Keeping the Smoke In the Chip

(Secrets of successful computer interfacing and outwitting Murphy)

Programming:

1. Start with a flowchart
2. Comment every program line in addition to a comment block header
3. Divide and conquer (write and debug program routines in small pieces)
4. Use descriptive names for variables and labels (be careful of reserved names depending on which language you are using)

Hardware:

Prototyping Etiquette –would Martha Stewart approve?

1. Draw the schematic **first**, then build the circuit. Update your schematic immediately if you find mistakes or make changes.
2. Divide and conquer (build and debug hardware in small pieces)
3. Color code your wires to make your circuit look more festive (and easier to debug). black = GND, red = +5V, etc…
4. Plan ahead, arrange parts in a logical fashion. Orient IC's so that Pin #1 is in the upper left corner. Be neat and well organized to facilitate later additions and debugging
5. Don't forget to connect power and ground to every active component

Design Guidelines – things that EE's don't want you to know

6. Use bypass capacitors liberally (.01 or .10 μF) to filter out noise on the power supply
7. Use diodes to protect mechanical switches and switching transistors from transients due to inductive loads (motors, solenoids)
8. Use opto-isolators on all digital input and output lines
9. Tie unused pins on IC's either high or low. Don't leave them dangling.
10. Transistors get hot. Use heat sinks.

Care and Feeding of IC's

11. Remove chips with a chip puller, **NOT** fingers or screwdriver
12. Turn off power before adding or removing chips
13. Avoid touching the pins of an IC (particulary CMOS devices) due to the danger of frying the chip with static discharge. Use a wrist ground strap.

Power Supplies – don't bite the hand that feeds you

14. Connect the ground pins from all devices (unless you really want to isolate things)
15. **Do Not** connect the +5 volt terminals from different power supplies
16. **Do Not** connect the positive (+) terminal of any power supply directly to ground (this is a short circuit, and can destroy the power supply)
17. **Never** use a digital output pin as a source of current, only use a digital output pin as a sink (absorber) for current
18. **Do Not** use the **PLUG and PRAY** method of debugging. It is considered bad form to destroy the same part twice

and Finally….

19. As an offering to appease ADIB, the god of circuit incompetence, sacrifice a red LED

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