

Model Railroad Calculator Tools Manual



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Document History

| Version | Description | Date |
|---------|-------------------------------------|----------------|
| 1-0-0-0 | First Release. | 12 June 2015 |
| 1-1-0-0 | Incline and Speed calculator added. | 15 August 2015 |
| 1-2-0-0 | Helix calculator added. | 29 August 2015 |

1 Introduction

This tool was created to assist the model railroaders that find it a challenge to calculate scale measurements and electrical values. There are six tools currently available and these are the Scale Converter to calculate measurements, Incline calculator to calculate the percentage rise, Helix calculator for constructing a helix, Speed calculator for scale speeds, Wire Gauge Selector that will assist in the selection of the correct wire gauges to be used on the layout and an Electronic Calculator for currents, voltages, resistance and power.

1.1 Main Screen Menu Options



File ► Exit

Exit the Scale Converter software.



File ► Close *name of screen*

Displayed when a screen is selected. Closes the screen when clicked.

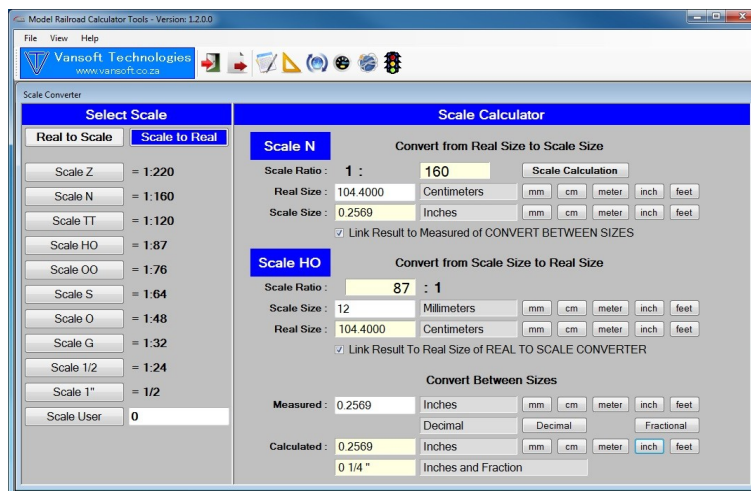
2 Scale Converter

The scale converter calculates measurements to and from a real value to a scale value using the selected scale. The following section describes the functions available in the converter.



View ► Scale Calculator

Opens the scale calculator screen.



2.1 Convert from Real Size to Scale Size

Follow the steps below to calculate the scale size when the real world size is known.

1. In the **Select Scale** panel click the **Real to Scale** button.
2. Select the required scale by clicking its button. The scale will be set in the top calculator **Convert from Real Size to Scale Size**.
3. Enter the measurement into the **Real Size** field.
4. To the right of the field click the measurement unit type button. (mm, cm, meter, inch or feet) to do the calculation. The result will be displayed in the **Scale Size** field.
5. To the right of the **Scale Size** field click a measurement unit type button for the desired units.

2.2 Convert from Scale Size to Real Size

Follow the steps below to calculate the real world size when the scale size is known.

1. In the **Select Scale** panel click the **Scale to Real** button.
2. Select the required scale by clicking its button. The scale will be set in the middle calculator **Convert from Real Size to Scale Size**.
3. Enter the measurement into the **Scale Size** field.
4. To the right of the field click the measurement unit type button. (mm, cm, meter, inch or feet) to do the calculation. The result will be displayed in the **Real Size** field.
5. To the right of the **Real Size** field click a measurement unit type button for the desired units.

2.3 Convert Between Sizes

Follow the steps below to convert a measurement from one type to another type.

1. Enter the measurement into the **Measured** field.
2. To the right of the field click the measurement unit type button. (mm, cm, meter, inch or feet) to do the calculation. The result will be displayed in the **Calculated** field.

Note: When selecting inches or feet an option is displayed that will allow the entering of the measurement in decimal form or in fractional form.

3. To the right of the **Calculated** field click a measurement unit type button for the desired units.

Note: When selecting inches or feet the calculation will be displayed in decimal format and fractional format.

2.4 How to Calculate A Scale

When the two measurements of real size and scale size is known the scale can be calculated.

1. In the **Convert from Real Size to Scale Size** converter click the **Scale Calculation** button.
2. Enter the real size measurement into the **Real Size** field.
3. To the right of the field click the measurement unit type button. (mm, cm, meter, inch or feet) to do the calculation.
4. Enter the scale size measurement into the **Scale Size** field.
5. To the right of the field click the measurement unit type button. (mm, cm, meter, inch or feet) to do the calculation.
6. The calculated scale will be displayed in the **Scale Ratio** field.

2.5 How to Convert Scale Size To Fractions

When calculating scale sizes, the result can be converted into fractions if required.

1. Below the **Convert from Real Size to Scale Size** converter set the check box on. This will copy the calculated result to the **Measured** field in the **Convert Between Sizes** section.
2. Do the normal scale size calculation as described in section 2.1
3. Do the normal measurement conversion as described in section 2.3

2.6 How to Convert From One Scale To Another Scale

When measurements are known in one scale and it needs to be converted to another scale say from **HO** to **N** then do the following.

1. Below the **Convert from Scale Size to Real Size** converter set the check box on. This will copy the calculated result to the **Real Size** field in the **Convert from Real Size to Scale Size** section.
2. Do the normal real size calculation as described in section 2.2 setting it to **HO**.
3. Do the normal scale size calculation as described in section 2.1 setting it to **N**.
Note: Make sure that the measurement types in both converters **Real Size** fields are set to the same units.

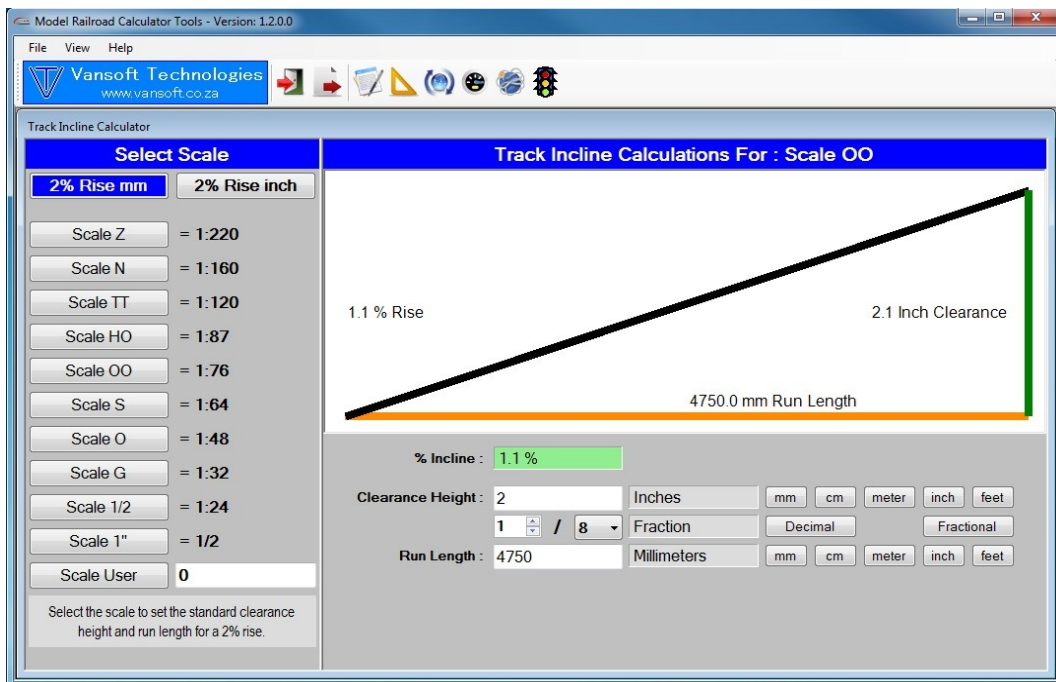
3 Incline Calculator

The incline calculator calculates the rise in percentage from the supplied run length. The following section describes the calculator functions.



View ► Track Incline Calculator

Opens the incline calculator screen.



3.1 How to Calculate Incline

The following describes the method to calculate the incline.

1. In the **Select Scale** panel click the **2% Rise mm** button for metric default values or the **2% Rise inch** for imperial default values.
2. Select the required scale by clicking its button. The rise and run default values will be set in these fields.
3. Change the desired rise in metric or imperial to recalculate the incline.
4. Change the run length in metric or imperial to recalculate the incline.

Note: Metric and imperial values can be mixed in any of the fields.

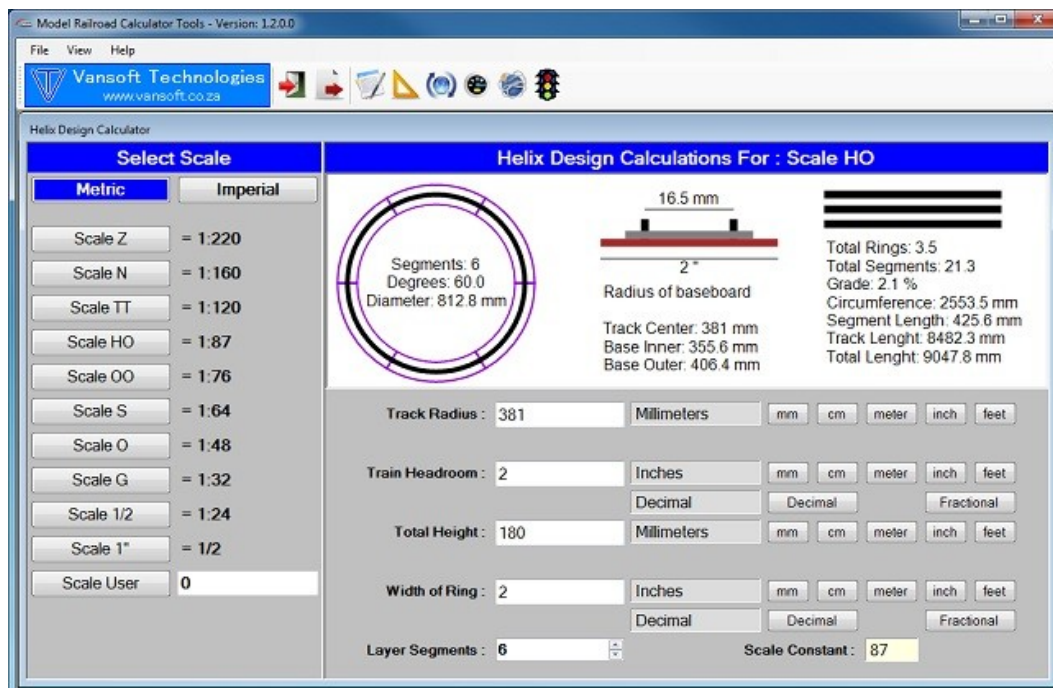
4 Helix Design Calculator

The helix design calculator assists in the design of a helix riser for model railroads. The following section describes the operation of the designer.



View ► Helix Design Calculator

Opens the helix design calculator screen.



4.1 How to Calculate Helix

The following describes the method to calculate the helix.

1. In the **Select Scale** panel click the **Metric** button for metric default values or the **Imperial** for imperial default values.
2. Select the required scale by clicking its button. The radius, head room, ring width and total height default values will be set in there fields.
3. Change the values in the fields as desired then click the desired measurement units to recalculate the values.

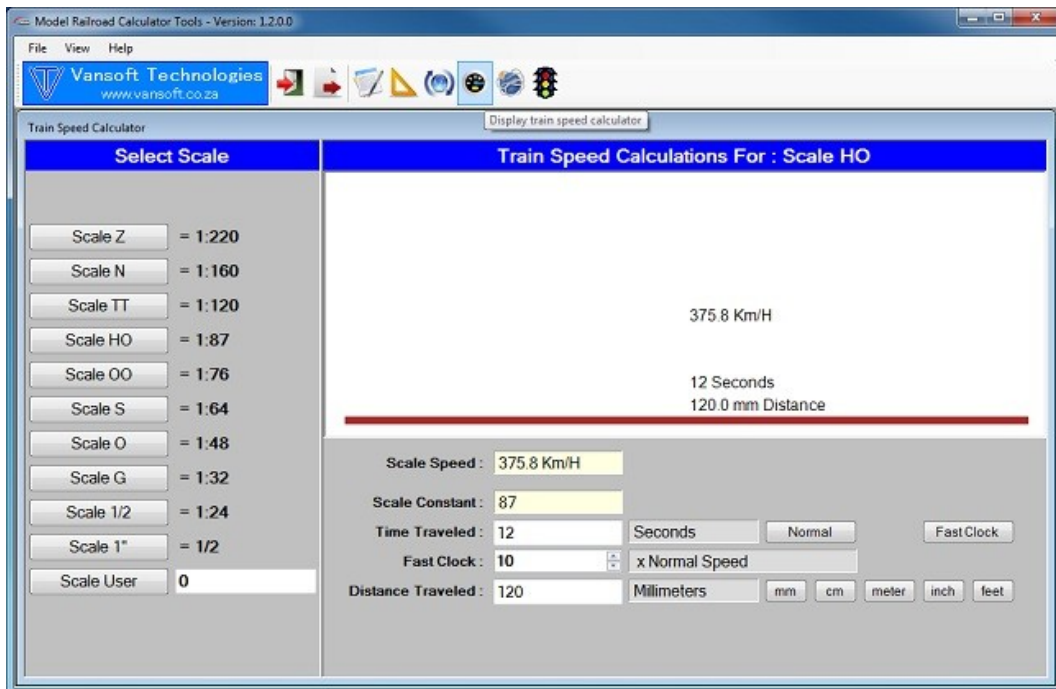
5 Scale Speed Calculator

The scale speed calculator assists in the calculation of the scale speed a model train is travelling. The following section describes the operation of the calculator.



View ► Speed Calculator

Opens the scale speed calculator.



5.1 How to calculate the scale speed

The following describes the method to calculate the scale speed.

1. In the **Select Scale** panel click the **Scale** button that you want to calculate.
2. Enter the time travelled in seconds, then select normal for a 1 to 1 calculation or fast clock if accelerated time is used.
3. Enter the distance that the train travelled in the desired measurement and then click the measurement unit.

6 Wire Gauge Selector

The section is a wire selector to assist in the selection of the correct wire sizes used in the model railroad layout. As the voltage supplied to the locomotive must be constant, the selector calculates the voltage drop on the wire for the specified current over the required length.



View ► Wire Size Calculator

Opens the wire size calculator screen.

The screenshot shows the 'Wire Size Voltage Drop Calculator' window. At the top, it displays the Vansoft Technologies logo and website. The main interface is divided into several sections:

- Summary:** Shows Voltage (12.00), Loss (0.23), Result (11.77), and % Change (1.9%).
- Wire Properties Table:**

| AWG | Diameter inch | Diameter mm | Ohm 1000 feet | Ohm 1000 m | Max Panel Wiring | Max Transmission | Max Frequency | Breaking Force |
|-----|---------------|-------------|---------------|------------|------------------|------------------|---------------|----------------|
| 22 | 0.0254 | 0.64516 | 16.14 R | 52.9392 R | 7 A | 0.92 A | 42 kHz | 18 lbs |
- Input Fields:**
 - Voltage applied on wire: 12 V (with options for millivolts and volts)
 - Current drawn on wire: 3.5 A (with options for milliamps and amps)
 - Length of the wire: 4 feet (with options for mm, cm, meter, inch, feet)
 - Calculated resistance: 0.06456 Ohm

6.1 How to Select Wire Size

The following describes the method to select a wire size.

1. Enter the voltage in its field and select its measurement to the right.
2. Enter the current in its field and select its measurement to the right.
3. Enter the wire length in its field and select its measurement to the right.
4. The calculated resistance will be displayed in its field for the selected wire.
5. At the top the resultant voltage and percentage change is displayed.
6. Now in the wire section change the selected wire size by clicking on the **Up / Down** arrows of the **AWG** field. Note the calculation changes at the top. Change the wire size until an acceptable result is displayed.

Note: If you have a wire size, set it and then enter the voltage, current and lengths to check if the calculated voltage drop will be acceptable.

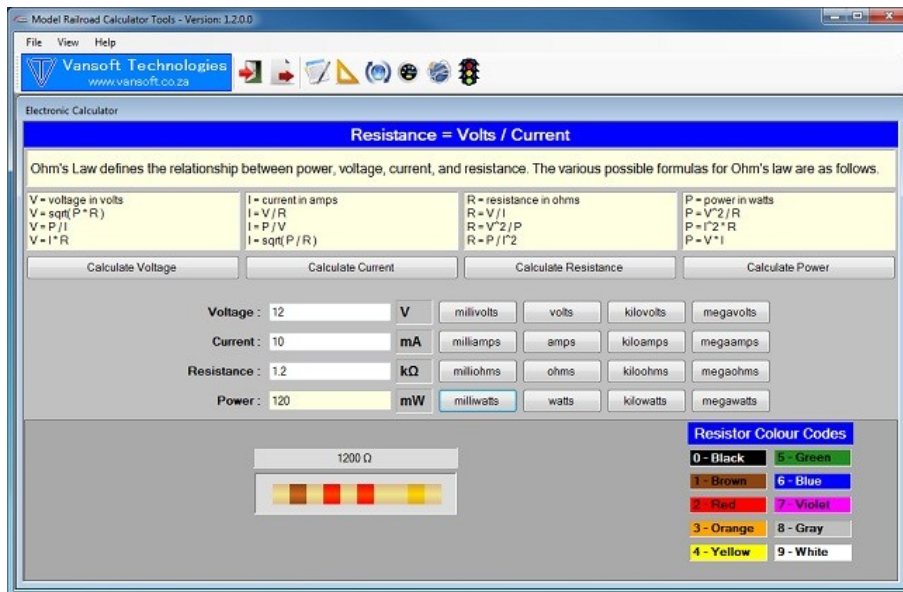
7 Electronic Calculator

The section is a basic ohms law calculator. It can be used to calculate voltages, resistance, current and power values.



View ► Electronics Calculator

Opens the electronics calculator screen.



7.1 Calculate Voltage

1. Enter the current in its field and select its measurement to the right.
2. Enter the resistance in its field and select its measurement to the right.
3. Click the **Calculate Voltage** button to display the result in the **Voltage** field.
4. Select the required measurement to the right of the field.
5. Click the **Calculate Power** button to display the result in the **Power** field.
6. Select the required measurement to the right of the field.

7.2 Calculate Current

1. Enter the voltage in its field and select its measurement to the right.
2. Enter the resistance in its field and select its measurement to the right.
3. Click the **Calculate Current** button to display the result in the **Current** field.
4. Select the required measurement to the right of the field.
5. Click the **Calculate Power** button to display the result in the **Power** field.
6. Select the required measurement to the right of the field.

7.3 Calculate Resistance

1. Enter the voltage in its field and select its measurement to the right.
2. Enter the current in its field and select its measurement to the right.
3. Click the **Calculate Resistance** button to display the result in the **Resistance** field.
4. Select the required measurement to the right of the field.
5. Click the **Calculate Power** button to display the result in the **Power** field.
6. Select the required measurement to the right of the field.