

Name _____

This lab exercise will have you investigate the signals we've been using on the BS2 and the Board of Education. You will make use of the Agilent Digital scopes to capture screen shots of various signals and post them on the Forums at cset.stcc.edu/forums.

1.) HIGH/LOW/PAUSE

One of the most basic I/O commands is HI/LO command to directly make an I/O output pin High or Low, respectively. This is commonly used to create PWM signals. A typical program segment might look something like:

```
DO
  HIGH 1
  PAUSE 25
  LOW 1
  PAUSE 10
LOOP
```

Run this program segment on your BS2 and use the Agilent Digital Scope to get a screen shot of the signal generated on I/O Pin 1. Your screen shot should have your initials/name and the following measurements: + *Pulse Width*, - *Pulse Width*, *Frequency* & *Duty Cycle*.

Which program line creates the + Pulse width? _____

Which program line creates the - Pulse width? _____

Do your measured +PW, -PW & D.C. agree with what you expect based upon the PBASIC commands running on the BS2? _____

If not, explain any difference:

Modify the above program segment to create an output signal on Pin 1 which has a frequency of 40 Hz with a 25% D.C. Take a screen shot of this signal with the same measurements as your previous screen shot. **This will be one of the screen shots you will post on the forums.**

You will be expected to be able to use the BS2 to create a signal of any specified frequency and duty cycle, so make sure you understand this step fully.

2.) **PULSOUT:**

A common servo motor control command program segment you are familiar with is of the form:
DO

PULSOUT 14, 750

PAUSE 20

LOOP

Run this program on your BS2 and use the Agilent Digital Scope to get a screen shot of the signal generated on I/O Pin 14. Your screen shot should have your initials/name and the following measurements: + *Pulse Width*, - *Pulse Width*, *Frequency* & *Peak-to-Peak* voltage.

Which program line creates the + Pulse width? _____

Which program line creates the - Pulse width? _____

Do your measured +PW and -PW agree with what you expect based upon the PBASIC commands running on the BS2? _____

If not, explain any difference:

Change the PULSOUT value to 850 and take another screen shot. Do your measured +PW and -PW agree with what you expect based upon the PBASIC commands running on the BS2?

Change the PULSOUT value to 650 and the PAUSE value to 18 and take another screen shot. Do your measured +PW and -PW agree with what you expect based upon the PBASIC commands running on the BS2? _____

Post ONE of your screen shots from this step. Be sure to label the post with the PULSOUT/PAUSE values.

You will be expected to be able to accurately predict the +PW, -PW, period and frequency of the signal generated at the output pin from the program segment above.

3.) **PULSIN:**

Refer to the PULSIN command on page 343 in the ***Basic Stamp Syntax and Reference Manual***. (A handout sheet has been provided for your convenience.) Use the circuit shown and the PULSIN.bs2 Demo program for this exercise. (Note: If you use the Basic Stamp Reference Manual, there is a discrepancy between which pin is used. It should be Pin 7.) You will use three different Capacitor values. You should use the measurement cursors on the scope display to measure the time taken for the capacitor to discharge down to 1.4V (the comparator HIGH/LOW voltage point of the inputs of the BS2). Take a screen shot of one of your traces with pertinent information labelled (and your name/initials). **This screen shot will be posted to the forums.**

Capacitor	<i>time</i> (BS2 variable)	BS2 Pulse-Width Measurement	Time from Scope Display
0.1 uF			
0.22 uF			
0.47 uF			

4.) **RCTIME:**

Perform Activity #3 in Chapter 5 of the *WAM* manual which begins on page 150. (A handout of this exercise has been provided for you.) Use the schematic diagram shown and run the *ReadPotWithRcTime.bs2* program and observe the output of the RCTIME command in relation to the position of the potentiometer.

Once you are sure your circuit is working properly, take a screen shot to reproduce the trace shown in Fig. 5-12 on page 153 of the *WAM* manual. Include your initials on the screen shot plus the important information as shown in Fig. 5-12. **This screen shot will be posted on the Forums.**

Then create a table consisting of 6 different *R* & *time value* pairs. NOTE: The potentiometer settings indicated are approximate.

Resistance Setting	Measured Resistance	<i>time</i> (BS2 variable)
Minimum		
≈ 20% of Max.		
≈ 40% of Max.		
≈ 60% of Max.		
≈ 80% of Max.		
Maximum		

5.) **FREQOUT:**

Use the FREQOUT command to create an audible output from the BS2. For reference, you can turn to page 246 in *What's A Microcontroller v3.0* and page 199 in the *Basic Stamp Syntax and Reference Manual*. Describe what your oscilloscope display shows. Is this what you would expect it to look like? (Hint: Read the *Explanation* from the Syntax & Reference Manual.) Take a screen shot of your output. **This screen shot will be posted on the Forums.**

Frequency = _____

Description:

- 6.) When you are done, put all of your equipment away and post the screenshots specified throughout this experiment.