ACES PROGRAM

Basics of Interfacing to CanSat

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Digital Input

Each of the Basic Stamp’s I/O Pins, P0…P15 can be programmed to be an Input or an Output (Direction)

Example using P1:

INPUT 1

IN1 = 1 when P1 is connected to VCC

IN1 = 0 when connected to GND

IN1 may be either 0 or 1 if P1 is unconnected
Digital Input

Improved circuit for reading a switch state.

"Active Low" Circuit if using NO switch.

Example using Pin P1:

INPUT 1

IN1 = 1 if switch is not activated

IN1 = 0 if switch is activated

I/O pin is always explicitly connected to either +5V thru a resistor, or to GND

NO = Normally Open

NC = Normally Closed

Also see BUTTON Function

Basic Stamp BUTTON Function is one solution to switch contact bounce problem.
Digital Input

Input Interfacing of Electronics to the BASIC Stamp

A. Standard TTL to BASIC Stamp

B. Low voltage logic to BASIC Stamp

C. High-voltage logic to BASIC Stamp

D. Analog comparator to BASIC Stamp

E. Optocoupler to BASIC Stamp
Digital Output

Basic Stamp Pin as Current Source

HIGH [Px]  Turns LED ON
LOW [Px]   Turns LED OFF

OUTPUT [Px]
OUT[Px] = 1  Turns LED ON

for example, using Pin P3:

output 3
out3 = 1    'LED ON
out3 = 0    'LED OFF
Digital Output

HIGH [Px]  Turns LED OFF
LOW [Px]   Turns LED ON

OUTPUT [Px]
OUT[Px]=1   Turns LED OFF

for example, using Pin P7:

output 7
out7 = 1   'LED OFF

out7 = 0   'LED ON
Digital Output

Basic Stamp can only source or sink about 20 milliamps. Some loads require more.
Digital I/O Command Summary

- INPUT
- OUTPUT
- REVERSE
- LOW
- HIGH
- TOGGLE
- PULSIN
- PULSOUT
- BUTTON
- COUNT
- POLLIN
- POLLOUT
- POLLMODE
- XOUT
- LCDCMD
- LCDIN
- LCDOUT
- SERIN
- SEROUT
- OWIN
- OWOUT
- SHIFTIN
- SHIFTOUT
- I2CIN
- I2COUT
Simple Analog In/Out Techniques

Analog Input

```
RCTIME 7, 1, result
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```
RCTIME 7, 0, result
```

![Diagram](image)
Simple Analog In/Out Techniques

Analog Output using PWM

PWM pin, duty, duration

I/O Pin [P0..P15] → R → Analog Voltage Out

+5V
Analog In/Out Interfacing

Analog-to-Digital & Digital-to-Analog Converters

But the BASIC Stamp has a limited number of I/O pins for connection to bit-parallel devices.
Analog In/Out Interfacing

Analog-to-Digital & Digital-to-Analog Converters

Serial ADC uses fewer connections than a parallel output ADC.

SPI, I2C, Microwire and 1-Wire protocols.

Basic Stamp supports with built-in functions:

SHIFTIN, SHIFTOUT, I2CIN, I2COUT, OWIN, OWOUT, PULSIN, PULSOUT