

How to use the Laser Positioning System, LPS

OVERVIEW

The Laser Positioning System (LPS) is easy to use. There are three simple steps:

- 1) Set Up
- 2) Measuring Operations
- 3) Viewing your measurement data

SET UP

To set up your LPS, all that's needed is to plug your LPS in to an available USB port of your computer then you have to run the LxDemo software from your desktop. Click Start. Select All Programs. Double Click on LxDemo. If you are using LPS for the first time, then you must load the software and drivers first, then you should follow the same steps mentioned above.

When you start the LxDemo software, and the USB cord from the laser is not connected to the USB port of the computer, you will see results similar to Figure 1. Notice that the Rangefinder Status indicates "Searching" and notice that the "Start" (laser) button is grayed out:



Figure 1, Pre Start and No Laser Found

If the Laser is connected to USB port of your computer, the LxDemo software will find the laser and display its information similar to Figure 2. Notice that the Rangefinder

Status indicates the Laser Model, Board Revision, Firmware version and the Serial Number. Notice that the Start Button is ready for use:

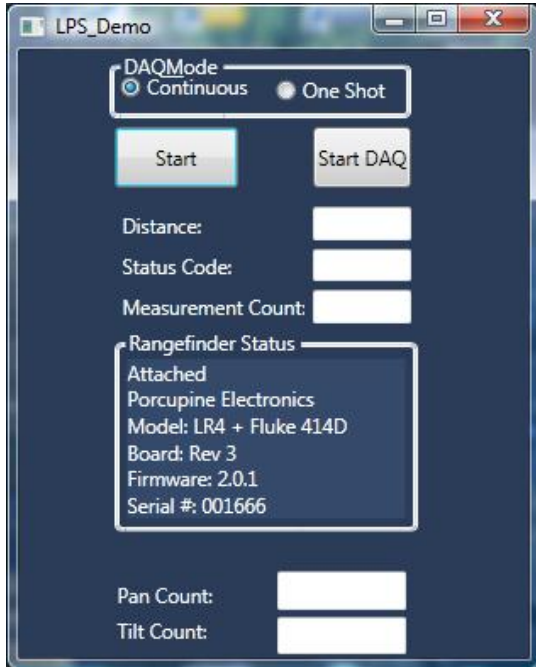


Figure 2, Pre Start and Laser Found

MEASURING OPERATIONS

Measuring Modes:

There are three LPS measuring modes:

1. **No Data Acquisition (DAQ) Mode**
 - a. This mode is useful for a trial run of a measurement session
2. **Continuous DAQ Mode**
 - a. This mode is useful for scanning a surface or a profile of an object
 - b. Lots of 3 dimensional data is generated from this mode
3. **One Shot DAQ Mode**
 - a. This mode records a single position after each click of a button.
 - b. This mode is useful to minimize data recorded and to reduce subsequent data processing

To operate the LPS, first select which DAQ mode you would like to use (Continuous, or One shot). The LPS defaults to the continuous DAQ mode.

The No DAQ Mode

If you press the “Start” Button without pressing the “Start DAQ” button, the LPS will begin measurements without each measurement being recorded on the computer. The text on the “Start” (laser) Button changes to “Stop”. You will see the laser Rangefinder laser beam start. The “Measurement Count” text box will continually increment by one for every distance measurement completed by the Rangefinder. To stop the Rangefinder

from measuring, press the “Stop” button. See Figure 3 for sample “Start” button display. See Figure 4 for sample “Stop” button display.

The “Distance” text box is the straight line distance, in feet, from the laser outside surface opposite of the lens to the laser beam dot on the object of interest. The “Measurement Count” text box indicates the total number of laser measurements that have been made. The Pan and Tilt Counts indicate the Laser Pan and Tilt angular positions. At power on, when the LPS is plugged into an AC power source, the Pan and Tilt Counts start at “0”. If the laser is moved subsequent to receiving power, the Pan and Tilt Counts will read as non-zero values. The maximum Pan and Tilt Counts are + and – 2500 counts. See Figure 3 below for the “Measurement Count” text box, and the “Pan Count”, and “Tilt Count” text boxes.

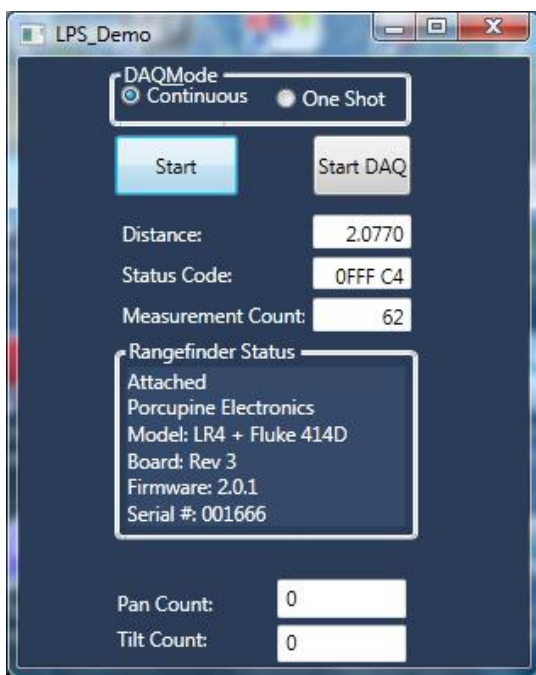


Figure 3, No DAQ Mode

Figure 4

The Continuous DAQ Mode

Set the DAQ Mode radio button to “Continuous”. Press the “Start” (laser) Button. Press the Start DAQ Button. This begins the “Continuous DAQ” mode where laser measurements are streamed to a file in your computer.

On the graphical user interface (GUI), the RangeFinder Status section is replaced with three text boxes: Delta X, Delta Y and Delta Z. The text in the “Start DAQ” changes to “Stop DAQ”. A “DAQcnt” text box appears to the right of the “Start/Stop DAQ” Button. The Daqcnt text box displays the number of data points that have been streamed to a file on your computer. See Figure 4 for a representative GUI display of the “Stop DAQ” Button and the “Daqcnt” text box .

The first point that is recorded becomes the zero reference point. All other Delta X, Delta Y and Delta Z data points are compared to this location in units of feet. $\Delta X = (X - X_0)$, $\Delta Y = (Y - Y_0)$, and $\Delta Z = (Z - Z_0)$. X, Y and Z are the current measurements. X_0 , Y_0 , and Z_0 are the zero reference point (first recorded) coordinates. The Delta X, Delta Y and Delta Z are displayed on the GUI to allow you to experiment with the positioning of an object. The actual position X, Y and Z is recorded in the DAQ data file.

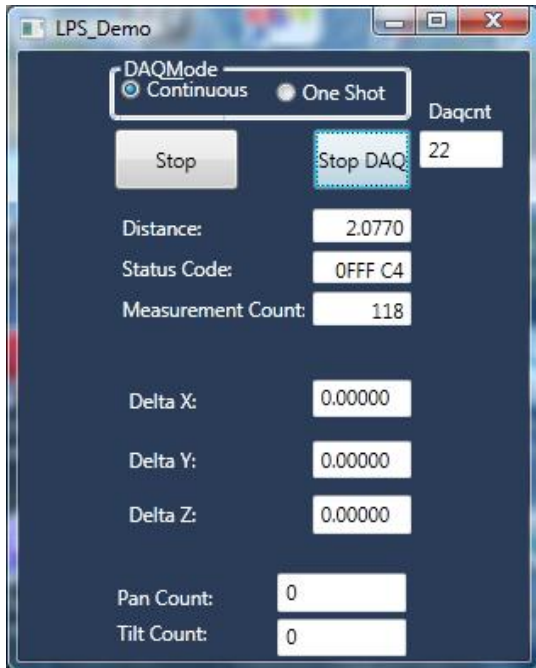


Figure 4, Continuous DAQ Mode Zero Reference

GUI display when the zero reference data point is captured.

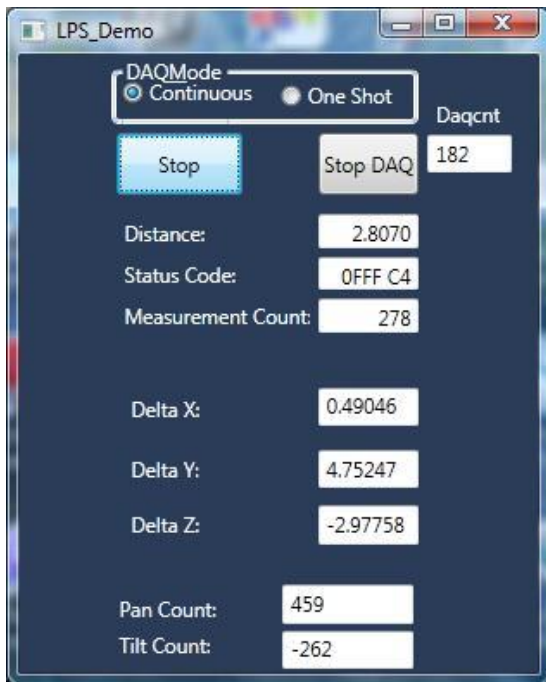


Figure 5, Continuous DAQ Mode Non-Reference Positioning Data

Image of GUI when a non-reference position is captured

The One Shot DAQ Mode

Set the DAQ Mode radio button to “One Shot”. Notice that the text on the Start DAQ changes to “1shotDAQ” to remind you of this mode. See Figure 6 for a representative GUI display prior to selecting either the laser “Start” Button” or the “1shotDAQ” Button.



Figure 6, One Shot DAQ Mode Pre Start

Press the “Start” (laser) Button. Press the “1shotDAQ” Button. This begins the “One Shot DAQ” mode where laser measurements are placed in a file after each press of the “1shotDAQ” button.

Notice that the RangeFinder Status section on the graphical user interface is replaced with three text boxes: Delta X, Delta Y and Delta Z. The text in the “Start DAQ” changes to “Stop DAQ”. A “DAQcnt” Text Box appears to the right of the “1shotDAQ” Button. The DAQcnt text box displays the number of data points that have been placed into a DAQ file on your computer.

The first point that is recorded becomes the zero reference point. All other Delta X, Delta Y and Delta Z data points are compared to this location in units of feet. $\Delta X = (X - X_0)$, $\Delta Y = (Y - Y_0)$, and $\Delta Z = (Z - Z_0)$. X, Y and Z are the current measurements. X_0 , Y_0 , and Z_0 are the zero reference point (first recorded) coordinates. The Delta X, Delta Y and Delta Z are displayed on the GUI to allow you to experiment with the positioning of an object. The actual position X, Y and Z is recorded in the DAQ data file. See Figure 7 for an image of the zero reference data point in the One Shot DAQ Mode. See Figure 8 for an image of a non-zero data point in the One Shot DAQ Mode.

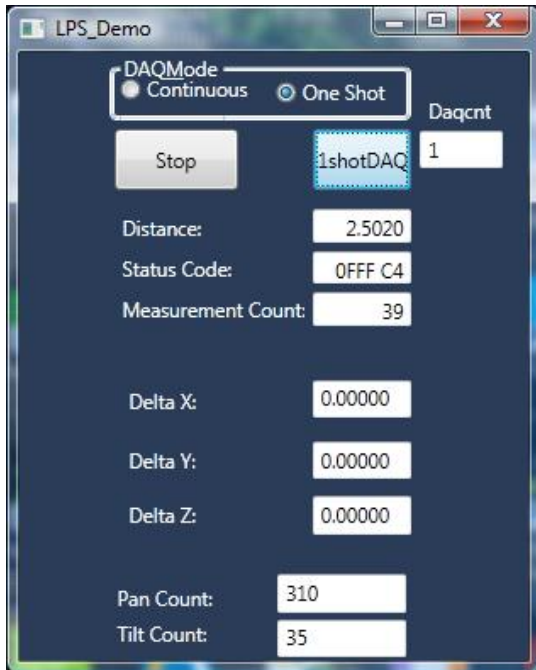


Figure 7, One Shot Mode, Zero Reference Data Point



Figure 8, One Shot DAQ Mode Non-Zero Reference Data Point

VIEWING YOUR MEASUREMENTS

There are two ways to view your data:

- Viewing Data File “LPS_DAQ.txt
- Viewing data via software application “LPS_Surface”
 - Data is projected on your computer screen as a 3 dimensional image

Viewing Data File “LPS_DAQ.txt

Your three dimensional data file “LPS_DAQ.txt” can be found in the following directory:
C:\Users\Public\LPS_DAQ.txt

You may open this file while the LxDemo software is running. Opening the file during a measurement session allows you to see which data points are recorded. The file will be displayed in a separate window. It will be periodically refreshed to update the data points recorded by the LPS based on Windows threading protocols.

Figure 9 is a representative LPS_DAQ.txt three dimensional comma delimited data file. The first column is the DAQ count Number, the second column is the X coordinate, the third column is the Y coordinate, the fourth column is the Z coordinate, and finally the fifth column is the root sum square of the Delta X, Delta Y, and Delta Z. This is the distance from the zero reference point. This column allows you to compare a distance from a zero reference point to another data point using, say, a tape measure or other method of measurement.

	LPS_DAQ			
1,	5.269029,	0.000000,	0.000000,	0.000000
2,	5.269029,	0.000000,	0.000000,	0.000000
3,	5.272306,	0.006625,	0.000000,	0.007391
4,	5.262463,	0.006613,	0.000000,	0.009319
5,	5.269025,	0.006621,	0.000000,	0.006621
6,	5.262467,	0.000000,	0.000000,	0.006562
7,	5.272310,	0.000000,	0.000000,	0.003281
8,	5.282136,	0.000000,	-0.013275,	0.018655
9,	5.441323,	-0.020513,	-0.129943,	0.216775
10,	5.355881,	0.020191,	-0.134637,	0.161488
11,	5.359414,	0.067352,	-0.215648,	0.243331
12,	5.348921,	0.107561,	-0.215252,	0.253546
13,	5.345200,	0.127647,	-0.215120,	0.261482
14,	5.344862,	0.141080,	-0.215120,	0.268200
15,	5.344681,	0.147797,	-0.215120,	0.271742
16,	5.338127,	0.147616,	-0.214857,	0.269682
17,	5.344681,	0.147797,	-0.215120,	0.271742
18,	5.340809,	0.167842,	-0.214989,	0.282034
19,	5.340138,	0.187975,	-0.214989,	0.294298
20,	5.352495,	0.208616,	-0.215516,	0.311343
21,	5.358504,	0.222339,	-0.215780,	0.322493

Figure 5, LPS_DAQ.txt 3D data file

Viewing data via software application “LPS_Surface”

Details for viewing 3D data via the software application is found in a separate publication titled “LPS_Surface User’s Guide.pdf”