder the broken ends together using a piece of fine wire to bridge the gap.

To Test the Board

Parallel Port   ULN2803   Integrated LEDs

Stiquito Tripods

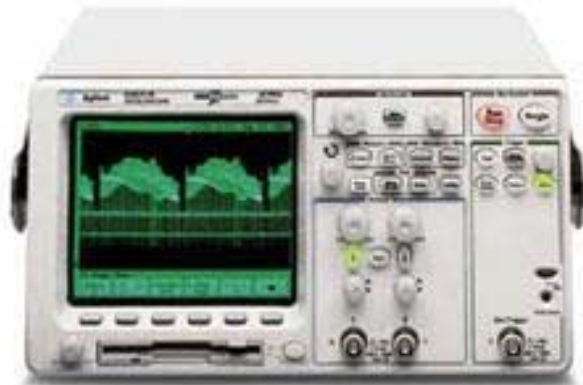Note: Because there is no dot here, these wires are not connected

6 to 9v

Multimeter

- Measure Current, voltage, resistance

Oscilloscope

- Measure frequency, voltage, range
- Can start your measurements based on a "trigger"

Logic Analyzer

- Measure some frequency, voltage, range
- Can start your measurements based on a "trigger"
- Usually used with digital circuits, can be used to examine a microprocessor circuit

What Next?

- Monday's Lab #2 - Build and test the parallel port controller, AND make some measurements on lab equipment.
- Only one controller needed for each lab group.
- Over the weekend, read Chapter 7 carefully. If interested, start soldering the controller.
- I will have two test devices to verify your work.
- I will set up two lab stations for measuring such things as current, voltage, resistance, and frequency.