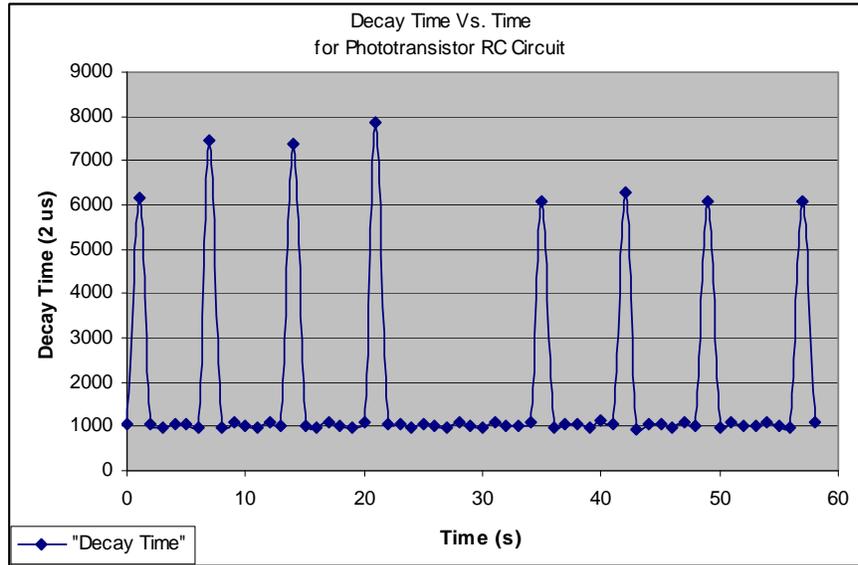


## GRAPH BASIC STAMP LIGHT MEASUREMENTS WITH MS EXCEL

Especially with spreadsheets, moving data from the BASIC Stamp Editor's Debug Terminal to a graph like the one in Figure 1 takes just a few minutes.

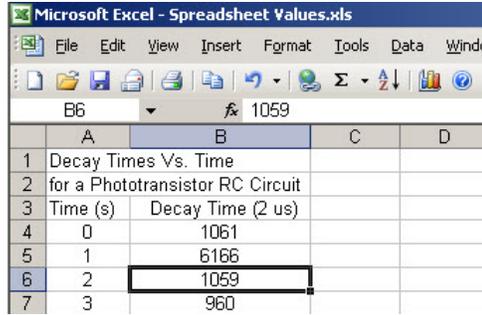
**Figure 1** Graph of Phototransistor Light Measurements



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### From Debug Terminal Value Lists to Spreadsheet to Graph

Spreadsheet software like the Microsoft Excel example in Figure 2 allows you to enter numbers or text into cells. Once the numbers have been entered into cells, spreadsheet software has lots of features for doing repetitive math on the lists of numbers as well as analysis tools like graphing. Each cell in a spreadsheet has an address, given by a row and column number. For example, the value 1059 in Figure 2 is in row 6 and column B.



The screenshot shows a Microsoft Excel window titled "Microsoft Excel - Spreadsheet Values.xls". The spreadsheet has four columns labeled A, B, C, and D, and seven rows. The data is as follows:

	A	B	C	D
1	Decay Times Vs. Time			
2	for a Phototransistor RC Circuit			
3	Time (s)	Decay Time (2 us)		
4	0	1061		
5	1	6166		
6	2	1059		
7	3	960		

Figure 2  
Spreadsheet example

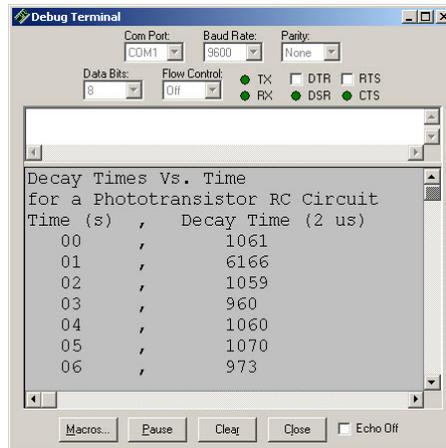
Transferring lists of numbers from the Debug Terminal to a spreadsheet takes 4 steps:

1. Write a program that displays the lists of numbers in a format that the spreadsheet will be able to import.
2. Copy the lists of numbers from the Debug Terminal to a text file.
3. Import the text file into the spreadsheet.
4. Start the spreadsheet's graphing feature and adjust the settings to get the display you want.

### **Example Program – LightMeasurementsForSpreadsheet.bs2**

**Step 1** for transferring your light measurements to a spreadsheet is: “write a program that displays the lists of numbers in a format that the spreadsheet will be able to import.” Figure 3 shows an example of a display with comma delimited values, meaning that each value is separated by a comma. The spreadsheet program can put each comma delimited value in a different cell on a given row, and a carriage return causes the spreadsheet to place the next value on the next row.

- √ Compare Figure 3 to Figure 2 to see how the commas separate the values so that the spreadsheet program loads them into different cells.



**Figure 3**  
Comma delimited values displayed by the Debug Terminal

LightMeasurementsForSpreadsheet.bs2 takes RC decay measurements every second and displays them with the comma delimited format shown in Figure 3.

- √ Run LightMeasurementsForSpreadsheet.bs2, and cast a shadow over the phototransistor ever few seconds. (For a graph similar to Figure 1, cast a shadow over the phototransistor for one second in every seven seconds.)

```
' What's a Microcontroller - LightMeasurementsForSpreadsheet.bs2
' Format light measurements for a spreadsheet.

' {$STAMP BS2}
' {$PBASIC 2.5}

time          VAR    Word
seconds      VAR    Byte

PAUSE 1000

DEBUG "Decay Times Vs. Time", CR,
      "for a Phototransistor RC Circuit", CR,
      "Time (s) , Decay Time (2 us)", CR

FOR seconds = 0 TO 58
  HIGH 2
  PAUSE 1000
  RCTIME 2, 1, time
  DEBUG " ", DEC2 seconds,
        " ", " ", DEC time, CR
NEXT
```

END

**Step 2** for transferring your light measurements to a spreadsheet is: “copy the lists of numbers from the Debug Terminal to a text file.” You can do this by shading and copying the text displayed in the Debug Terminal, and then pasting it into a notepad document and saving the file.

- √ In the Debug Terminal, scroll to the top of the list, then click and hold the mouse button as you drag down to the bottom of the list of numbers.
- √ Copy the text to the clipboard by pressing *CTRL + C*.
- √ Open Notepad (*Start → All Programs → Accessories → Notepad*).
- √ In note Notepad, click *Edit* and select *Paste* (or *CTRL + V*).
- √ Click *File*, and select *Save*. Name the file Spreadsheet Values. Make sure to save it to a folder that’s easy to get to, My Documents or the Desktop for example.

**Step 3** for transferring your light measurements to a spreadsheet is: “Import the text file into the spreadsheet.” The steps for this vary from one spreadsheet program to the next. Here are the steps for Microsoft Excel from Microsoft Office 2003.

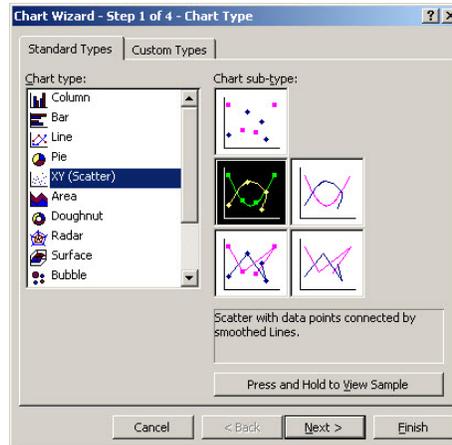
- √ Open Microsoft Excel. Here are the two most common Start Menu selections for opening it: *Start → All Programs → Microsoft Office → Microsoft Excel*, or *Start → All Programs → Microsoft Excel*.
- √ Click *File* and select *Open*.
- √ In the *Open* window, select *Text files (\*.prn; \*.txt; \*.csv)*.
- √ Find the Spreadsheet Values text file, click it, and then click the *Open* button.
- √ The Text Import Wizard Step 1 window will appear. Make sure to click the *Delimited* radio button before you click next.
- √ In the Text Import Wizard Step 2, make sure there is a check in the *Comma* checkbox. If it doesn’t have a checkmark, click it to make a checkmark appear. Also, make sure that the *Space* checkbox is NOT checked.
- √ Click *Next*, and then click *Finish* to complete the import.

Your spreadsheet should now resemble Figure 2. Optionally, to make it an exact match, grab the separator between column headings B and C and drag it right until column B is wide enough to fit the entire Decay Time (2 us) heading. Then, shade Cells A3 through

B62, and then click the *Format* menu and select *Cells*. Click the *Alignment* Tab, and select *Center* in the Horizontal dropdown menu.

**Step 4** is graphing the data. Here's how it works with Microsoft Excel 2003:

- √ Shade Cells A4 through B62.
- √ Click the *Insert* Menu and select *Chart*.
- √ In the Chart Wizard – Step 1, Click *XY (Scatter)* in the Chart Type.
- √ In Chart Subtype, click *Scatter with data points connected by smooth lines* as shown in Figure 4.



**Figure 4**  
Chart Wizard – Step 1

- √ Click *Next*.
- √ In the Chart Wizard – Step 2, make sure that the *Columns* radio button is clicked in the Series in area. Then, click the *Series* tab, and type Decay Time into the Name field. Then, click *Next*.
- √ In the Chart Wizard – Step 3's *Chart title field*, type Decay Times Vs. Time for a Phototransistor RC Circuit. In the *Value (X) axis* field, type Time (s), and in the *Value (Y) axis* field, type Decay Time (2 us).
- √ Click *Finish*.

Your graph will appear, but it will probably look somewhat different from Figure 1. In the graph title, place your cursor next to the left of the f in the word “for”, then press the enter key to make the title two lines. You can then click different objects of the graph

(labels, legend, graph area), and drag them around to adjust placement. You can also drag the edges of objects you click to resize them.