TSC

For

Windows

TORSION SPRING CALCULATOR

For OVERHEAD DOORS
Version 4

REFERENCE MANUAL

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INTRODUCTION

Welcome to version 4 of the **TSC - Torsion Spring Calculator for Windows**.

We strongly suggest that you to read this manual at least once and keep it in a safe place for easy reference whenever the need arises. This manual is written with the inexperienced operator in mind. If you would like to contact **SAROTECH** with comments or suggestions, please write to:

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INSTALLATION

In order to run **TSC**, you must first install it from the distribution diskette or CD. To run the installation program, follow the steps below.

- Click the "Start" button from the task bar.
- Choose "Run…" from the Start menu.
- If you are installing **TSC** from a diskette; type "a:\setup" without the quotes and press the Enter key or click the OK button.
- If you are installing **TSC** from a CD; type "d:\setup" (where d: is the letter of your CD-Rom drive) without the quotes and press the Enter key or click the OK button.

The installation screen will be displayed.

Select the language you wish to work with and then click the Next button.

The next screen will prompt you to select the drive and the sub-directory where you wish to install the **TSC** program.

The final screen will allow you to change, if you wish, the program folder which will be created.

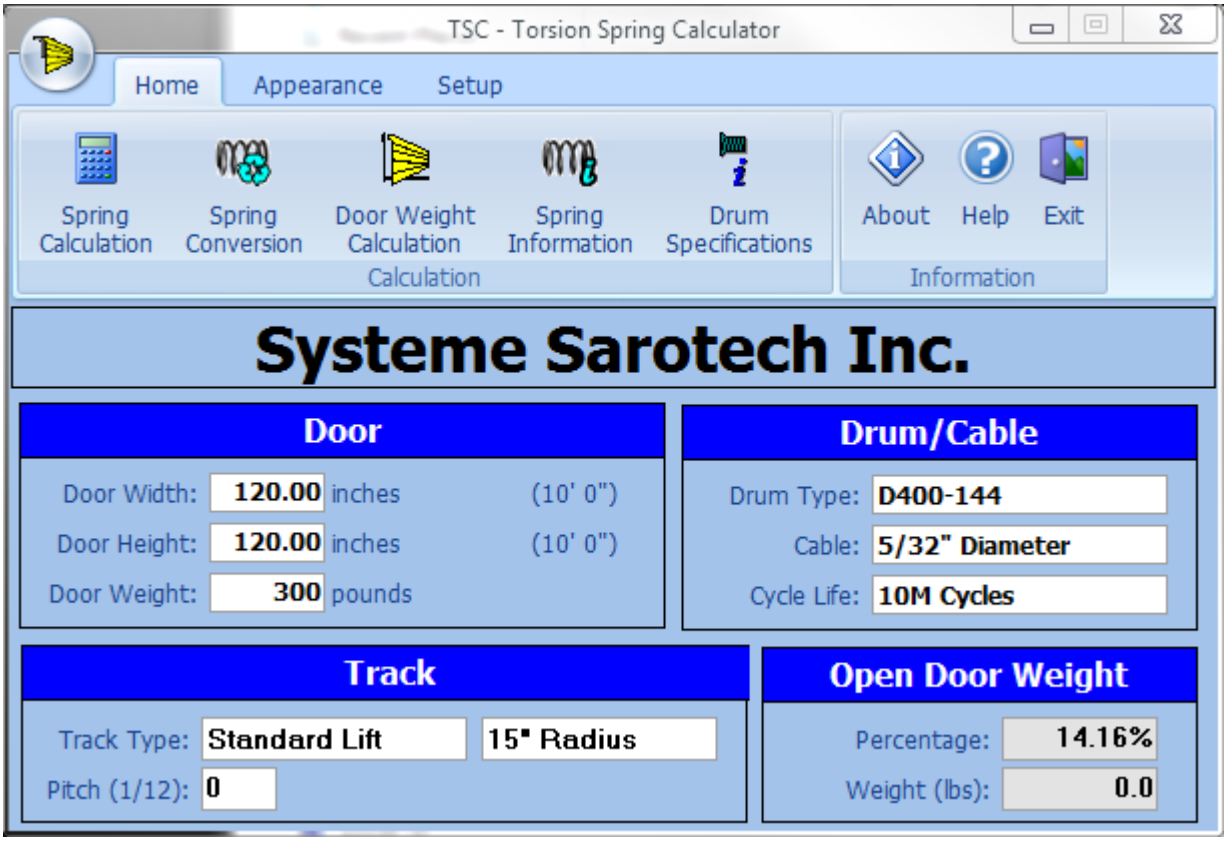
Once you answer the questions, the installation program will then take over and install the program.

GETTING STARTED

To start the program, select the "**Torsion Spring Calculator**" icon from the "**Programs**" menu or from the desktop by double clicking the icon. After a few seconds, the **TSC** title screen will appear. After reading the copyright notice, press the **Enter** key or click the OK button to continue.

CHAPTER 1
TORSION SPRING CALCULATION

This is the Entry screen of the **TSC** program, where you will be able to enter door measurements such as the size, the weight, the track configuration and more.



At the top of the screen, the name of the company, which this software is registered to, will be displayed. Above this line, the **TSC** "ribbon bar" is found. The purpose of the ribbon bar is to simplify the transfer from this screen to another with several quick shortcut buttons pointing to frequently used windows.

There are three tabs in the ribbon menu.

1) Home tab
2) Appearance tab
3) Setup tab

Home Tab:

Spring Calculation - Clicking this button calculates springs according to the measurements entered on the Entry & Configuration screens and displays the calculation dialog screen. You may also use the "**F2**" key from the keyboard to calculate springs.

Spring Conversion - Click this button to convert existing springs to new springs. You may also use the "**F3**" key from the keyboard to convert existing springs.

Door Weight Calculation - Click this button to estimate the door weight from existing springs. You may also use the "**F4**" key from the keyboard to estimate the door weight.

Spring Information – Click this button to display Display detailed information of a spring. You may also use the "**F5**" key from the keyboard to reach this screen.

Drum Specifications - Displays all the drums supported by **TSC** with their specifications. You may also use the "**F6**" key from the keyboard to reach this screen.

Help - Displays the help screen.

Exit - Closes the Entry screen and exits **TSC**.

About TSC - Display the about dialog screen, where you will find various information about this program.

Appearance Tab:

You can change the appearance of the program by going to the Appearance ribbon tab and selecting your preferred colors. The application comes with three default styles: blue (default), black and silver. Click on the color buttons will change the program's appearance immediately. You can also individually select form colors, background, text, border and grid colors and styles accordingly.

Setup Tab:

Company Profile - Displays the company configuration screen, where you may enter your company information. You may also use the "**F8**" key from the keyboard to reach this screen

System Configuration – Click this button to display the system configuration screen, where you may customize the **TSC** program to your liking. You may also use the "**F9**" key from the keyboard to reach this screen.

Default Wire Types - Click this button, to enter custom spring types screen, where you may enter the custom average tensile strength values. If you are using special springs you have to use this screen.

Default Wire Sizes - The **TSC** program uses the industry standard oil tempered spring wires for its tensile strength values. If you wish to use spring material which is different than the standard, select one of the custom types. It is the user's responsibility to enter the proper average tensile strength values for each wire size.

The door specification fields are placed below the speed buttons. Use the **TAB** key to move between input fields or click in with the mouse. The door width, height and the weight must be filled in; otherwise the calculations will not be processed. If the hi-lift tracks are selected, another input field will be shown to enter the hi-lift amount.

If you wish to exit the **TSC** program, click on the Exit speed button shown in the picture above or press the **ALT** and **F4** keys simultaneously. Pressing the **F1** key for each individual field will give you the help pop-up windows.

Here are some of the fields found on the Entry screen:

DOOR SIZE: The fields for the door width and height; they must be entered in inches or in millimetres according to unit of measurement you have selected in the **System Set-up** screen. You may also enter decimal places for 1/2" (0.5), 5/8" (0.625). Beside these fields, the feet-inch equivalent of the entries will also be displayed.

DOOR WEIGHT: Next, we have a field for the door weight. This must be entered in pounds (lb.) or in kilograms (kg.). Remember, the door weight you will enter here must include the weight of all the surface hardware (hinges, locking devices, etc.) as well as the glazing units.

TRACK CONFIGURATION: We now arrive at the track lift specification. Here you will simply choose the track configuration applicable for each particular case from the drop down list.

TRACK RADIUS: If standard lift tracks are used, the program will prompt you to select the proper track radius. This will serve the program to calculate the open door weight.

TRACK SLOPE: If the track configuration of your door is not a full vertical lift, you will be prompted to enter a pitch (x/12). This is truly one of the many advantages of the **TSC** program. Can you imagine calculating torsion springs for a door having horizontal tracks at a 30 degree slope? All you have to do here is simply enter zero (default value) for a completely horizontal track or the factor of inclination if you have inclined horizontal tracks. Horizontal tracks inclined more than 45 degrees must be considered as a full vertical lift.

HI-LIFT: If you select the hi-lift track configuration, you will be prompted to enter the amount of hi-lift in inches or in millimetres. The **TSC** program defines hi-lift the distance between the door lintel and the top of the horizontal tracks. Note that this is not the distance that will be left clear underneath the horizontal tracks (which is the straight vertical distance between the door lintel and the underside of the tracks).

COUNTER-BALANCING DRUMS: Next we have the selection of the counterbalancing drums. The **TSC** program will have a default selection for the drums according to the information you have entered up to this point. As with the track lift options, you may select a different drum from the drop down list if you wish. Although **TSC** allows the user to select any drum, it is important to be aware that not all the selections will work in practice. The **TSC** program is designed this way to allow for some degree of experimentation on your part, letting you sometimes choose an incompatible drum size.

LIFE EXPECTANCY: Finally, the last selection you will make will be the total reserve or the life expectancy you wish to design the torsion springs for. The **TSC** program will default to 10M (10000 cycles) which is a minimum. You may choose from any of the other options presented in the drop down list.

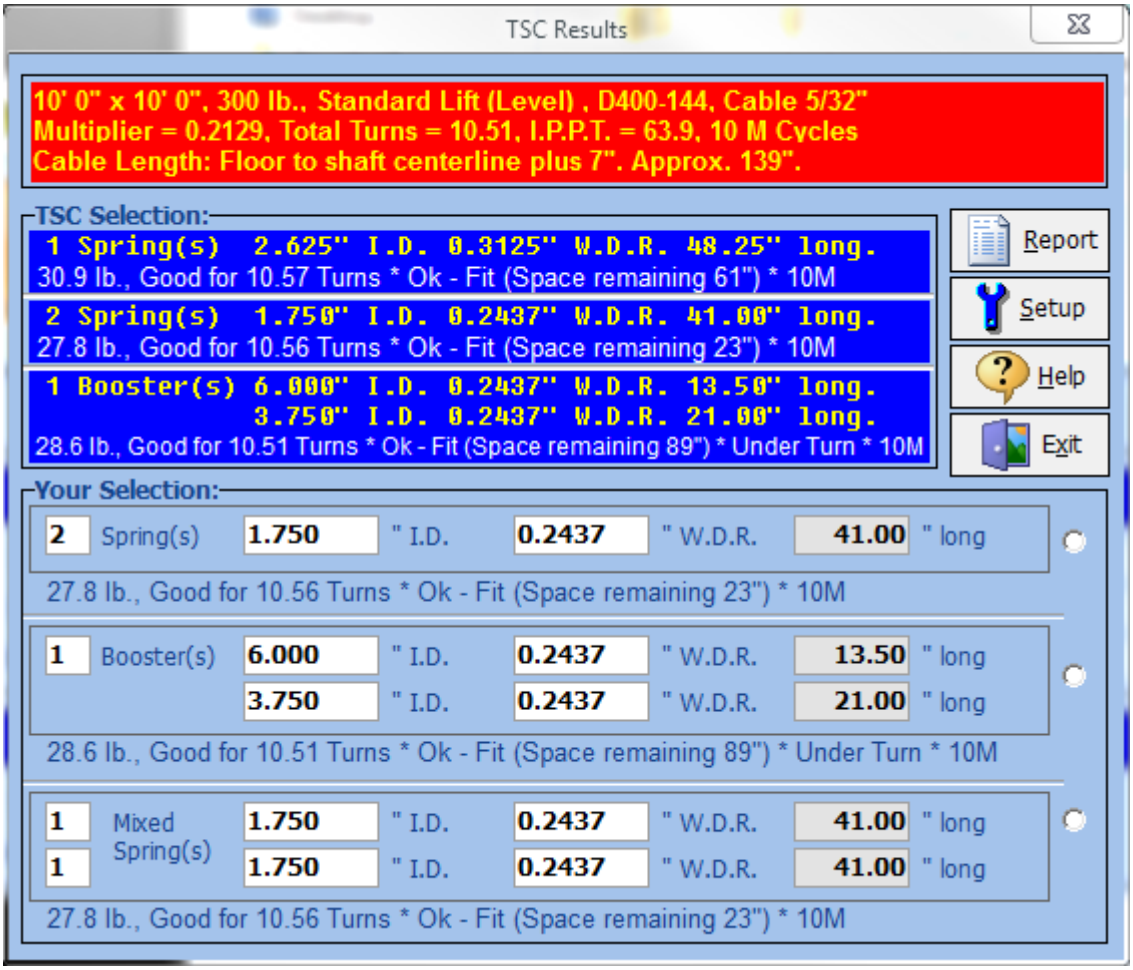
PERCENTAGE: **TSC** automatically calculates the percentage of the open door weight. The calculation is based on two criterias. Bottom section is 21-24" and the door weight is uniformly distributed. If the bottom section of the door is much heavier than the other sections than when it is in open position, it will not be properly balanced. Under these circumstances, the user must override this calculation. Regularly, **TSC** will not allow the user to override this value, however one may right click the mouse and from the submenu can uncheck the "Calculate Open Door Weight" choice and then enter the percentage of the open door weight in this field. The **TSC** will calculate the open door weight multiplying this value with the door weight. If you revise any other field, which might affect this value such as track type, door weight etc., it will be recalculated by the **TSC**. Therefore this entry must be done last.

WEIGHT: This is the open door weight, which is a calculated field and it cannot be overwritten. It represents the open door weight percentage multiplied by the door weight.

After entering this information, you may proceed with the calculation by clicking the **Calculator Speed Button**. You can also access to this command by simply pressing the **F2** key. The window shown on the next page should appear after using any of these methods.

Now you have the **TSC** processing torsion spring selections according to the door specifications you have entered. You may calculate any other springs in the "**Your Selection**" section by filling the input fields with other spring(s), booster(s), or mixed spring(s) specifications.

Notice that the information at the top of the screen is reminding you of what you had entered for the door specifications. It is good practice to check this information often when you calculate a new torsion spring. If you see an error, you can select the **Exit button**, which will bring you back to the door specification screen and you may change or correct any entry you wish. The approximate cable length will also be displayed. The cable length formulas are suggestions of the drum manufacturer. Sarotech will not take any responsibility of their validity.



Also, notice the information supplied with each spring. First, the total weight of the spring(s) are displayed, which can be very useful to an installer. Next, you have the number of turns the spring(s) are good for. This number **MUST** always be higher than the **TOTAL TURNS** (if you wish to maintain the lifetime expectancy of your design) which is displayed in the second line of this screen. And lastly, you have the "**FIT REMARKS**" telling you if the spring(s) will indeed fit or not along with the actual life expectancy of the spring. In the "**Your Selection"** section, the information supplied with each spring is normally written in blue when the specifications you have entered are compatible. When they are not compatible, this information will be displayed in red. You may want to reconsider and modify the quantity or the dimensions you have entered to fix any incompability.

There are four buttons on this screen.

REPORT - If you wish to have a hard copy of the results, select the "**Report"** button. The **TSC** will display the report dialog box, where you may enter your client name, address and the order number. Once it is completed you have three choices: you may view the results and then print them, print directly to a printer or discard the report entirely.

SET-UP - If you wish to change the set-up of your system, click this button. For more details, refer chapter 4 of this manual. Any changes such as wire type or language will have immediate effect on this screen.

HELP - This button will display the help screen.

EXIT - This button will allow you to return to Entry Screen.

Abbreviations used on this screen are as follows:

I.D.	Inside Diameter.
W.D.R.	Wire Diameter (Round)
W.D.S.	Wire Diameter (Square)

CHAPTER 2
CONVERT AN EXISTING SPRING

This is the part of the **TSC** program which deals in converting an existing torsion spring into a new and unique one.

Click on the S**pring Conversion** speed button or simply press the "**F3"** key. The window shown below should appear on your screen.

The **TSC** program allows for complete flexibility to all the conditions that you may encounter. You may try to design the new spring by either changing the inside diameter or the wire diameter, or both of them. You may also convert square wire springs to round wire ones. This is very advantageous when you wish to replace existing door spring(s) with a new one, which is readily available in your inventory.

All you have to do is enter the quantity, wire type and the dimensions of the existing spring(s) followed by the quantity, wire type and the dimensions (except the length) of the springs you wish to replace with.

Notice the information supplied on your screen. You have the weight of both spring assemblies which may be used to invoice your client. You also have the number of turns that both spring assemblies are designed for. If the new spring you entered is not as strong as the existing spring, the status bar of the new springs will be displayed in red. However you will not be able to tell the amount of reserve or life expectancy of each spring assembly, since door specifications are not included

in this application. The "**SPRING CONVERSION"** module is strictly designed to allow for redesigning and changing existing springs to new springs. It must be noted that it is solely the user's responsibility to assure that the new spring will meet all requirements. Such requirements are number of turns the new spring is good for and the fit.

The three buttons shown on the screen are as follows:

REPORT - If you wish to have a hard copy of the results, click the "**Report"** button. The **TSC** will display the report dialog box, where you may enter your client name, address and the order number. Once it is completed you have three choices: you may view the results and then print them, print directly to a printer or discard the report entirely.

HELP - This button will display the help screen.

EXIT - This button will allow you to return to the Entry screen.

CHAPTER 3
DOOR WEIGHT CALCULATION

Another feature of the **TSC** program is the ability to calculate the weight of an existing door. You might be asking yourself at this point, why on earth would you ever want to know the weight of an existing door? Let us elaborate with two examples:

Scenario 1: A door service company is called in to replace a broken torsion spring assembly on an existing overhead door. The client is fed up with having to change the spring every six months and asks if you can upgrade the design. What can the repairman do at this point? Well, he can either go back to the office and make a new pot of coffee and then begin a lengthy manual calculation of the door weight by himself, or he can call in a door manufacturer to do it for him and end up paying a hefty bill. Of course, you'd have to pass this bill onto you client, resulting hidden, unexpected costs in his invoice, something a person generally never likes to see or experience.

Scenario 2: A door service company, or for that matter a door manufacturer, is called in to modify an existing overhead door's conditions. The client wants to put on an extension to his building and while in the thick of things, would like to renovate the existing building as well. The ceiling is to be modified to a higher level. By extension, the overhead doors must also open with respect to this new ceiling height.

Basically, this part of the **TSC** program works very much like the "**TORSION SPRING CALCULATION"** part. The only difference is that now we have an unknown door weight instead of an unknown torsion spring assembly.

NOTE: **This part of the TSC program will figure out the precise weight of an overhead door that was well-balanced before the spring failure. If the overhead door was not properly balanced to begin with, you will not arrive at the proper door weight, since the information required here has to do with the existing torsion spring assembly.**

After selecting the "**DOOR WEIGHT CALCULATION"** by pressing the speed button or by simply pressing the "**F4"** key, the window shown below should appear on your screen.

DOOR SIZE: The first two fields are the door width and the height and they must be entered in inches or millimetres according to the unit of measurements you have chosen in the system set-up.

TRACK TYPE: Next, we have to specify the existing track configuration as well as the existing counterbalancing drums. This is very straight forward, but if you need some assistance, you can refer to the parts on "**TRACK CONFIGURATION"** and "**COUNTER-BALANCING DRUMS"** on chapter 1 of this manual.

EXISTING SPRINGS: Finally, we must specify the size of the existing torsion spring assembly. As is the case with converting an existing torsion spring, it is very important to be as precise as possible with the measurements of existing torsion springs. This will have a direct effect on the resulting door weight calculated and by extension, the new torsion spring assembly.

Once you have entered all of the above information to the best of your knowledge, you will be given the calculated door weight to one decimal point accuracy in lb.

There three buttons on this screen are as follows:

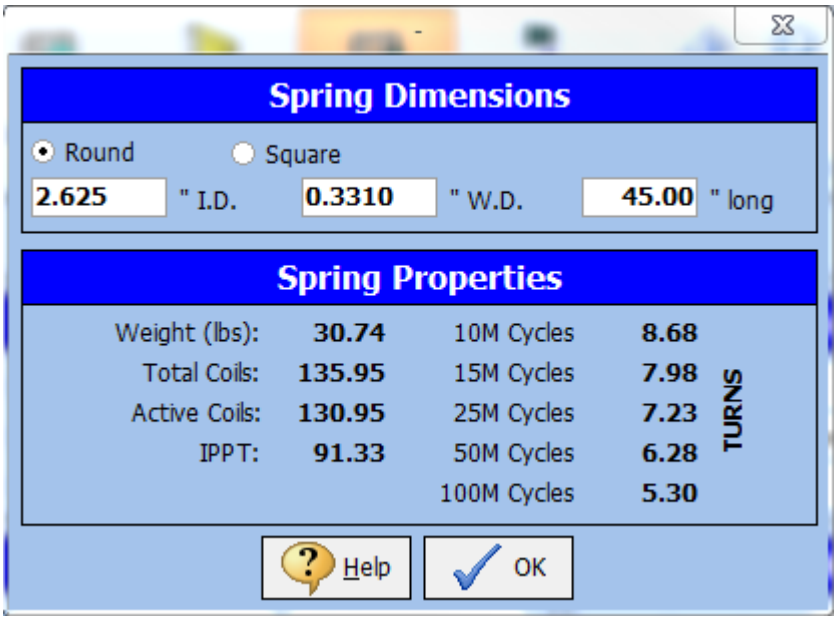
REPORT - If you wish to have a hard copy of the results, select the "**Report"** button. The **TSC** will display the report dialog box, where you may enter your client name, address and the order number. Once it is completed you have three choices: you may view the results and then print them, print directly to a printer or discard the report entirely.

HELP - This button will display the help screen.

EXIT - This button will allow you to return to the Entry screen

CHAPTER 4
SPRING INFORMATION

Another feature of **TSC** is to provide the user detailed information about the torsion springs which you may find in a drum supplier's spring chart manual. This screen will also provide said information for any odd size of spring you may encounter. Click the **Spring Information** button or press the "**F5**" key. The screen shown below should appear on your screen.



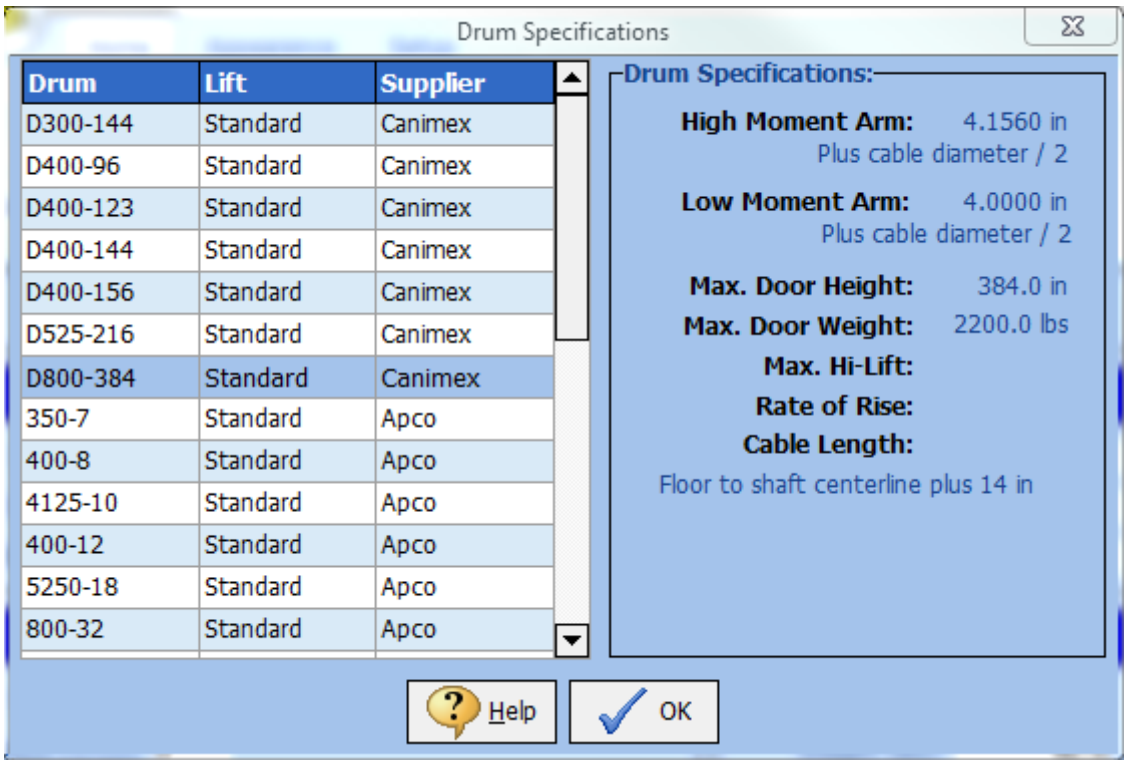
Once the type and the dimensions of the spring are entered, **TSC** will provide the following information:

- Spring Weight
- Total Coils
- Active Coils
- Spring IPPT
- Turns for 10M Cycles.
- Turns for 15M Cycles.
- Turns for 25M Cycles.

- Turns for 50M Cycles.
- Turns for 100M Cycles.

CHAPTER 5
DRUM SPECIFICATIONS

This screen will display the main characteristics of the 26 drums that TSC supports. Click the **Drum Specifications** speed button or simply press the "**F6**" key. The window shown below should appear on your screen.



Simply select the desired drum from the list to see various characteristics, such as:

1. High Moment arm.
2. Low Moment arm.
3. Maximum door weight.
4. Maximum door height.
5. Maximum hi-lift amount (for hi-lift drums only).
6. Rate of rise (for hi-lift and full vertical drums).
7. Cable length.
8. Drum type.
9. Drum supplier.

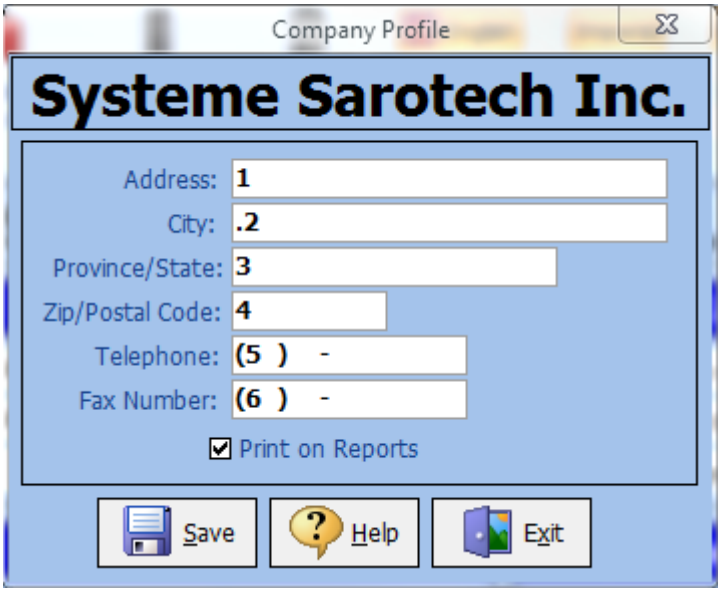
The two buttons shown on this screen are as follows:

HELP - This button will display the help screen

EXIT - This button will allow you to return to the Entry Screen.

CHAPTER 6
COMPANY PROFILE

Click the **Company Profile** button or press the "**F8**" key. The screen shown below should



This is where you will enter your company's contact information, useful to generate reports. If you wish to include your company's contact information in your reports, check the last line where it says "**Print on Reports**".

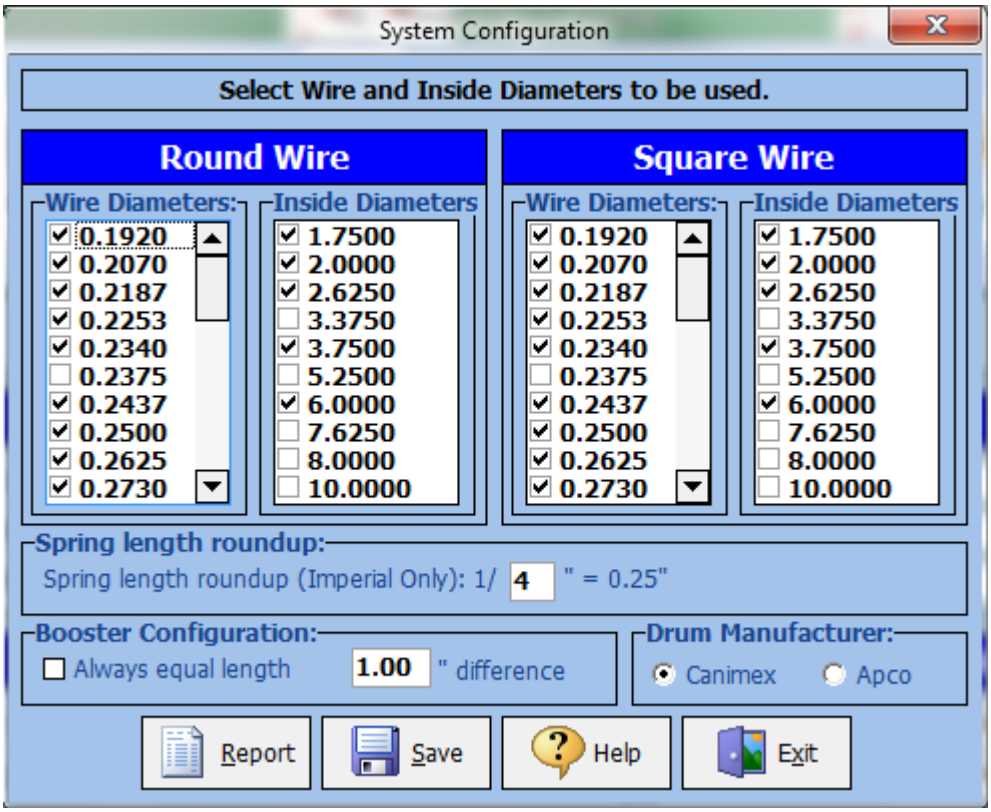
The only information which cannot be modified is the company name.

The fields are self explanatory. The first four lines are your company's address. The next two lines are the telephone and the fax number of your company.

If you wish to save the changes, click the **"Save"** button.

CHAPTER 7
MODIFY SYSTEM CONFIGURATION

TSC for windows will give you the choice to select wire sizes, inside diameters, drum supplier, the language of your choice and the unit of measurements the program will use for its calculations. Click the **System Configuration** speed button or press the "**F9**" key. The screen shown below should appear on your screen.



Mark the boxes of wire sizes and the inside diameters which you wish to work with. During spring calculations, any wire size or inside diameter not marked in this set-up screen will be disregarded.

Select the drum supplier out of two choices; **CANIMEX** or **APCO**. The **TSC** will select the proper drum and calculate the springs according to this selection.

The four buttons on this screen are as follows:

REPORT - If you wish to have a hard copy of this screen, select "**Report"** button**.** The **TSC** will prompt you to prepare the printer. If your printer is ready to receive the printout, press the **OK button** to continue.

SAVE – Click the save button or press the Alt-S to save the changes you made to this screen.

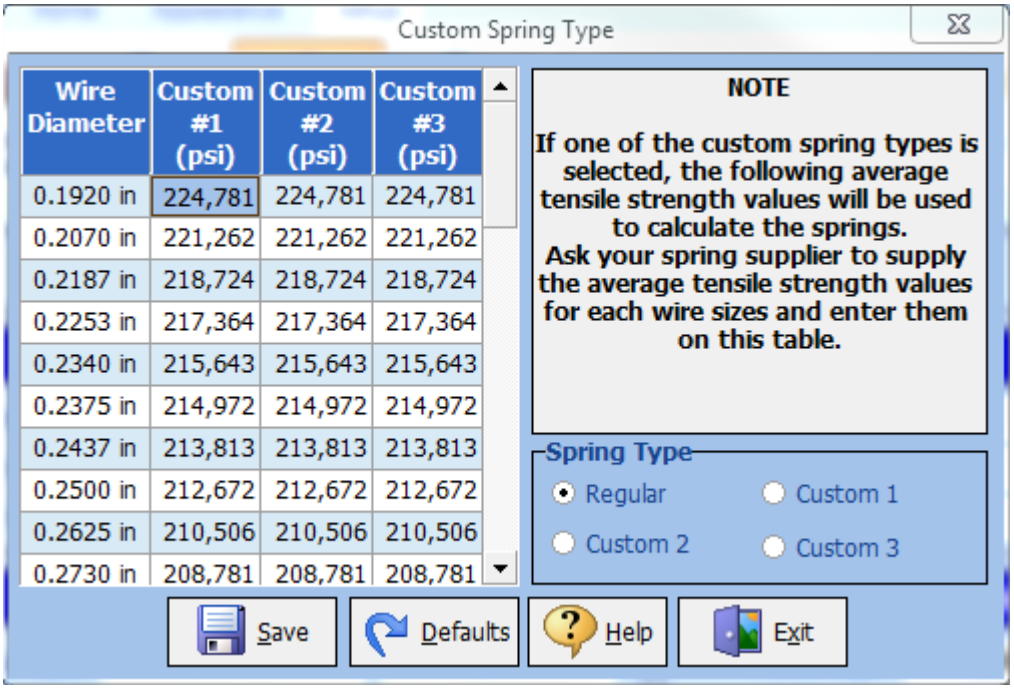
HELP - This button will display the help screen.

EXIT - This button will allow you to return to the Entry Screen.

CHAPTER 8
DEFAULT WIRE TYPES

The **TSC** program uses the industry standard oil tempered spring wires for its tensile strength values. If you wish to use spring material which is different than the standard, select one of the custom types. It is the user's responsibility to enter the proper average tensile strength values for each wire size.

By clicking the "**Default Wire Types**" from the "**Home**" tab, the screen shown below should appear on your screen



SAVE – Click the save button or press the Alt-S to save the changes you made to this screen.

DEFAULTS - This button will load the TSC default tensile strength values on the table.

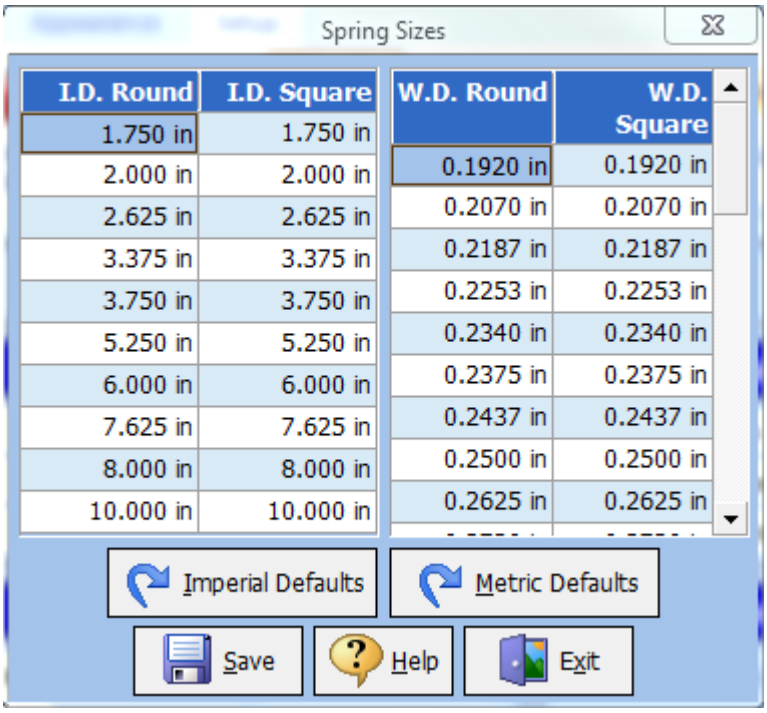
HELP - This button will display the help screen.

EXIT - This button will allow you to return to the Entry Screen.

CHAPTER 9
DEFAULT WIRE SIZES

By default RDS uses the most popular imperial wire sizes. However the user has all the power to modify and enter the sizes that wishes to use.

By clicking the "**Default Wire Sizes**" from the "**Home**" tab, the screen shown below should appear on your screen.



IMPERIAL DEFAULTS - This button will load the TSC default imperial wire and inside diameter.

METRIC DEFAULTS - This button will load the TSC default metric wire and inside diameter.

SAVE – Click the save button or press the Alt-S to save the changes you made to this screen.

HELP - This button will display the help screen.

EXIT - This button will allow you to return to the Entry Screen.

TSC Default Imperial Wire Sizes:

0.1920	0.2070	0.2187	0.2253	0.2340
0.2375	0.2437	0.2500	0.2625	0.2730
0.2830	0.2890	0.2950	0.2970	0.3065
0.3125	0.3195	0.3310	0.3437	0.3625
0.3750	0.3938	0.4062	0.4218	0.4305
0.4375	0.4531	0.4615	0.4687	0.4844
0.4900	0.5000			

TSC Default Metric Wire Sizes:

4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5
9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5
14.0	14.5	15.0							

TSC Default Imperial Inside Diameter Sizes:

1.750	2.000	2.625	3.375	3.750
5.250	6.000	7.625	8.000	10.000

APPENDIX A

DRUM COMPATIBILITY CHART

All the calculations in the **TSC** program are based on **CANIMEX** and/or **APCO** drums & calculation techniques. Products by other manufacturers have the same or similar characteristics. If you use the following compatibility chart you may get results that are identical or very close. Any slight difference is negligible and in practice will not affect the outcome.

STANDARD LIFT DRUMS

TORQUE-FORCE	APCO
D400-96	400-8
D400-123	4125-10
D400-156	400-12 *1
D525-216	5250-18
D800-384	800-32

HI-LIFT DRUMS:

TORQUE FORCE	APCO
D400-54HL	400-54
D525-54HL	5250-54
D575-120HL	5750-120
D800-120HL	N/A
D6375-164	6375-164

FULL VERTICAL LIFT DRUMS

TORQUE-FORCE	APCO
D850-132VL	850-11
D1100-216VL	1100-18
D1350-336VL	1350-28

NOTE: The **CANIMEX** D400-156 drum is good for 13'0" high doors. However, its equivalent 400-12 by **APCO** is good for up to 12'3" high doors.

APPENDIX B
GLOSSARY OF TERMS

BOOSTER SPRINGS: An assembly of torsion springs consisting of one spring inside the other. Used in situations where regular (single) torsion springs calculated are too long for proper fit or where life-cycle expected cannot be achieved otherwise.

HORIZONTAL TRACK PITCH: The angle of the horizontal track is inclined upwards to the rear. This affects the open door weight to be supported by the springs, increasing substantially as the pitch is increased. Standard drums should be used for standard doors with an inclined track to a 12/12 pitch (45 degrees). Above that, vertical lift drums should be used with the springs calculated accordingly. Hi-Lift doors with inclined horizontal tracks require hi-lift drums up to a 12/12 pitch (45 degrees).

INTERIOR DIAMETER: The diameter of a torsion spring taken from the inside of the coil.

INDEX RATIO: The relative diameter ratio between the wire size and the coil diameter. For torsion springs used on overhead doors, the ideal would be an index ratio of at least 8 to 1. However, some are used with a ratio as low as 6 to 1 with reasonably satisfactory results.

IPPT: Abbreviation for Inch Pounds Per Turn. The Torque rate of a spring, indicating the number of inch pounds of Torque delivered to the shaft for each turn a spring is wound by the installer.

MULTIPLIERS: Factors developed for the individual drum that allows the IPPT rate of the springs to be determined by multiplying the total door weight by such a factor. The multipliers are selected from charts for a particular cable drum and door height. Multipliers are based on the track radius, usually a 12" radius or 15" radius.

TOTAL DOOR WEIGHT: This is the weight of the door sections; all hardware mounted on the sections, glass (if any) paint and any other material or objects to be balanced with the door.

TOTAL TURNS: The number of turns required to open the door to its fully opened position plus the number of initial turns given.

WIRE DIAMETER: The diameter of the steel wire by which the torsion spring is made up from.