GRAPHING LIGHT MEASUREMENTS WITH STAMPPLOT LITE

Factories often have to monitor many sensor inputs to make sure the products they make turn out right. From light levels in a greenhouse to fluid levels in an oil refinery to temperature levels in a nuclear reactor, the people responsible for controlling these levels often rely on graphs of the sensor measurements to get the information they need.

Introducing Stamp Plot Lite

Figure 1 shows Stamp Plot Lite software graphing RC-time measurements sent by the BASIC Stamp. The line shown in Figure 1 is much easier to understand than the 250 RC-time measurements that were used to plot that line. Viewing the graph from left to right, the RC-time measurements gradually get larger and then suddenly drop off. Since RC-time measurements get larger when the light levels decrease and smaller when they increase, the graph tells a story. It looks like the light level being measured declined gradually, and then it suddenly increased again.
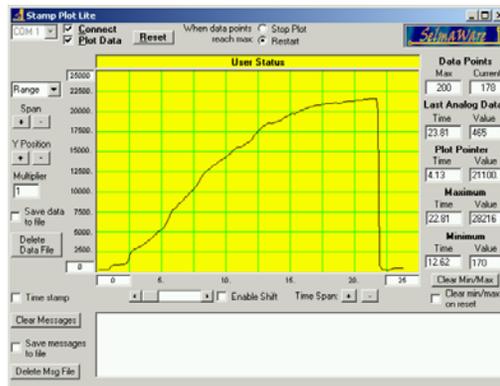

Figure 1
Stamp Plot Lite
Graphing
Measured Light
Levels

This graph could depict any number of scenarios to the technician reading it. Perhaps a microcontroller in a greenhouse switched on the artificial lights after the sunlight dropped below a certain level. Perhaps a system of motors and gears that maintains a solar panel's position for maximum sunlight exposure just readjusted the panel's position after detecting a decrease in light exposure. Regardless of the scenario, if you are familiar with the measurement being graphed, tools like Stamp Plot Lite can really help make sense out of data. It does this by converting lists of measurements into a graph.

> **ⓘ**   **Stamp Plot Lite** is free for educational use courtesy of SelmaWare Solutions and can be downloaded from the Parallax web site or directly from http://www.selmaware.com/.

Downloading and Installing Stamp Plot Lite

Below are instructions for downloading and installing Stamp Plot Lite from the Parallax web site:

- √   Go to the Downloads area at www.parallax.com.
- √   Select BASIC Stamp Software.
- √   Download the file labeled "**Stamp Plot Lite…**graphing utility…"
- √   Save SPL.zip to your disk.
- √   Unzip SPL.zip and run setup.exe.
- √   Follow the Stamp Plot Lite installation program's prompts to install the software.

Programming to Send Measurements to Stamp Plot Lite

Sending values you want to graph in Stamp Plot Lite is almost the same as sending numbers to the Debug Terminal, but there are a few rules. First, values are sent using only the **DEC** formatter and the **CR** control character. We want to plot the value of the **time** variable, so all that should be sent to the Debug Terminal is the decimal value followed by a carriage return.

```
DEBUG DEC time, CR
```

You can also send display settings to Stamp Plot Lite by sending special messages in quotes. These messages are called control codes. Control codes are sent to Stamp Plot Lite at the beginning of a PBASIC program. Although you can click and adjust all the settings on the software itself, it is usually easier to program the BASIC Stamp to tell Stamp Plot Lite those settings for you. Here is an example of some configuration settings from the next example program that will make your RC-time measurements easier to read without any adjustments to Stamp Plot Lite's display settings.

```
DEBUG "!AMAX 1250", CR,
      "!TMAX 25", CR,
      "!TMIN 0", CR,
      "!SHFT ON", CR,
      "!RSET",CR
```

> **For more information** on how to send values and control codes to Stamp Plot Lite, run Stamp Pot Lite's Help file. Click Start, select programs, select Stamp Plot, then click Stamp Plot Help.

Example Program: PlotPhotoresistor.bs2

Follow these steps to plot the phototransistor data:

√ Use the BASIC Stamp Editor to enter and run PlotPhotoresistor.bs2.
√ Verify that there is a single column of values scrolling down the Debug Terminal. Figure 2 shows an example.
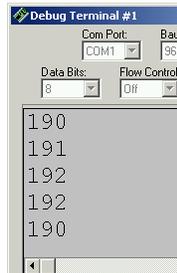
Figure 2
Example of Scrolling Values in the Debug Terminal.

√ Make a note of the COM number in the COM Port field in the upper left hand corner of the Debug Terminal.
√ Use the Windows Start Menu to run Stamp Plot Lite. Click *Start*, then select *Programs → Stamp Plot → Stamp Plot Lite*.
√ Set the COM Port field in Stamp Plot Lite to that same value. Figure 3 shows an example where the value is COM1 in the Debug Terminal, so Stamp Plot is also set to COM1. Your COM port value may be a different number. Just check to see what the number is in the Debug Terminal, then set Stamp Plot Lite to that number.
√ Close the Debug Terminal (click the *X* button on the top-right or click the *Close* button near the bottom of the window).
√ In the Stamp Plot Lite window, click *Connect*, then click *Plot Data*. Checkmarks should appear in each box after you click it.

Figure 3
COM Port Settings

*Debug Terminal (left)
and Stamp Plot Lite
(right).*

√   Press and release the Reset button on your Board of Education or HomeWork Board. This starts the BASIC Stamp program over from the beginning, which sends the **DEBUG** commands that configure Stamp Plot Lite.

√   The data will start graphing as soon as you click Plot Data. Hold you hand over the photoresistor at different distances to simulate different lighting conditions. Remember, the darker the shadow you cast, the higher the value in the graph; the brighter the light, the smaller the value.

IMPORTANT: Only one program can use a COM port at one time.

Before attempting to run a different program using the BASIC Stamp Editor, you must uncheck the *Connect* and *Plot Data* checkboxes in Stamp Plot Lite. Also, before reconnecting Stamp Plot Lite (by clicking the Connect and Plot Data checkboxes), you must close the Debug Terminal.

```
' What's a Microcontroller - PlotPhototransistor.bs2
' Graph light levels using Stamp Plot Lite.

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

time            VAR     Word

PAUSE 1000

DEBUG "!AMAX 1250", CR,
      "!TMAX 25", CR,
      "!TMIN 0", CR,
      "!SHFT ON", CR,
      "!RSET",CR
DO

  HIGH 2
  PAUSE 100
  RCTIME 2, 1, time
  DEBUG DEC5 time, CR

LOOP
```

Your Turn – Adjusting the Display

Span and Time Span have + and – buttons that you can click to increase or decrease the vertical and horizontal scales. Span is to the left of the area that displays the graph, and you can use it to adjust the maximum and minimum values displayed on the graph. Time Span is below the graph, and you can use it to change how many seconds worth of values plotted in the window.

√   Experiment with increasing and decreasing these values and note their effects on the how the graph appears.

If you have difficulty finding your plot, you can always press and release the Reset button on your Board of Education or BASIC Stamp HomeWork Board to restore the default settings.

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