Programming the
BASIC Stamp

- Computers do exactly what you tell them, no more, no less

- BASIC Stamp uses the PBASIC programming language

- You can go a long ways with just a few instructions

- See the BASIC Stamp Guide (2011 web site)
On the Stamp

- Programming cable
- EEPROM
- Brain
- Power pins
- I/O pins
- 9V battery
- Breadboard area
- Reset
Schematic icons

1K

1st Color Band
Multiplier Color Band
2nd Color Band
Tolerance Color Band

TIP120

LED

Switch

Motor

1-10
Dealing with the outside world

SENSOR ➔ COMPUTER ➔ ACTUATOR

Switch
Light beam
Potentiometer
Encoder
Temperature
...

Lamp
Relay
Motor
Solenoid
...

...
Driving actuators

Program sets ports high/low (1/0)

Stamp board pins set to +5V/0V

Interface electronics use signal voltages and power supply to switch motors on/off

High 4
Low 4

+5V
0V

+12 V

PIN 4 1K TIP120
Reading sensors

Program reads value of ports (1/0)

Stamp board pins set to +5V/0V

Interface electronics change sensor signals into +5V/0V

IF in4 = 1 THEN ....
IF in4 = 0 THEN ....
Format

Labels, comments

```asm
loop:
toggle 0  ` toggle motor
pause 250 ` pause for 250
goto loop
```

Symbols

```asm
LED con 1
MOTOR con 0

start:
toggle LED
toggle MOTOR
pause 250
goto start
```
## Data sizes

A bit is one binary digit: 0/1

A byte is 8 bits

\[
b7 \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad b0
\]

00000011 (binary) = 3 (decimal)

11111111 = 255

<table>
<thead>
<tr>
<th>Type</th>
<th>#bits</th>
<th>Number range</th>
</tr>
</thead>
<tbody>
<tr>
<td>bit</td>
<td>1</td>
<td>0-1</td>
</tr>
<tr>
<td>byte</td>
<td>8</td>
<td>0-255</td>
</tr>
<tr>
<td>word</td>
<td>16</td>
<td>0-65,535</td>
</tr>
</tbody>
</table>
Variables

Pins
15 i/o pins 0-15 for outputs
    in0-in15 for inputs

Data variables
26 bytes of variable space
byte (0-255) or word (0-65,535)

Allocate like this:

length  var  byte
width   var  byte
area    var  word

Then in program:

length = 20
width = 20
area = length * width
Math

+, - add, subtract
* multiply
/ division (truncates)

x var byte
x = 2
x = x+2  result?

x var byte
x = 254
x = x+2  result?

y var word
y = 50*50 = 2500

x var byte
x = 5/2
A FIRST PROGRAM

'Turns on LED for a brief time
LED con 0

high LED
pause 200
low LED
end
LOOP

LED con 0

doit:
    toggle LED
    pause 200
goto doit
FOR...NEXT LOOP

LED con 0
i var byte

for i = 1 to 20
    toggle LED
    pause 200
next
end
IF....THEN

x var byte
y var byte
x = 5
y = 7

start:
    if x < y then motor
    high 1          ' led on
    goto continue
motor:
    high 0          ' motor on
continue:

Conditionals:
=    <>    >    <    >=    <=
motor con 1

start:
    if in4 = 1 THEN start
gomotor:
    high motor ` motor on
    pause 2000
    low motor
end