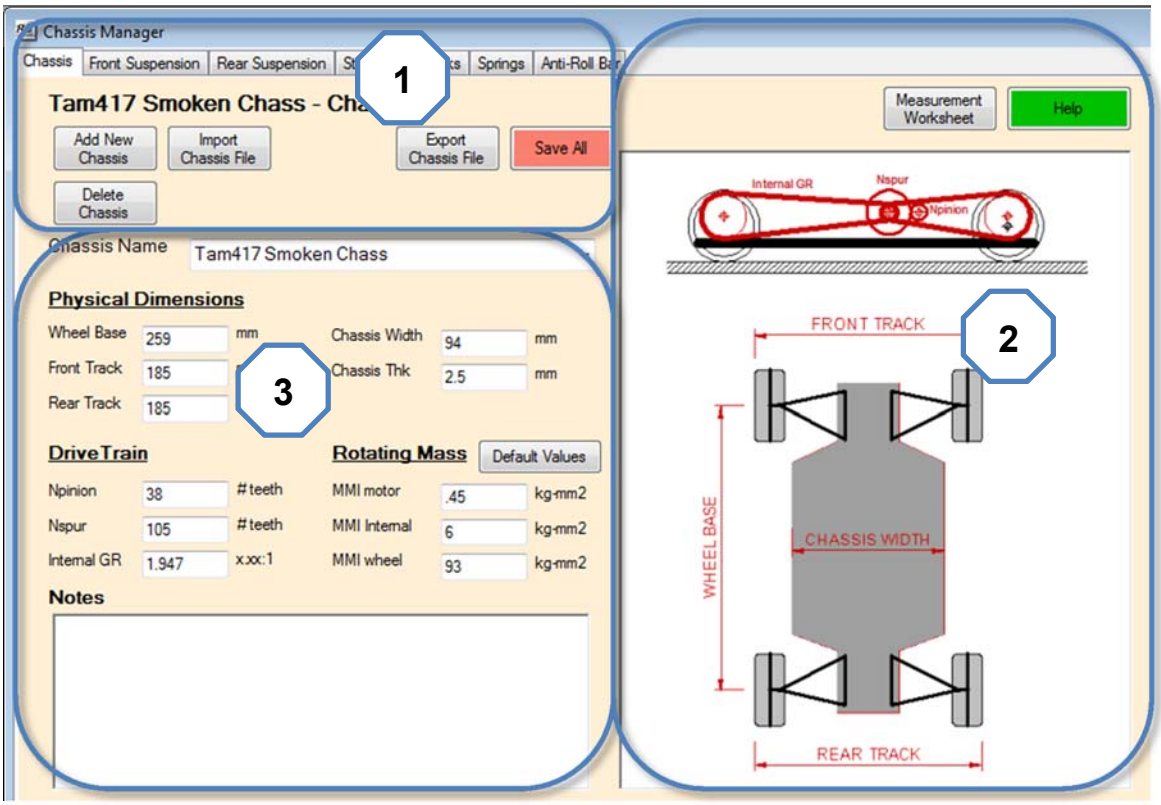
Chassis Manager User's Manual

General

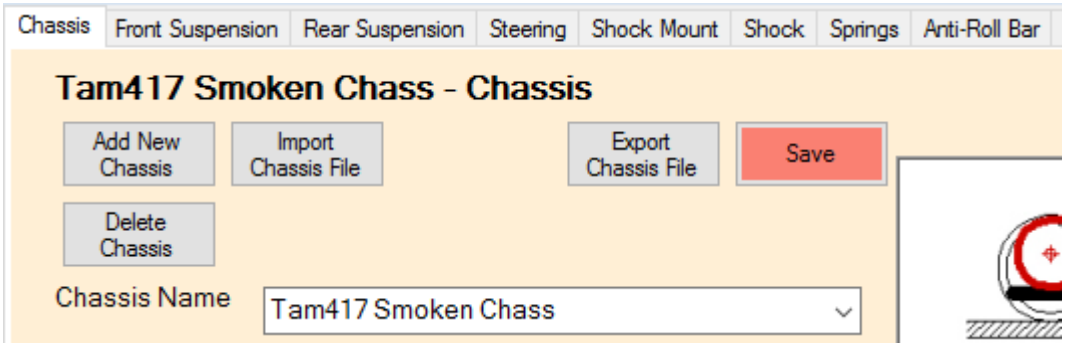
The Chassis Manager allows you to Edit, Add, Save, Delete and Import/Export Chassis models. The Chassis model displayed when you open the page corresponds to the chassis used in the current Car on the main page.

1. Chassis Tab

Below you will see the Chassis tab which is displayed when you open the Car Manager. Four main areas are boxed below and will be discussed in more detail in the following sections:

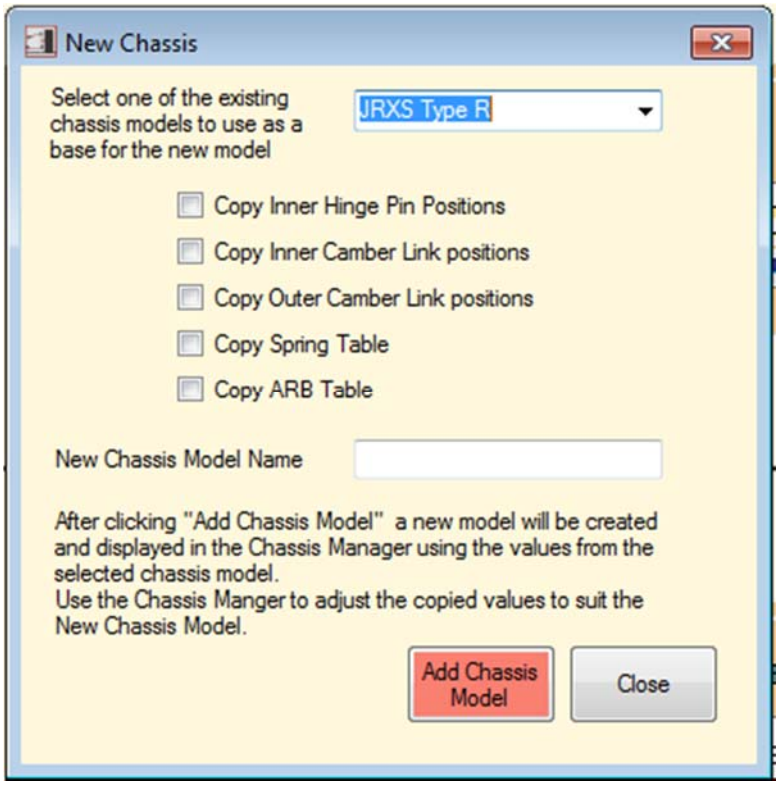


Area 1 – Selection Tabs and File Management



The Tab strip at the top is used to switch the display to provide access to the eight chassis component data pages. The button functions are:

Add New Chassis – Click and the **New Chassis** form is displayed. Select one of the models in the library to use as a base to build a new model, check the boxes of the other chassis parts you want to copy and enter a name for the model.



If you are creating a different version of an existing chassis you would want to check all the Copy boxes. For example one chassis model could have laydown shocks and another upright. Click **Add Chassis Model** and then **Close** to return to the **Chassis Manager.** A new model has now been created and you can edit the values to match your chassis.

Delete Chassis – This will delete the currently displayed Model from the database. A message box will be displayed requiring confirmation to ensure this is the action you intended. This action is not reversible.

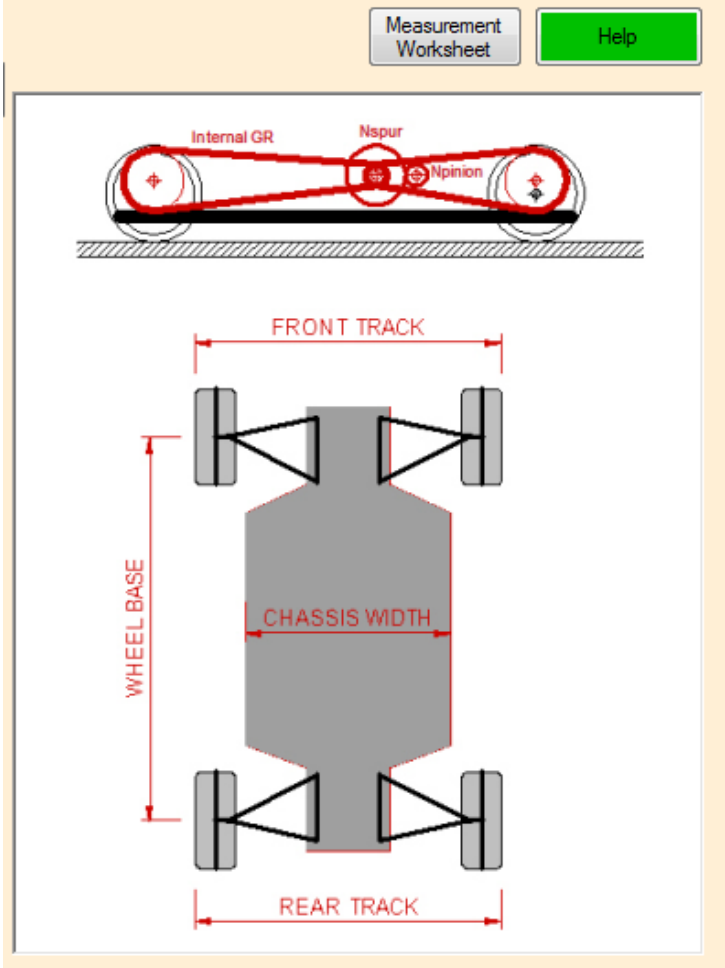
Import Chassis File – This button allows a text file containing all the values for a chassis to be imported into the program. The file must have a .rcc file extension. New chassis files will be will delivered this way and it can also be used to share files between racers. Clicking the button will open a file dialog. Navigate to the folder, select the file and click open to import the file.

Save - Once you have finished editing click the button to save changes on this page to the database.

Export Chassis File - It is strongly recommended that you also export the chassis file**.** This will allow you to save the entire chassis file to a folder outside of the program for sharing or recovery should you have a hardware or software failure

Area 2 – Chassis Graphic

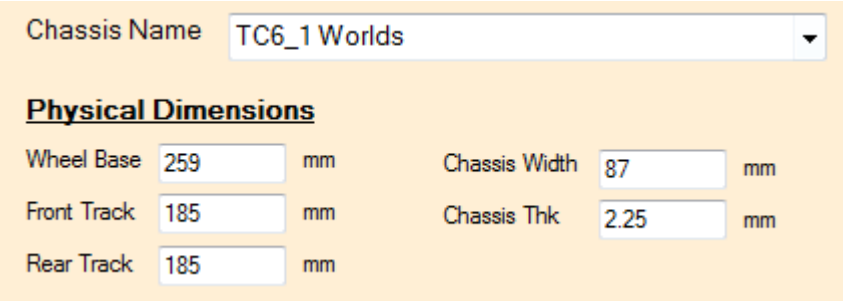
The Chassis dimensions and constants required are displayed in the graphic.

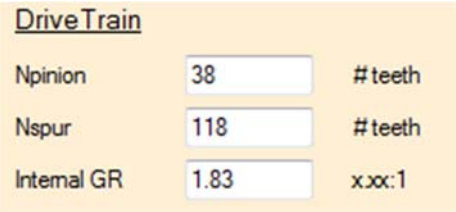


Note in the top left corner of each page is a **Measurement Worksheet** Button. If you want to create your own models clicking this button will display a .pdf file that illustrates the measurement required and provides a place to record the data. A different worksheet is provided for each page of the Chassis Manager so you will need to print them all if you plan on creating models.

Area 3 – Chassis Constants

Select a Chassis Name from the list and enter or change the physical dimensions shown in the graphic. To change the Chassis Name type a new name in the box





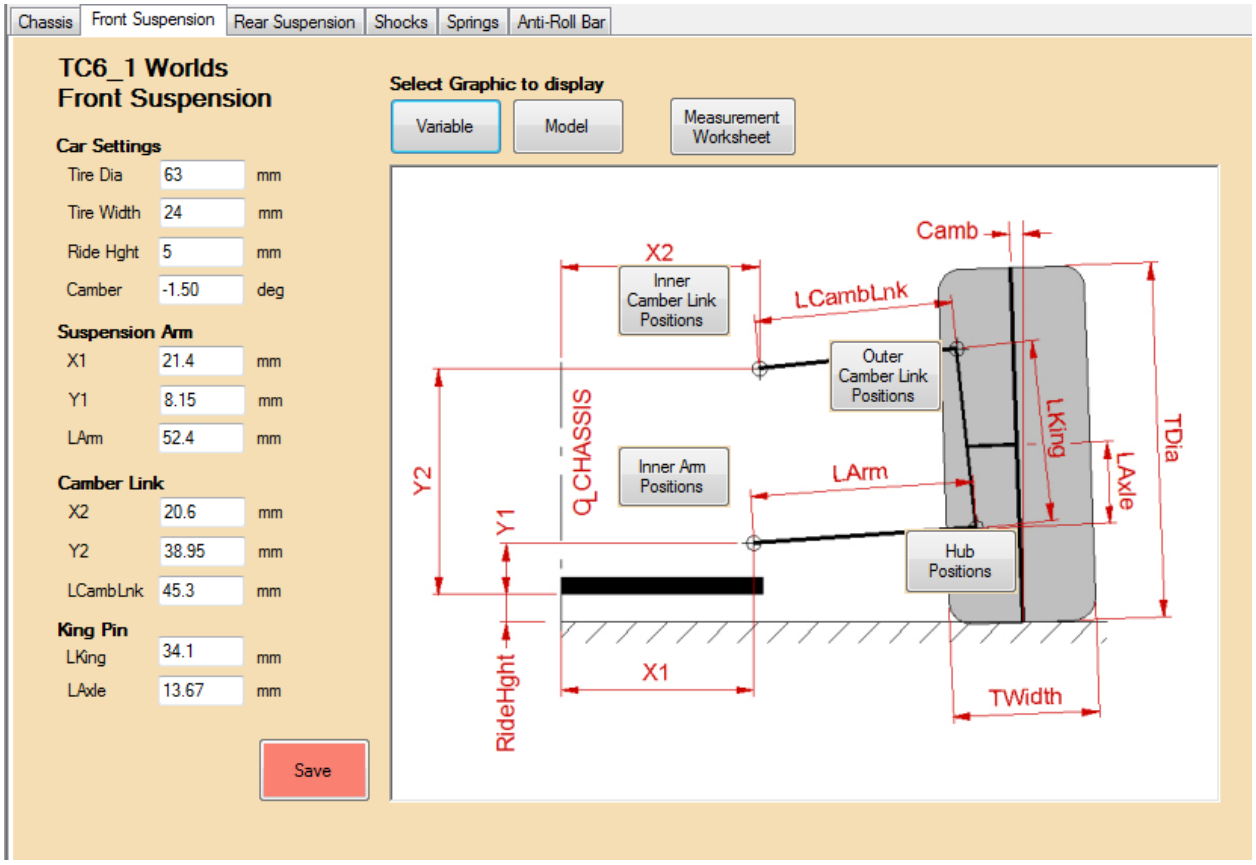
Enter Pinion, Spur and Internal Rear Ratio. Pinion and Spur values can also be changed in the Setup and Acceleration pages. The Internal GR cannot be changed in other areas so ensure the value entered here is correct.

Rotating Mass (mass moment of inertia) deserves a little explanation. In terms of acceleration **Rotating Mass** is to rotational acceleration as vehicle mass is to Linear acceleration. In order to accelerate a car you must accelerate the vehicle mass and the **Rotating Mass**. The Motor obviously is the source of these forces. This is good old Newton's Second Law, Force = Mass x Acceleration or in rotational terms Torque = Rotating Mass x Rotational Acceleration.

It is enough to know that the values provided are representative of 1/10 scale sedans. Rotating Mass only comes into play during the straight line acceleration simulations. To simulate different cars these values will need to be adjusted to reflect the increase in rotating mass of the components.

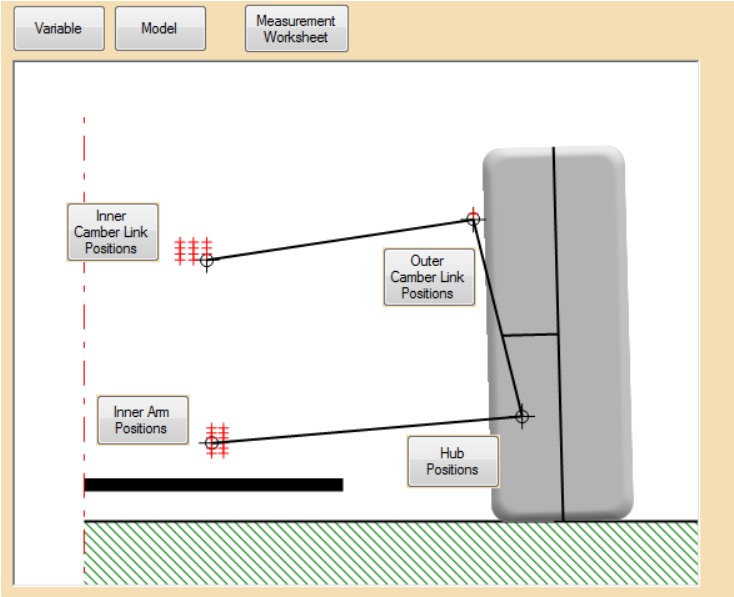
2. Front & Rear Suspension Tab

The Front and Rear suspension tabs are identical and will be treated together in this section.



The dimensions required to represent the suspension geometry are defined in the graphic. To display this version of the graphic click the **Variable** button above the graphic window. Measure all the values listed as accurately as possible. A set of digital calipers is recommended. The suspension link dimensions must be measured to the centerline of the hinge pin, ball stud or pivot ball. In most cases this will mean making several measurements and then adding/subtracting to get the required number. Partial disassembly will also be required.

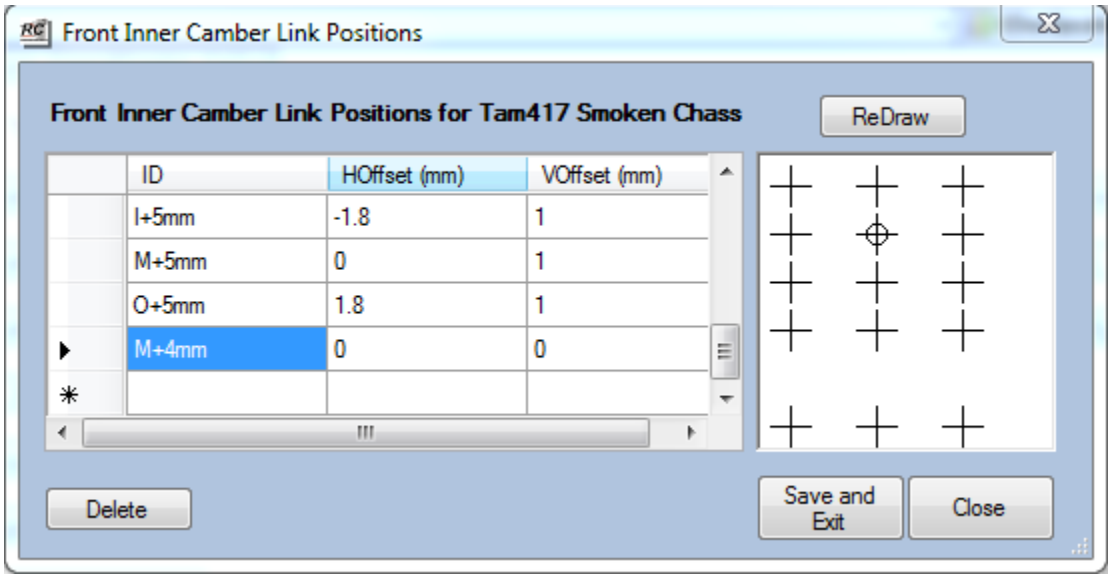
For example to get the dimension Y1 measure from the bottom of the chassis to the top of the hinge pin and then subtract ½ of the diameter of the hinge pin.



Clicking on the **Model** button will change the graphic to display a scale drawing of the suspension from the dimensions entered. Compare the real chassis to the model. The model appearance should match, if it doesn't then check your numbers.

At this point you can enter alternate positions for the Inner Arm, Inner Camber Link, Outer Camber Link and Hub positions link by clicking on the buttons in the graphic.

The Form displayed below represents the alternate Front Inner Hinge Pin Positions. The positions are entered as horizontal and vertical offset values from the primary link position entered on the Front Suspension tab. In this case that point would be the X1, Y1 point. The reference point is illustrated on the graphic as the circle plus cross hair. The alternate points are shown as simple cross hairs.



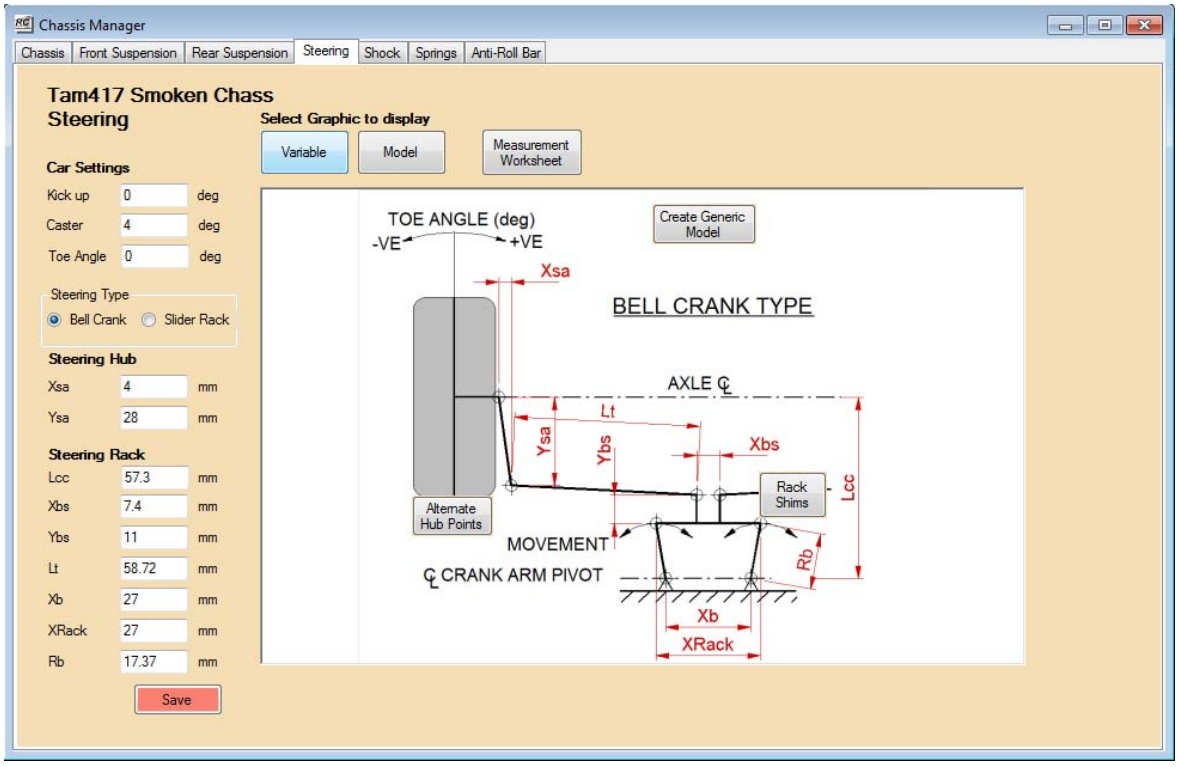
Entering an **ID** for each point is strongly encouraged as the entered text will be displayed in the **Setup** tab which will greatly help in identifying and selecting the shims or link positions used for a particular setup. In the example below the last entry represents the base point that was used when the suspension geometry was

measured so the HOffset and VOffset values are 0. In this case the base point was in the middle position and 4mm shims were installed under the ball stud so the ID “M + 4mm” has been entered. This is the Base Point from which all alternate points are referenced.

It is very important to understand how the alternate points are entered. For example the point immediately above the Base Point in the table is in the outer position on the bulkhead and is shimmed 5 mm so it is identified as “O +5mm”. Note how the HOffset and VOffset values are entered. The HOffset is entered at +1.8mm since the point is 1.8mm outboard from the Base Point. If the point was inboard of the Base Point it would be entered as -1.8mm. The VOffset is entered in a similar manner. In this example the point is shimmed 5mm so relative to the Base Point that is shimmed 4mm this point is 1mm higher so VOffset is +1mm. If the point was shimmed 3mm the VOffset would be entered as -1mm.

3. Steering Tab

Steering model is entered in the same manner as the front and rear suspension. There are two steering models currently supported, Bell Crank and Slider Rack. Select the appropriate radio button and refer to

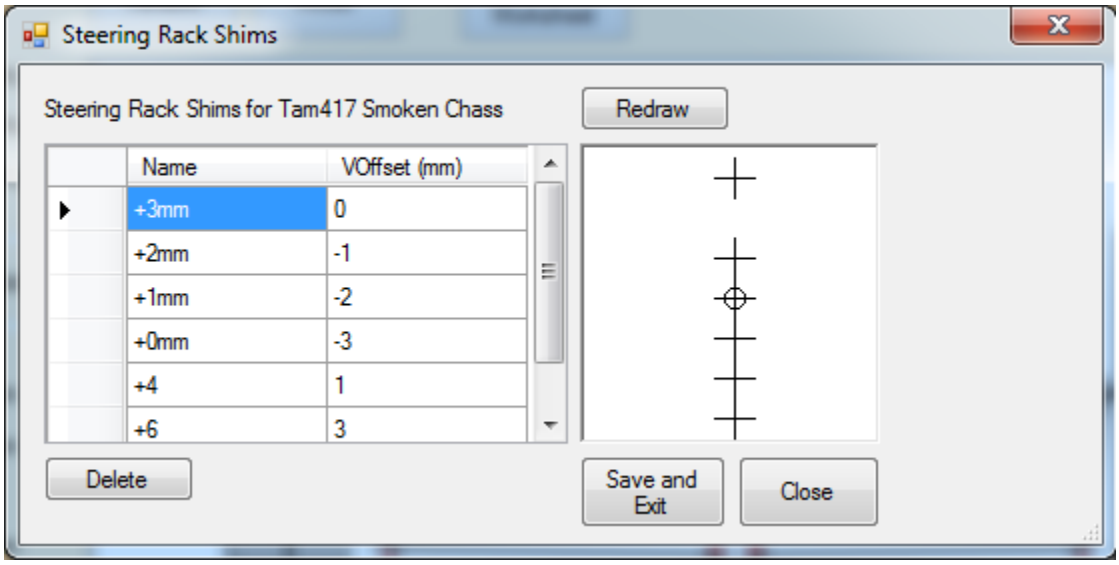


the graphic image displayed for the measurement values required.

Click on the **Measurement Worksheet** button to get a pdf file to record measurements.

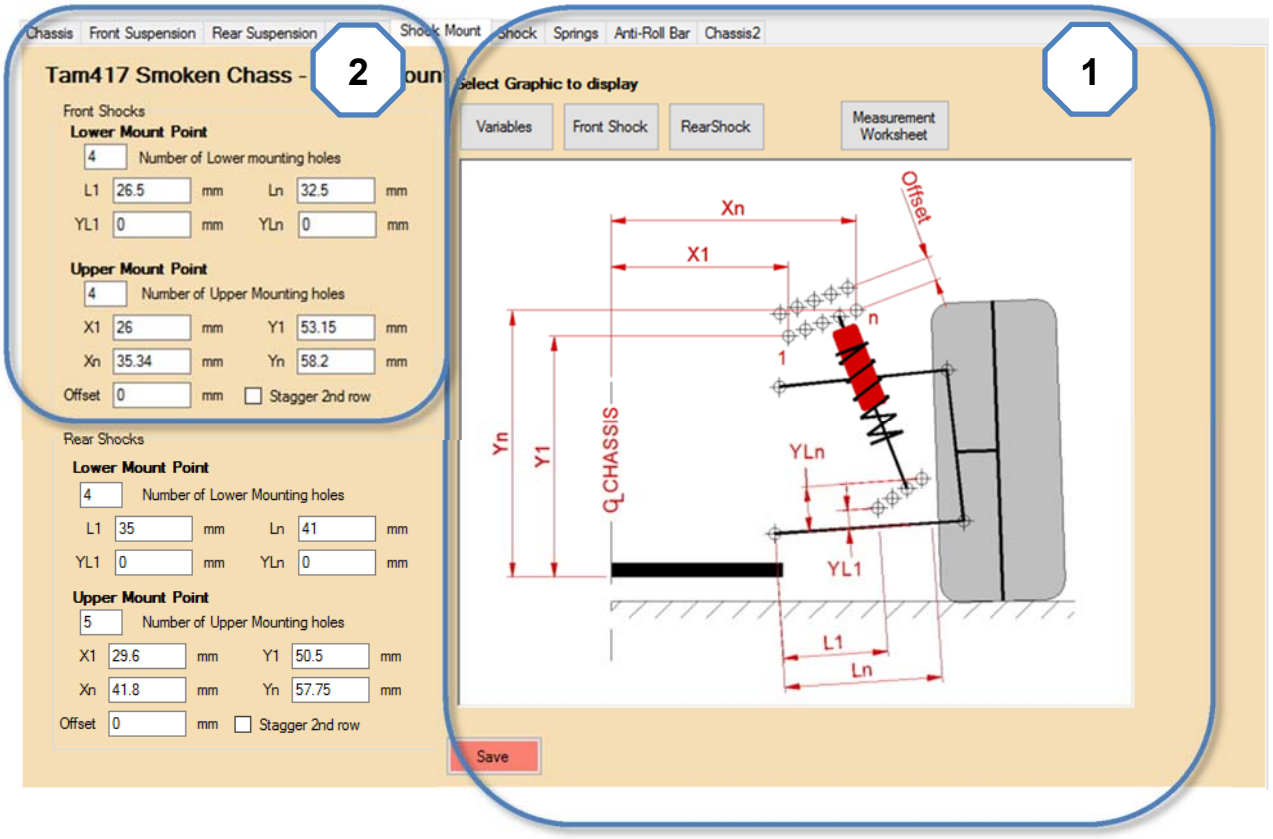
If you do not want to measure the actual steering geometry of the chassis a generic model can be created to get you started. Just select the Radio Button for the type of steering rack and then click the **Create Generic Model** button in the graphic. That's it. It will not replicate the exact geometry but it's a start.

Alternate shim positions for the rack and hub can also be entered. The procedure is the same as that described earlier for the alternate suspension points. When you enter alternate points it is strongly recommended that an ID is entered for each point as this will make selecting and identifying points in the set page much simpler.



4. Shock Mount Tab

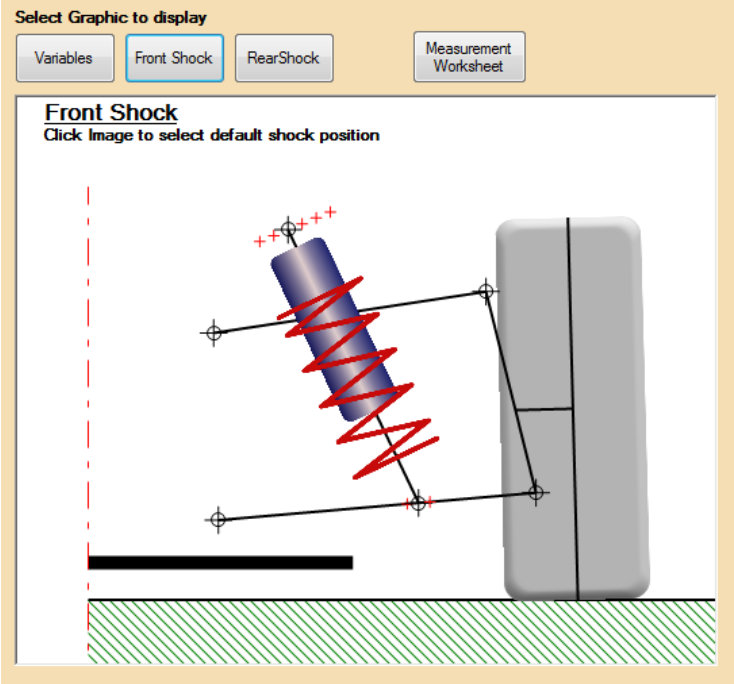
The shock tab is displayed below and has two main areas. Only the data entry field for the front shocks will be discussed. The rear shock field is identical.



Area 1 - Graphic Display Area

Three different graphics can be displayed.

Clicking the **Variables** button will display the image shown above. The image illustrates the dimensions required to define the shock positions.

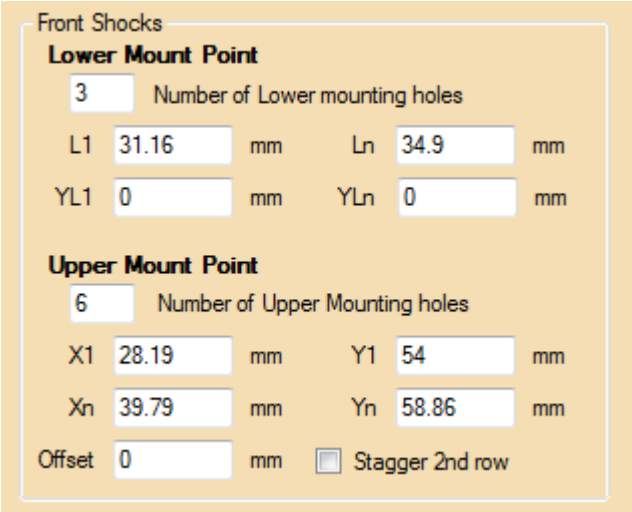


Clicking the **Front Shock** or **Rear Shock** button will display a scale drawing of the current geometry. The displayed graphic should be an exact copy of the real car.

You can select the default link positions by simply clicking on the graphic.

Area 2 - Front Shock Data Entry

The dimensions and values illustrated in the **Variables** graphic are entered in the appropriate boxes as shown below. The entry fields for the lower aand upper mount points are slightly different.



For the **Lower Mount Point** first enter the number of mounting holes. If only 1 hole is provided the **Ln** and **Yn** box will be greyed out and disabled.

The **L1** (and **Ln**) position of the shock lower mounting holes are enter as the distance relative to the suspension arm inner hinge pin position. Only the length to the first and last point are required. Any intermediate points will be equally spaced between the first and last points.

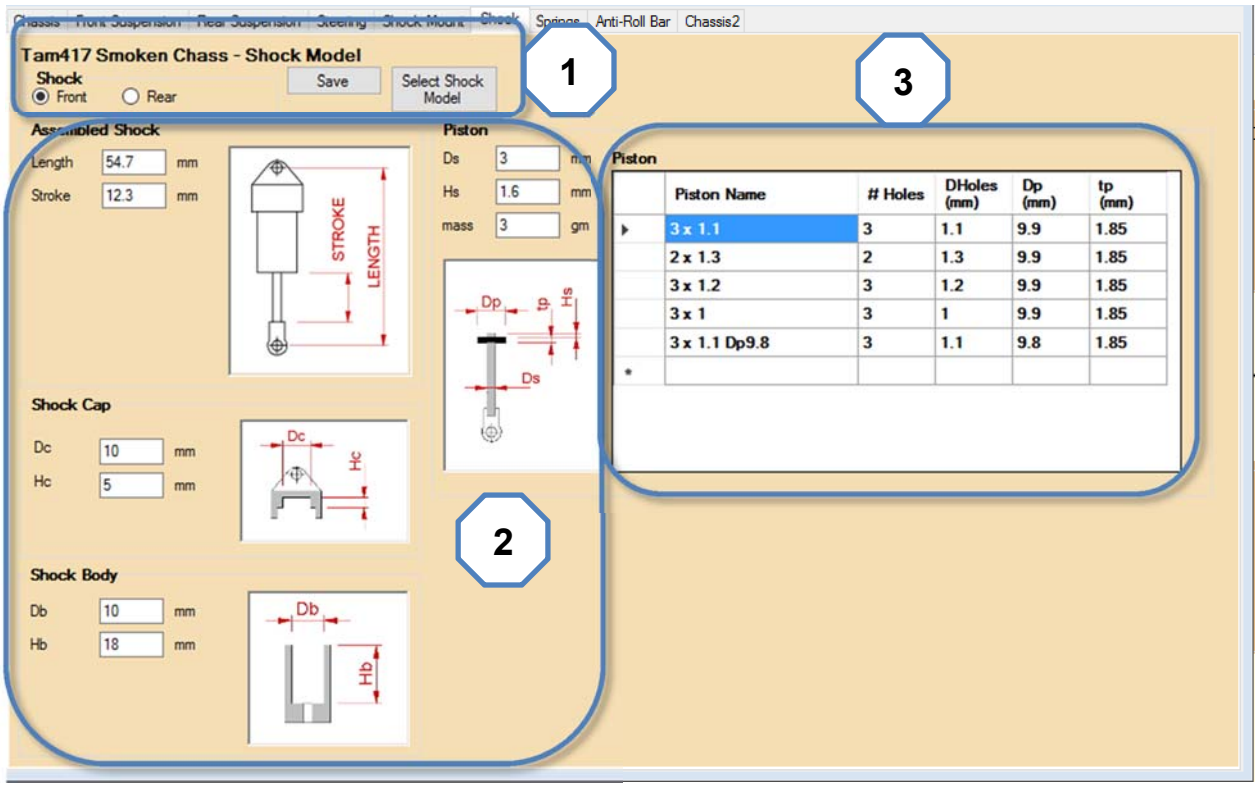
If the lower holes are offset or angled from the centre of the arm then non zero values for the **Y1** and **Yn** values are needed. The Y value reference line for a straight arm is the middle of the arm. If the arm is not straight then the reference line is the imaginary line connecting the inner and outer arm pivot points. Otherwise enter zero.

The **Upper Mount Point** also requires the number mounting holes to be entered. Should only one hole be provided, the **Xn** and **Yn** boxes will be greyed out and disabled. The X coordinate is entered relative to the centreline of the chassis. The Y coordinate is relative to the underside of the chassis.

If the upper mount has two rows enter the value for the offset between the two rows. If the holes between the two rows are staggered relative to each other then check the **Stagger 2nd Row** checkbox.

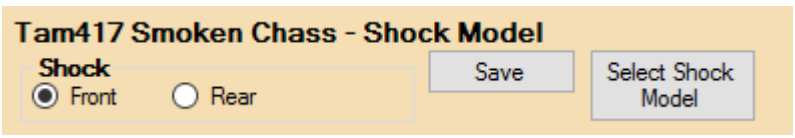
5. Shock Tab

The shock tab has three main areas.

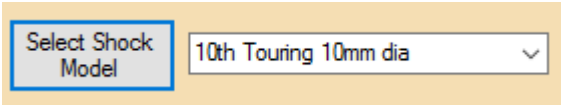


Area 1 – Model Display and Selection

Selecting the Front or Rear radio button will display the corresponding shock model values. Clicking **Save** will save all the current values to the database.

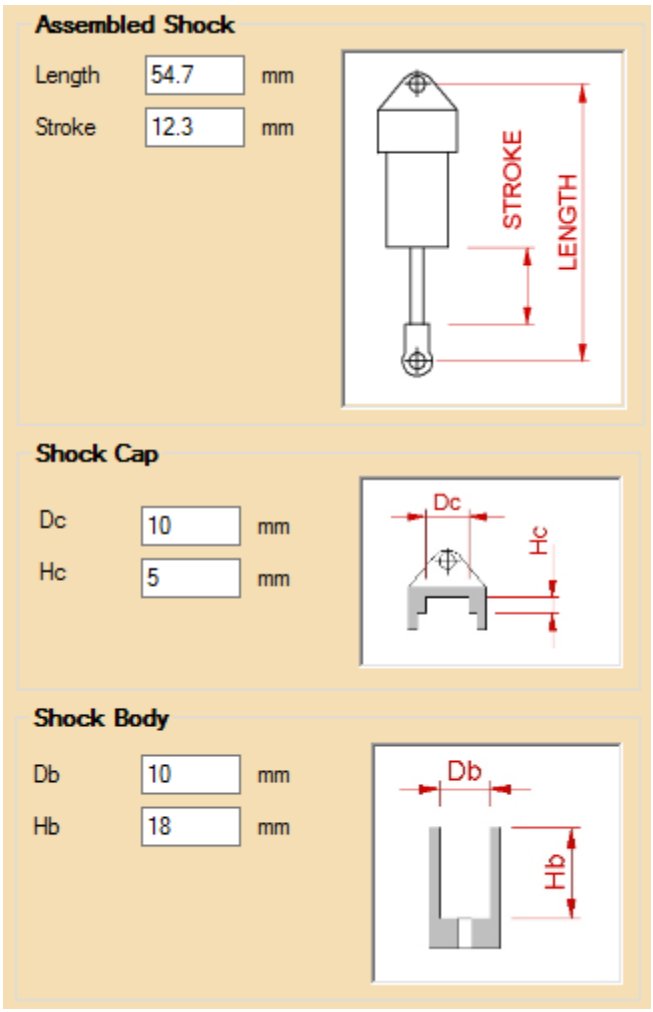


Clicking **Select Shock Model** will display a list of generic shock models to choose from. Selecting a model from the list will fill in all the values required. The values can be edited later if you wish to add actual measurements for your shocks.



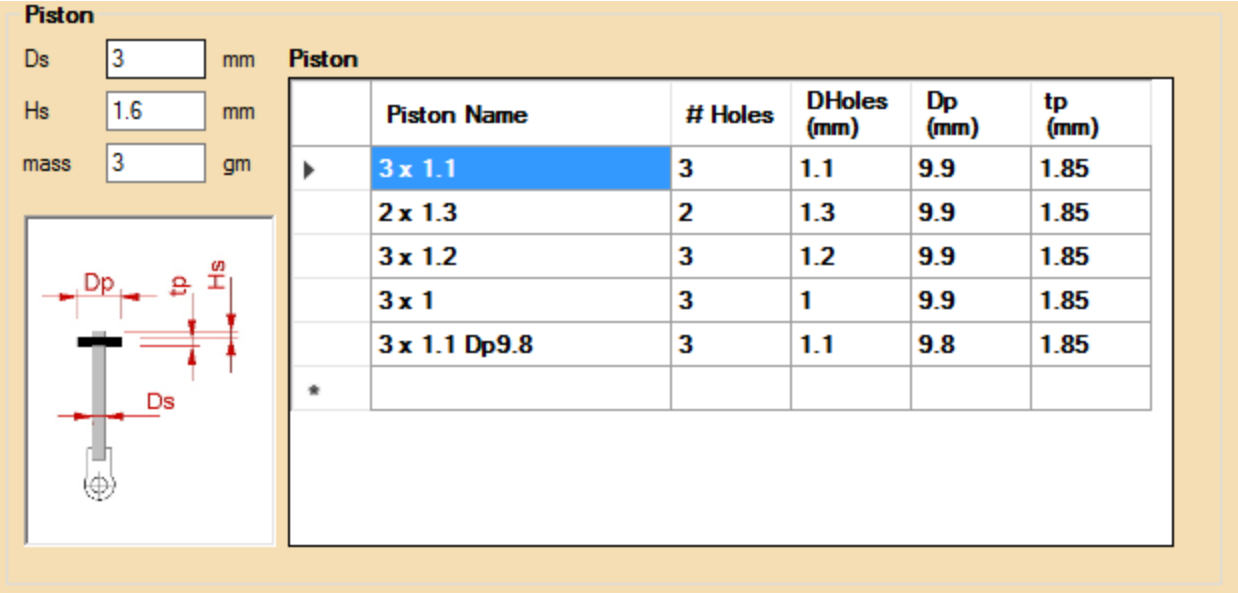
Area 2 – Shock Dimensions

Simply enter the values illustrated in the images.



Area 3 – Piston Dimensions

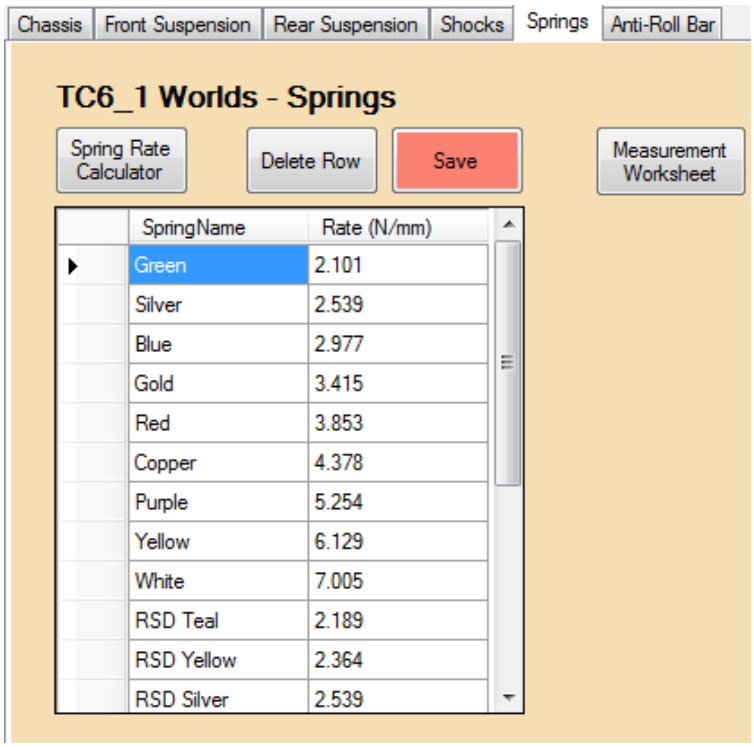
Enter the constants for the piston Ds, Hs and mass as illustrated in the graphic.



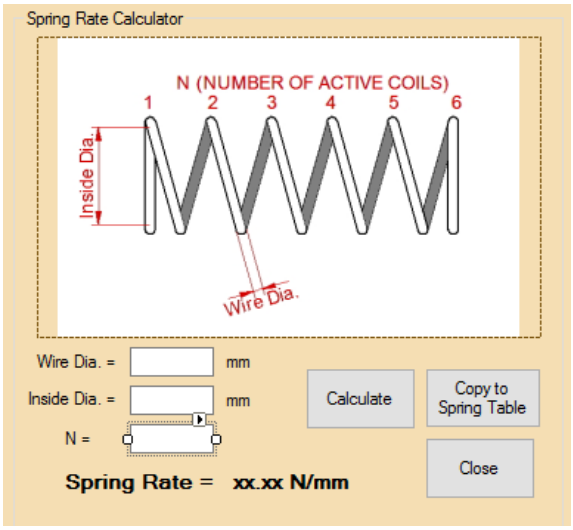
To allow different Piston Configurations to be evaluated values for each piston are then entered in the Table. **Piston Name** will be displayed in the drop down boxes on the Setup and Damping tab so enter a name that describes the piston.

6. Springs Tab

Chassis Springs are entered directly in the table shown below. Springs should be entered in order of spring rate from softest to hardest although this is not mandatory. The naming convention should follow the system used by the manufacturer.



If you don't know the spring rates for your chassis the spring rate calculator can quickly determine them. Click the **Spring Rate Calculator** button to display the **Spring Rate Calculator** form shown. Only three values are required to estimate the spring rate. Wire Diameter, spring inside diameter and the number of active coils.



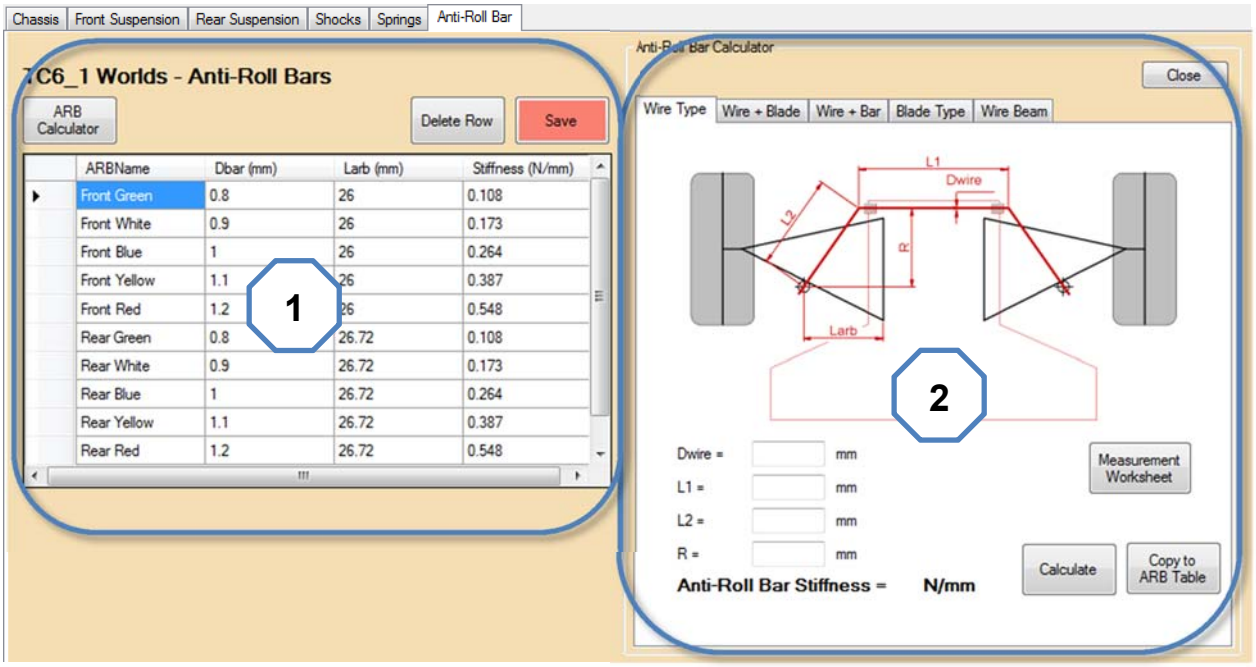
To determine the **Number of Active Coils** use the following procedure.

- Hold the spring as shown with the start of the spring wire at 12 o'clock.
- Count the total number of coils as shown.
- The last coil must be checked to see if it is a full or partial coil. Normally springs are wound CW so If the end of the spring wire of the last coil aligns with the starting point then the total number of coils equals the count, 6. If the spring wire ends before 12 o'clock the total number of coils would be 5 + the portion of full coil, 5.75 for example. If the end of the wire extends past the 12 o'clock position then the total number of coils would be 6 + the portion of full coil 6.25 for example.
- Normally the first and last coils are ground flat and closed meaning they are considered inactive. In that case the **Number of Active Coils** would be the total coil count – 2. So if the total coil count is 6.25 the **Number of Active Coils** would be 6.25– 2 = 6.25

It takes practice to determine the number of active coils so using a spring of known rate can be very helpful to compare the results.

7. Anti-Roll Bar Tab

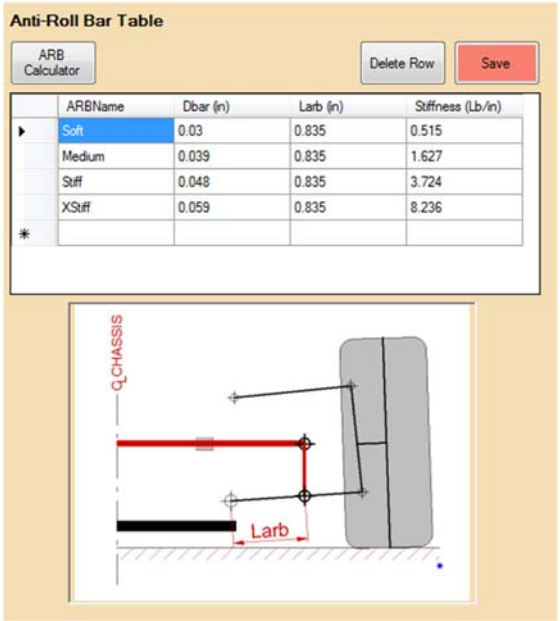
The **ARB** tab is very similar to the **Springs** tab. There are two areas of interest on this page.



Area 1 – Anti-Roll Bar (ARB) Table

Values are entered directly into the ARB Table. To enter a new ARB click on the first cell in the empty row and enter a name for the ARB. Next enter the diameter of the bar and the **Larb** value. **Larb** is simply the distance from the centre of the hinge pin to the point where the ARB connects to the arm.

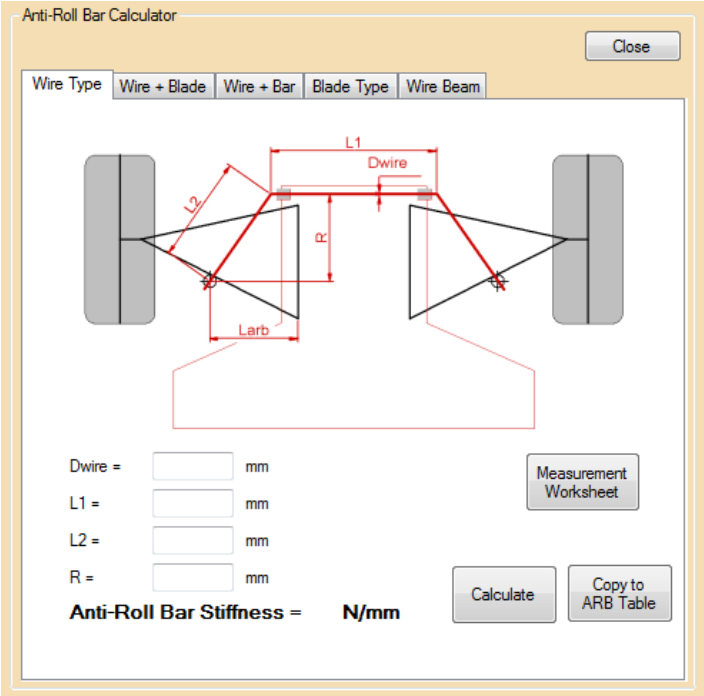
The Stiffness must be calculated. Once the value has been calculated using the ARB Calculator it can be entered directly or copied directly from the calculator.



Area 2 – Anti-Roll Bar (ARB) Calculator

Calculating the ARB stiffness will always be necessary as manufacturer's do not include a numeric stiffness rating for their ARB's. They are normally just described as soft, medium or stiff.

There are calculators provided for 5 different ARB configurations. If the type used in your chassis is not displayed then click through the tabs until you locate it.



Calculating the Anti-Roll Bar rate is very straight forward. The model used includes the effects of bending as well as torsion. Just measure and enter the values depicted in the graphic and click calculate.

The calculated value can then be copied into the currently selected ARB table row by clicking the **Copy to ARB Table** button. Just make sure you have selected the correct row in the table before copying the value.