

Introduction

NOTE: Complete details and plans on how to build the pinewood derby car scale with center-of-gravity (CG) calculation can be found on the “Instructables” website at: <https://www.instructables.com/Pinewood-Derby-Car-Scale-With-Center-of-Gravity-CG/>. A copy of those plans is included in the zip file download as a pdf document. An updated version of the Arduino source code ‘Dual_Scale_CG_Ver2.ino’ is also provided as a replacement for the original version.

This supplement covers the optional graphical user interface software running on your PC for display of a real-time visual representation of the car’s weight and CG. This is beneficial during your car build process when weights are being added to achieve the optimal CG position. The visual cues provided allow the user to instantly see the effect on weight and CG as weights are added, removed or repositioned.

The Dual Scale Display software requires an updated version of the Arduino code that was in the original build documentation provided on the Instructables web site.

1 Installing the Dual Scale Display Software

The Dual Scale Display software was developed using the JAVA based Processing3 integrated development environment (IDE). Perform the steps below to install the software on your PC.

STEP 1: Download and install the free Processing3 integrated development environment (IDE) from the Processing.org website. For complete instructions on how to download and install the Processing3 development environment, visit <https://processing.org>. The WEB site also provides tutorials and step-by-step instructions to help you every step of the way. Note: This version is specifically developed for MS Windows PCs.

For Windows machines:

- Use File Explorer to view the contents of the Processing zip file (e.g. processing-3.5.3-windows64.zip) you downloaded from the processing.org website. It should contain a folder called ‘processing-x.x.x’ (where x.x.x is the version#).
- Drag the ‘processing-x.x.x’ folder into your C:\Program Files\ folder.
- Double click ‘processing.exe’ to launch the program and cause it to install. If everything goes right it should create a Processing folder under your Document folder and start with the Processing IDE screen displayed.
- Exit the Processing3 program.

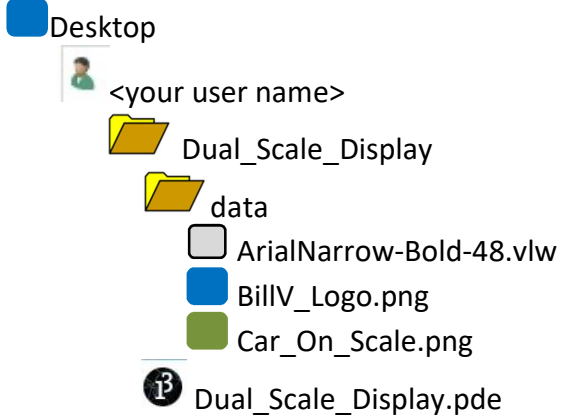
STEP 2: Perform the following to install the files associated with the dual scale display software (see folder/file hierarchy example below). Note that the Processing3 source code file must reside in a folder having the same name (less the ‘.pde’ file extension) in order to launch correctly.

1. Create a folder called ‘Dual_Scale_Display’ under your Desktop/Username folder.
2. Extract the file ‘Dual_Scale_Display.pde’ from the zip file and copy it into the ‘Dual_Scale_Display’ folder just created.
3. Create a subfolder called ‘data’ under the ‘Dual_Scale_Display’ folder.

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4. Extract the files 'ArialNarrow-Bold-48.vlw', 'BillV_Logo.png' and 'Car_On_Scale.png' from the zip file and copy them into the 'data' folder.

Below is a typical folder/file hierarchy for the race manager program that should look like this (except for file icons):



Step 3: Install the updated version of the Arduino source code titled 'Dual_Scale_CG_Ver2.ino' provided in the zip file.

2 Operation

This section provides operating instructions for using the scale with the graphical display software. Refer to the included document "Pinewood-Derby-Car-Scale-With-Center-of-Gravity-CG" for basic scale operation and calibration procedures.

2.1 Startup

Perform the following:

1. Power up your PC and launch the Processing3 IDE with graphical display software by double clicking on the Dual_Scale_Display.pde file.
2. Using a USB cable, connect the scale's Arduino board to your PC's USB port.
3. Verify the scale has power applied.
4. Start the graphical display software by clicking on the RUN arrow. The COM Port select dialog pop-up is displayed as shown in Figure 1.
5. Click on OK to select the COM port. The display introduction screen is displayed as shown in Figure 2.

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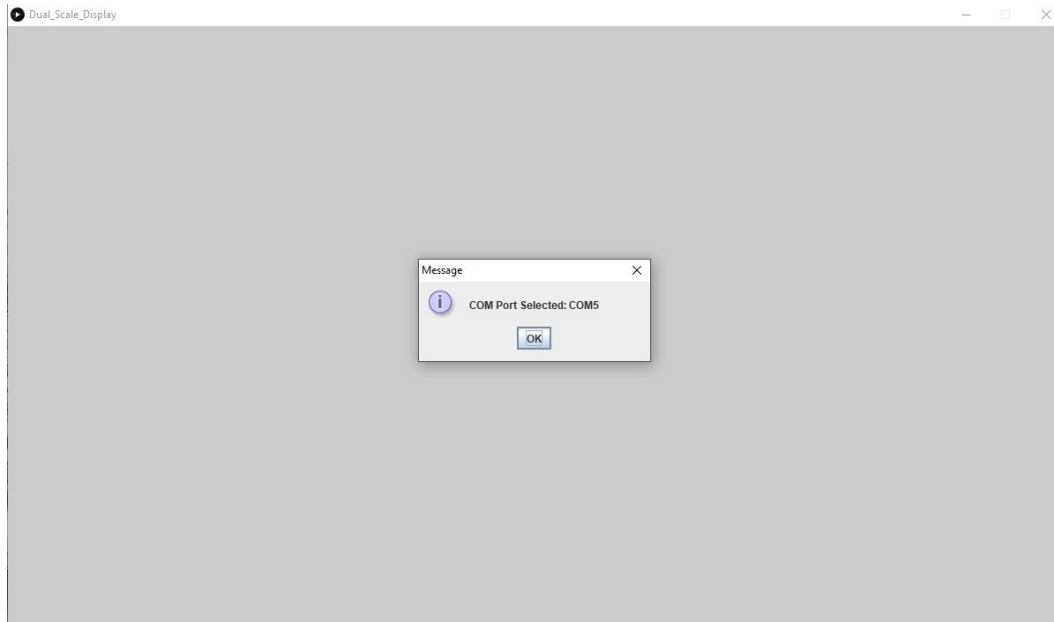


Figure 1. Com Port Select Dialog

2.2 Introduction Display

The Introduction Display (Figure 2) provides a kid friendly invitation/introduction to using the Pinewood Derby car scale. It can thus be set up at the check-in table at your pinewood derby race event allowing race participants to weigh their own car and learn about CG. It is assumed a ruler is available to allow them to measure their wheelbase.

Each time the user releases the + or – button when setting his car's wheelbase the Current Wheelbase Setting box will update with the new setting. When a car is placed on the scale the display automatically switches to the Weight & CG display as shown in Figure 3.

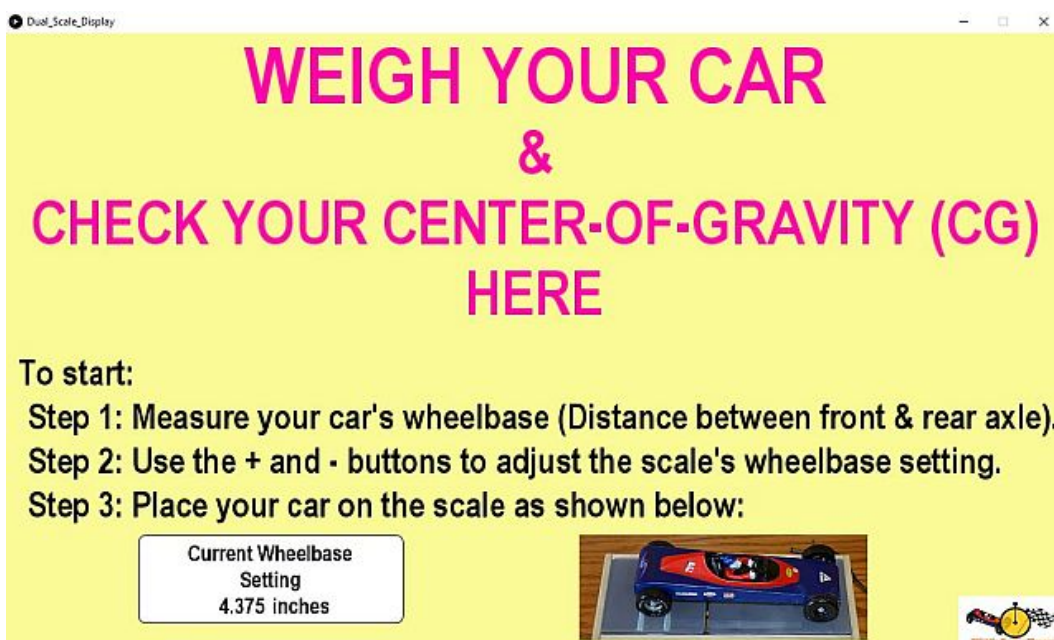


Figure 2. Display Introduction Screen

2.3 Weight & CG Display

The weight & CG display provides a to-scale graphical representation of the user's car and has the following features:

- The separation between the front and rear wheel is automatically adjusted based on the wheelbase setting.
- The yellow & green ideal CG position bar is also automatically adjusted based on the wheelbase setting. Each yellow and green square represents 0.25 inches with the center of the green box positioned at the calculated ideal CG position. The calculated ideal CG position assumes a weight distribution such that 17% of the total weight is on the front axle and the remainder is on the rear axle.
- The blue arrow shows the position of the car's actual CG (based on the ratio of the front and rear axle weights).
- The rear axle (left) weight, front axle (right) weight, and combined total weight are displayed at the bottom of the screen.

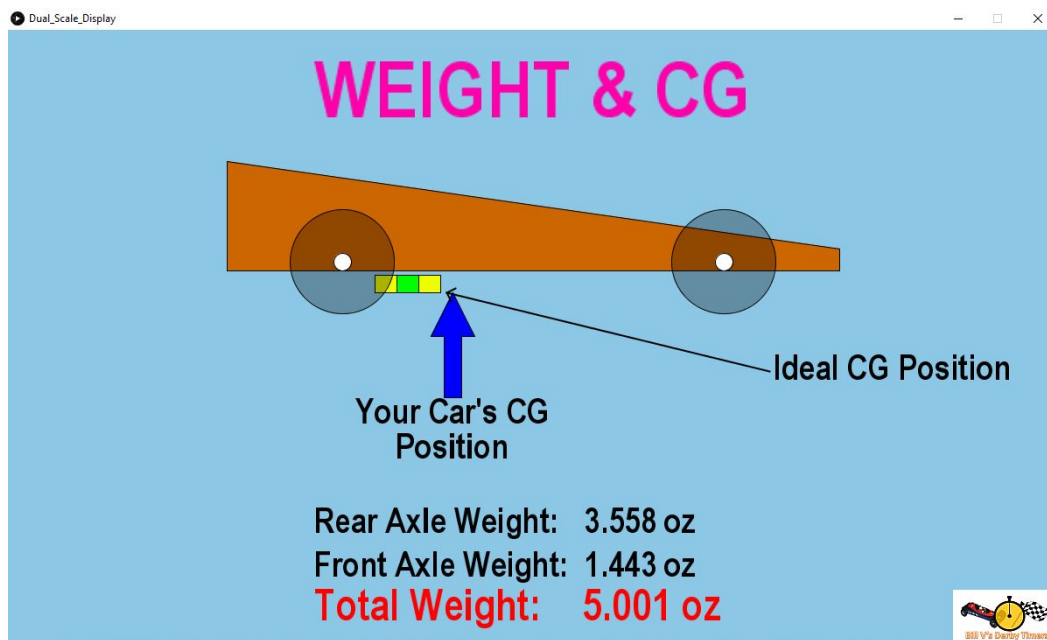


Figure 3. Weight & CG Display