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

Nitinol - What Is It?

• 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
Review of Schematic Symbols

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

Review (or Introduction) of Some Electronics
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

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<th>Parallel Port</th>
<th>ULN2803</th>
<th>Integrated LEDs</th>
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The Parallel Port Controller

The Completed Parallel Port Controller
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
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.