

TDD 2015

User Manual

Time Distance Diagrams for Traffic Signals

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Introduction

TDD is a Windows based software program which assists with determining the optimal traffic signal timing parameters that would allow for the most efficient traffic progression along a route of multiple intersections.

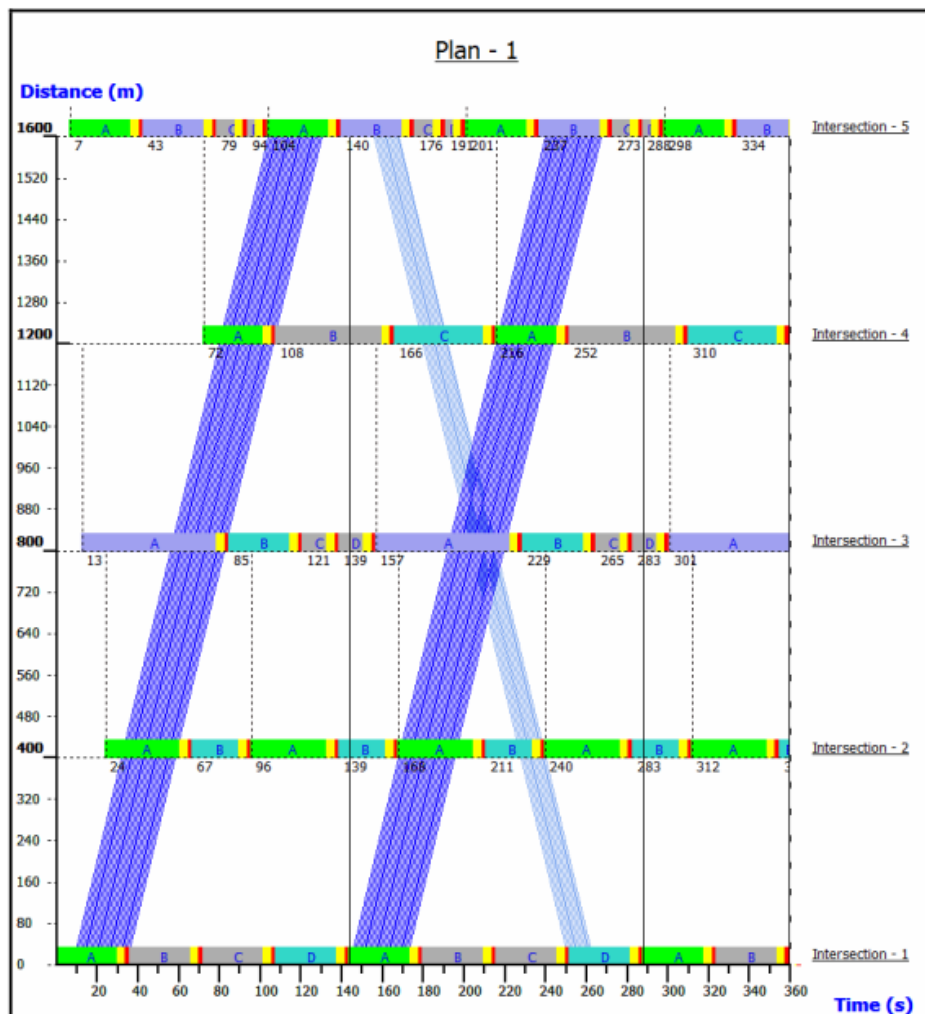
The name TDD is derived from the acronym Time Distance Diagram. The main function of TDD is the production of Time vs Distance diagrams for a set of coordinated intersections.

The key to efficient movement of vehicle platoons through multiple intersections during the Green phases for a particular direction is the intersection **Offset**. Through the use of TDD the user can easily manipulate phase timings and intersection offsets for a particular intersection set and have the resulting Time Distance Diagram graphically displayed.

TDD allows for easy addition of intersections to a project file and easy modification of intersection parameters. Comparison of alternative timing options for an intersection set can be performed with up to 10 different timing plans per project file.

The input parameters and graphical output from the time distance diagram can be exported in .csv and .bmp format.

Figure-1 Example Diagram - 5 Intersections sequenced in the North Bound Direction.



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Installation

TDD is installed with a single setup file: "TDD 2015 setup.exe" which can be downloaded from <https://www.traffictdd.com>

The default location for the application folder is C:\Program Files\TDD 2015

During the installation process the user will have the choice of installing a Shortcut in the start menu, Desktop icon and a Quick launch icon.

Once installed the application folder will contain the following files:

1. "TDD 2015.exe"
2. "TDD 2015 Manual.pdf "
3. "tdd.ini" (Configuration File)
4. EULA
5. "unins000.exe" (TDD Uninstall Program)

System Requirements

To use TDD 2015, your computer must have:

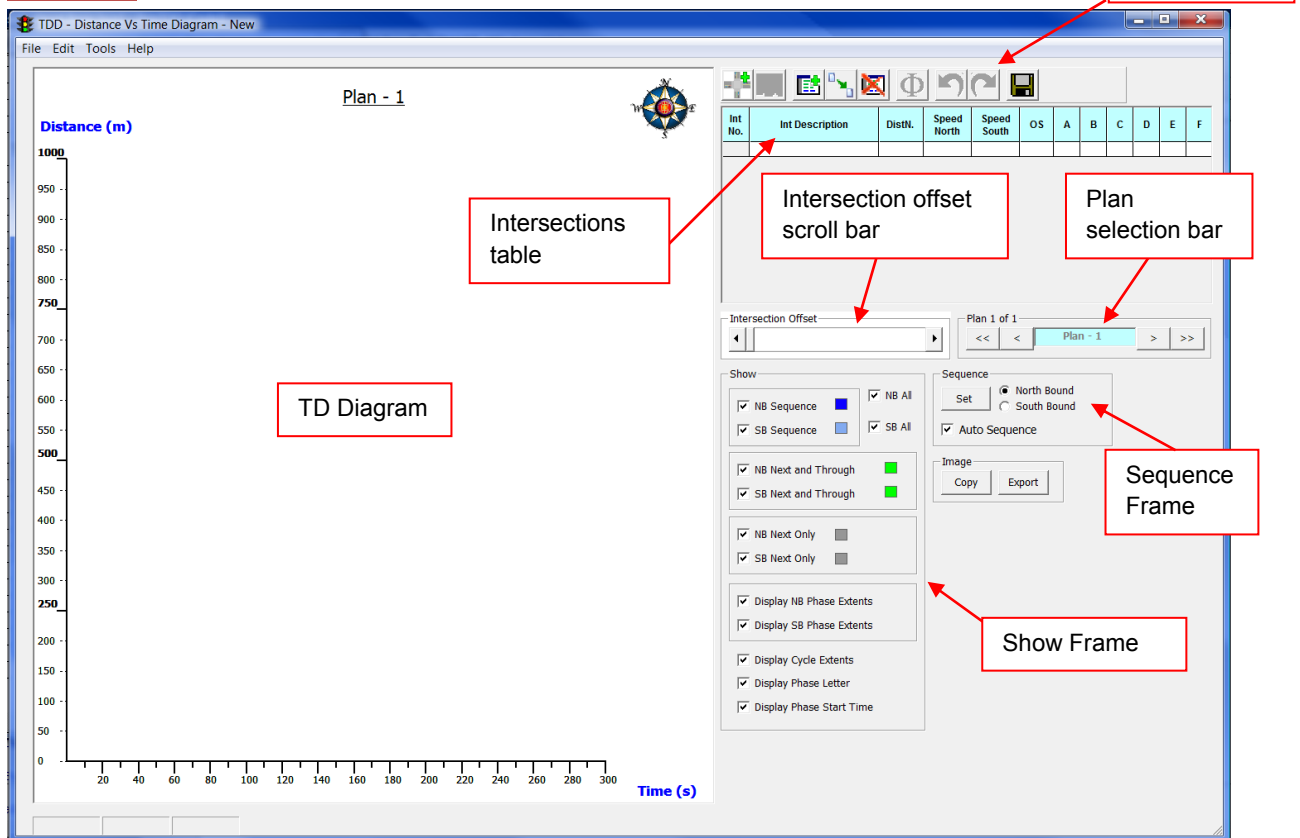
1. Microsoft Windows 7 (32-bit or 64-bit), Windows Vista (32-bit or 64-bit) or Windows XP.
2. Minimum monitor resolution of 1024 x 768. (1920x1080 recommended).
3. Pentium processor 1.5 GHz or higher.
4. 128 MB Ram.

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Main Form

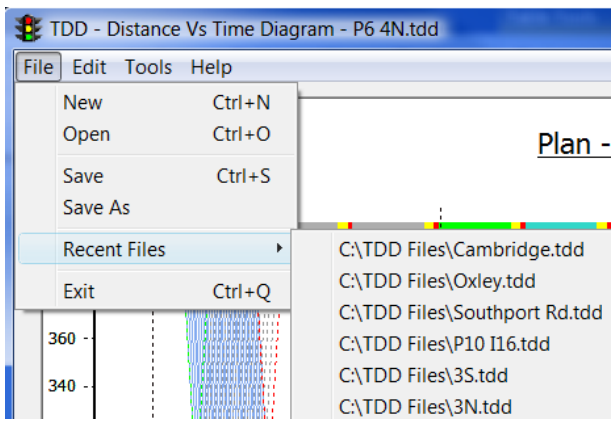
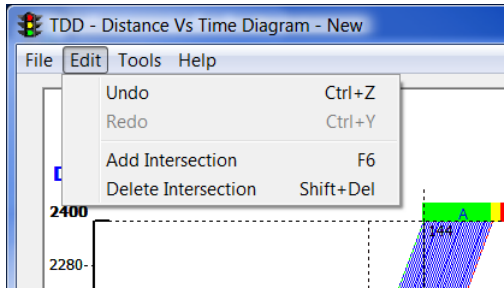
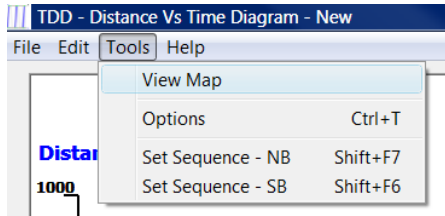
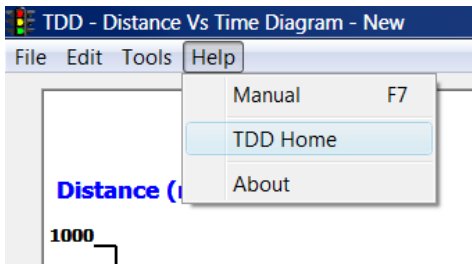
The Main form is shown in Figure-2 below with the main components labelled.

FIGURE-2 Main Form.



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Main Form Menus

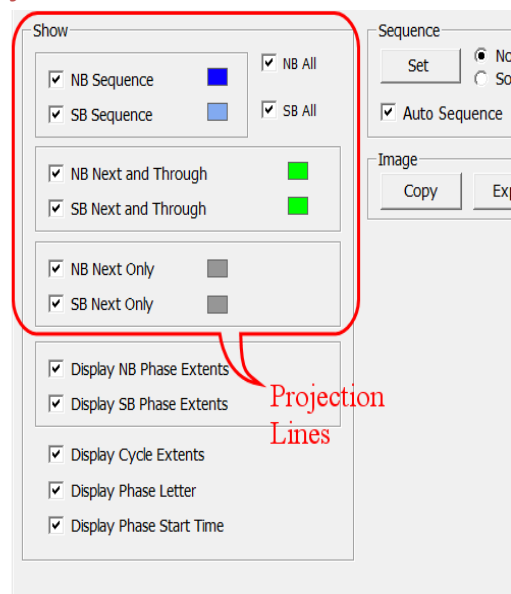
<p>File</p> <p>New Menu: Creates a new project.</p> <p>Open Menu: Opens a saved project. TDD project files have the file extension “.tdd”</p> <p>Save: Saves the current project file with existing file name.</p> <p>Save As: Saves the current project file with a new file name.</p> <p>Recent Files: Contains up to 10 most recently used files.</p>	
<p>Edit</p> <p>From the Edit menu the user can select the Undo/Redo functions if enabled and Add or Delete intersection functions.</p>	
<p>Tools</p> <p>The Tools menu provides access to the View Map Form and Options Form and the Set Sequence functions.</p>	
<p>Help</p> <p>The Help menu provides access to the TDD User Manual in .pdf format. The User Manual will be copied to the users computer with the program files during the installation process.</p> <p>This menu also contains a link to the TDD website: (https://traffictdd.com) and an about dialog box which provides information on the TDD version installed.</p>	

[Contents](#)**TD Diagram****Projection Lines**

The Show Frame controls what parameters are displayed on the TD Diagram. This frame consists of 3 projection line types for both the NB & SB directions. Each line type can be allocated a different colour, the default colours are shown in Figure-3 below. These colours can be changed in the Options Form – [setting projection line colours](#).

If the check boxes for these line types are checked then all of the projection line types will be displayed on the TD Diagram.

Figure-3 Show Frame – Projection Lines



1. The **NB Sequence** parameter is the line drawn from the first intersection in a sequence through to the last intersection only if the condition that a vehicle would not be required to stop at any of the intersections.

2. The **NB Next and Through** parameter is drawn from one intersection to the next NB intersection if a vehicle would arrive at the next intersection during the next green phase.

3. The **NB Next** only parameter will simply be drawn from any intersection at the given speed regardless of any other intersections parameters.

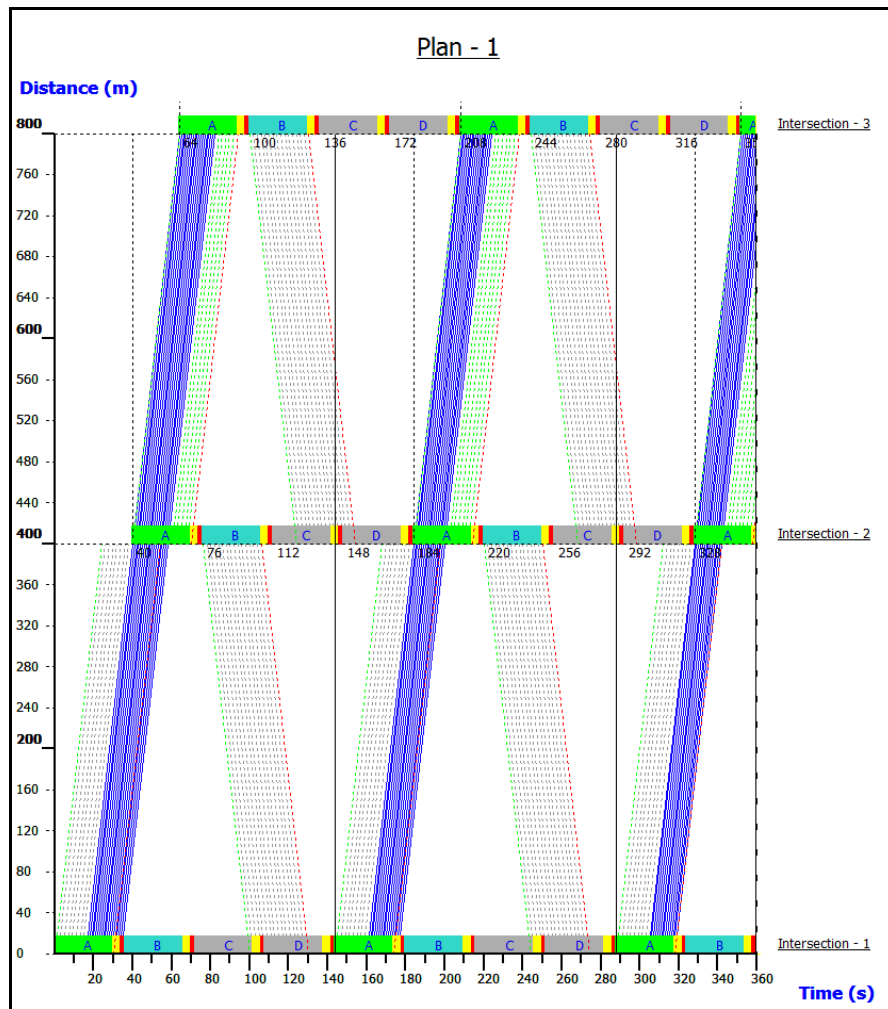
4. Clicking the “NB All” checkbox will turn all of the NB projection lines and “NB phase extents” parameters on or off.

The same applies to the SB parameters as described above.

Figure-4 over page provides an example of the above principles.

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Figure-4 TDD - Projection Lines



From Figure-4 we have 3 intersections, each with a 30 second NB phase, (Phase A).

This intersection set is sequenced NB with the IntNo-2 lagging 16 seconds behind the travel time from IntNo-1 of 24 seconds. We can see the grey band (NB Next Only) starting from the time of 0s from IntNo-1 through to IntNo-2 for this 16 second period only.

For the remaining 14 seconds of the green phase for IntNo-1 the blue band (NB Sequence) is displayed as this period passes through the green of all the intersections in this set.

For the remaining 16 seconds of the green phase for IntNo-2 we see the green band (NB Next & Through) through to IntNo-3, it is not sequenced as it does not pick up any of the NB green phase period from IntNo-1.

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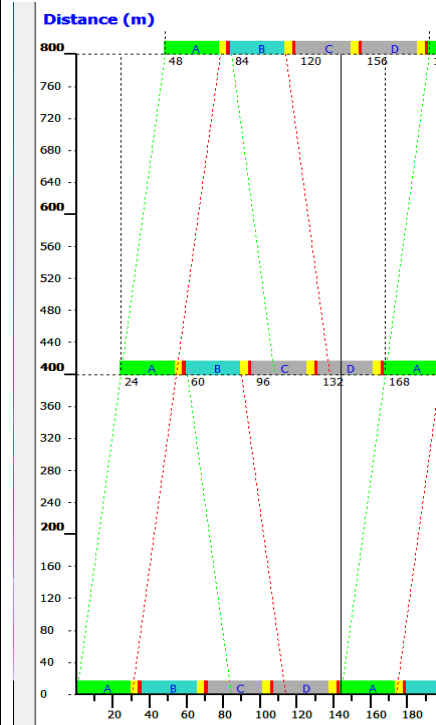
Phase Extents

With all projection lines turned off and the phase extents parameter turned on, the resulting diagram will appear as in Figure-5 with a green line indicating the start of the phase either NB or SB and a red line indicating the end of the phase.

Show

<input type="checkbox"/> NB Sequence	<input checked="" type="checkbox"/> NB All
<input type="checkbox"/> SB Sequence	<input type="checkbox"/> SB All
<input type="checkbox"/> NB Next and Through	<input checked="" type="checkbox"/>
<input type="checkbox"/> SB Next and Through	<input checked="" type="checkbox"/>
<input type="checkbox"/> NB Next Only	<input type="checkbox"/>
<input type="checkbox"/> SB Next Only	<input type="checkbox"/>
<input checked="" type="checkbox"/> Display NB Phase Extents	
<input checked="" type="checkbox"/> Display SB Phase Extents	
<input checked="" type="checkbox"/> Display Cycle Extents	
<input checked="" type="checkbox"/> Display Phase Letter	
<input checked="" type="checkbox"/> Display Phase Start Time	

Figure-5 TDD - Phase Extents



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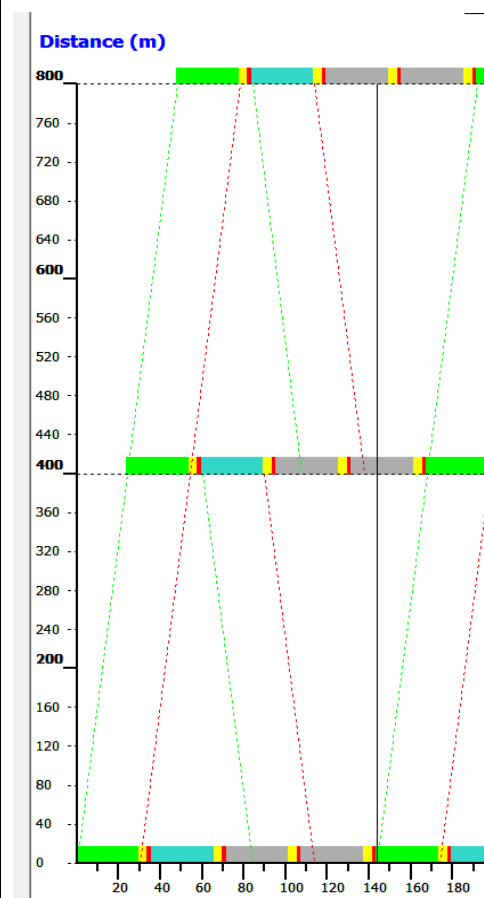
Cycle Extents, Phase Letter & Phase Start Time.

With all the above parameters turned off the TD Diagram will be displayed as in Figure-6.

Show

<input type="checkbox"/> NB Sequence	<input checked="" type="checkbox"/> NB All
<input type="checkbox"/> SB Sequence	<input type="checkbox"/> SB All
<input type="checkbox"/> NB Next and Through	<input checked="" type="checkbox"/>
<input type="checkbox"/> SB Next and Through	<input checked="" type="checkbox"/>
<input type="checkbox"/> NB Next Only	<input type="checkbox"/>
<input type="checkbox"/> SB Next Only	<input type="checkbox"/>
<input checked="" type="checkbox"/> Display NB Phase Extents	
<input checked="" type="checkbox"/> Display SB Phase Extents	
<input type="checkbox"/> Display Cycle Extents	
<input type="checkbox"/> Display Phase Letter	
<input type="checkbox"/> Display Phase Start Time	

Figure-6 TDD - Phase Extents Only



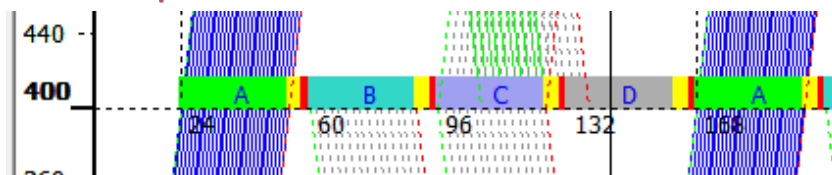
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Phase Band

The phase bands represent intersection phases. In Figure - 7 below we have an intersection with 4 phases each with a different phase band colour to represent one of the 4 possible sequence directions for that phase. Each of these phases has been allocated a 30 second Green time, 4 second Yellow time and 2 second Red time.

In this case: PH-A = NB,
 PH-B = SB,
 PH-C = NB & SB,
 PH-D = NA.

Figure – 7 Intersection phase bands.

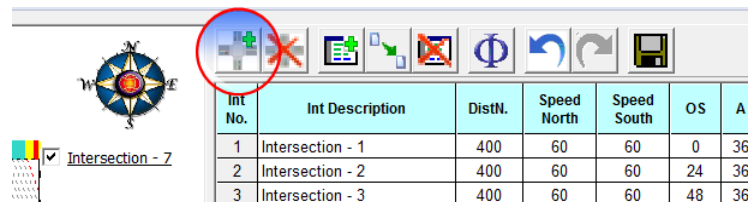


Related info; see: [Setting phase band colours](#); [Setting the phase sequence direction](#); [Phase Options](#).

Adding Intersections

Method 1

Click the “Add Intersection” button on the Intersection Table Toolbar.



Method 2

Shortcut key: **F6**.

Method 3

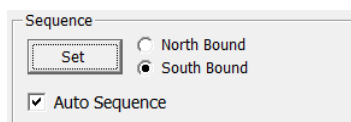
Edit Menu > Delete Intersection.

Figure-3 shows an example of the TD Diagram after 3 intersections have been added with the default values.

As the sequence setting is set to “North Bound” (NB) and the “Auto Sequence” check box set to true each intersection is allocated with an offset value equal to the time taken to travel from the previous intersection with the first intersections offset value set to 0.

If the “South Bound” (SB) option in the Sequence frame is selected and then the “Set” button is clicked, the sequence will be set in the SB direction as shown in Figure - 4.

If the Auto Sequence option is switched **off** then each new intersection offset will be 0.



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Figure-3 3 Intersections sequenced NB.

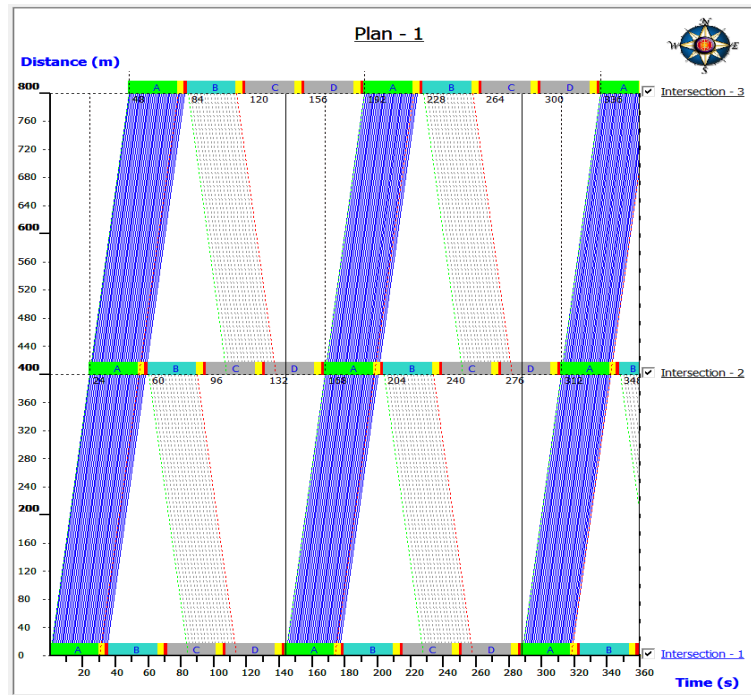
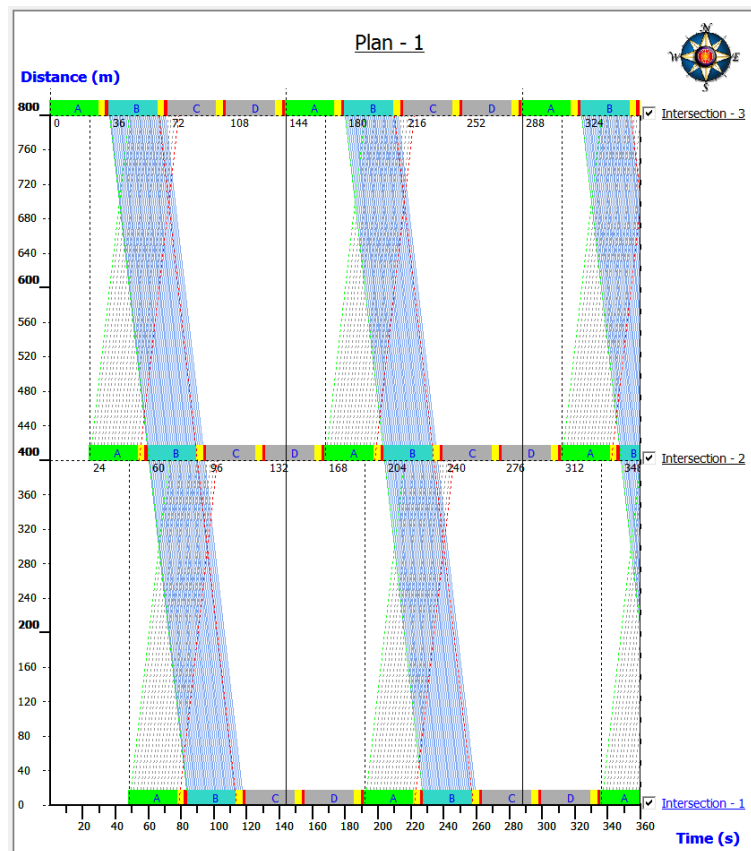


Figure-8 TD Diagram – 3 Intersections sequenced SB.



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Intersection Default Values

The default values for the intersection, phase parameters and diagram display settings can be modified in the Options form – [Intersection Options](#).

Any intersection added to the project will be assigned these default values.

Deleting Intersections.

Method 1

Click the “Delete Intersection” button on the Intersection Table Toolbar.



Method 2

Shortcut key: Shift+Del.

Method 3

Edit Menu > Delete Intersection.

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Modifying Intersection Parameters

The intersection parameters are modified in the Intersections Table by double clicking on the cell of the parameter you want to change. After modifying the cell contents, new values will only be accepted by pressing the **Enter key**.

Offset Adjustment

Method 1

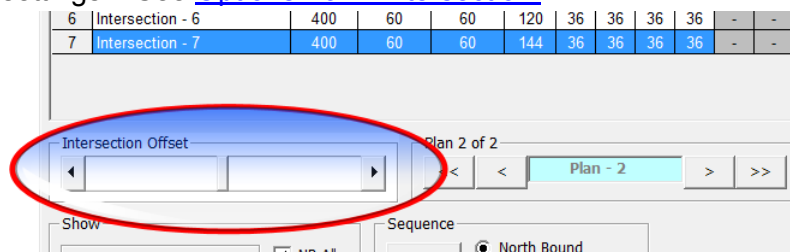
- Select the intersection in the Intersection Table Toolbar.
 - Double click on the offset cell & type in the new value and press the Enter key.
- The TD Diagram and the Offset scroll value will then be updated with the new offset value.

Int No.	Int Description	DistN.	Speed North	Speed South	OS	A	B	C	D	E	F
1	Intersection - 1	400	60	60	0	36	36	36	36	-	-
2	Intersection - 2	400	60	60	24	36	36	36	36	-	-
3	Intersection - 3	400	60	60	48	36	36	36	36	-	-

Method 2

- Click on the Intersection offset scroll bars left or right arrow or inside the scroll bar left or right of the current value.

The offset value will be adjusted up or down by the value in the intersection offset small change and large change settings. See [Options Form/Intersection](#).



Intersection Description, Distance and Speed

These parameters are modified in the same way as described in Method 1 for offset adjustment above.

Phase Times

The phase time can be changed for any phase in the intersection table the value displayed will be either just the **green period** for that phase or the **total phase time**, (green + yellow + red).

Different Yellow & Red times can be applied to individual intersections.





After changing these values in the Options form the new values will be applied to any new intersections added to the project.

Related info; see: [Phase Options](#).

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Phase sequence direction

Each phase for an intersection can be allocated one of the 4 sequence direction types as detailed in the table below.

Sequence Direction Type	Description	Default Colour
NB	Phase allows NB movements only.	
SB	Phase allows SB movements only.	
NB & SB	Phase allows both NB and SB movements.	
NA – Not sequenced	For phases that do not allow either North or SB movements.	

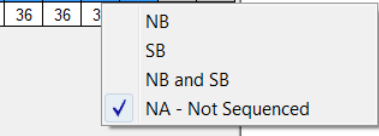
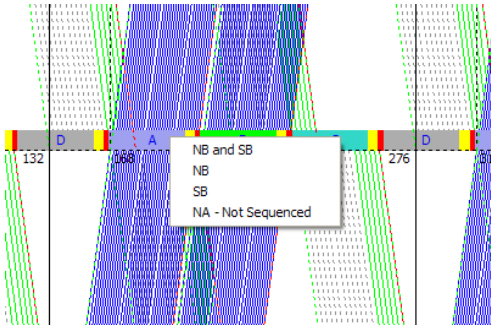
The default setting for the sequence direction of each new intersection added is:

- 1st phase = NB & SB,
- 2nd phase = NB,
- 3rd phase = SB,
- 4th phase = NA.

Related info; see: [Setting phase band colours](#); [Phase Options](#).

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Setting the phase sequence direction

<p>Method 1</p>	<p>Right click on the phase in the intersections table. A popup menu will appear with the following options and allow for setting that phase to one of the 4 sequence directions types:</p> <table border="1"> <thead> <tr> <th>A</th> <th>B</th> <th>C</th> <th>D</th> <th>E</th> <th>F</th> </tr> </thead> <tbody> <tr> <td>36</td> <td>36</td> <td>36</td> <td>36</td> <td>-</td> <td>-</td> </tr> <tr> <td>36</td> <td>36</td> <td>36</td> <td>36</td> <td>-</td> <td>-</td> </tr> <tr> <td>36</td> <td>36</td> <td>3</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> 	A	B	C	D	E	F	36	36	36	36	-	-	36	36	36	36	-	-	36	36	3			
A	B	C	D	E	F																				
36	36	36	36	-	-																				
36	36	36	36	-	-																				
36	36	3																							
<p>Method 2</p>	<p>Right click on the phase in the td diagram to display the same popup menu as above.</p> 																								

Adding Plans

A project file can contain up to 10 plans. Each plan can contain different intersections and parameters. Adding a new plan will reset the TD Diagram and intersection table.

To add a plan click the “Add Plan” button on the Intersection Intersection Table Toolbar.



Once a project has multiple plans, different plans can be selected using the plan selection bar.

4	Intersection - 4	400	60	60	96	36	36	36	36	-	-
5	Intersection - 5	400	60	60	96	36	36	36	36	-	-
6	Intersection - 6	400	60	60	120	36	36	36	36	-	-

Intersection Offset

Plan 6 of 6

Show

NB Sequence NB All
 SB Sequence SB All

Sequence

North Bound
 South Bound

Auto Sequence

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Cloning Plans

Cloning a plan will copy the currently selected plan data into a new plan.

Click the "Clone Plan" button on the Intersection Table Toolbar.



Deleting Plans

Click the "Delete Plan" button on the Intersection Table Toolbar.

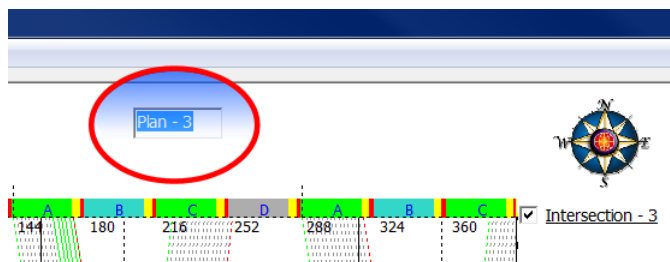


Changing the Plan Name

By default each new plan will be given the name "Plan - #"; where # = the total number of plans in the project. This plan name will be displayed on the TD Diagram title and in the plan selection bar title.

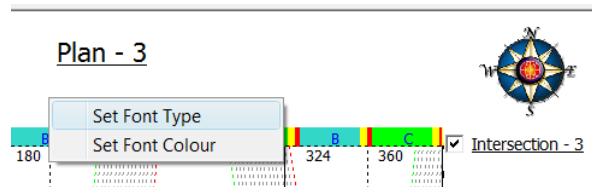
Int No.	Int Description	DistN.	Speed North	Speed South	OS	A	B	C	D	E	F
1	Intersection - 1	400	60	60	25	60	36	36	-	-	-
2	Intersection - 2	400	60	60	41	36	50	36	36	-	-
3	Intersection - 3	400	60	40	0	36	36	36	36	-	-

The plan name can be changed by double clicking on the TD Diagram title. This will activate a text box to allow modification of the plan name.



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The TD Diagram title **font type and colour** can be changed by right clicking on the title. This will then display the following popup menu. The font type & colour can then be selected.

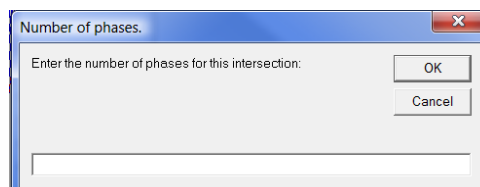


Adding or Removing Phases

Click the "Phase" button on the Intersection Table Toolbar.



Upon clicking the Phase button the following dialog box will appear.



Input parameters:

Type = numeric only.

Minimum = 2.

Maximum = 6.

Phases added to the intersection will have the sequence direction code – NA, which means it won't be sequenced either NB or SB. (See - [Setting the phase sequence direction.](#))

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Undo & Redo Functions

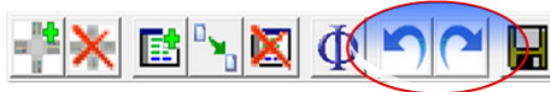
The Undo & Redo functions are enabled for events performed from the toolbar or within the table only and are reset if a plan is added, cloned or deleted.

Program events that are added to the Undo/Redo stacks include:

1. Add or Delete Intersection.
2. Modification of any table cell.

Method 1

Click the "Undo or Redo" button on the Intersection Table Toolbar.

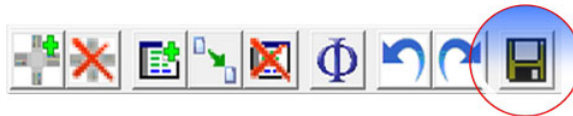


Method 2

Shortcut keys: Undo: Ctrl + Z
Redo: Ctrl + Y

Exporting the Intersection table

Click on the "Save Table" button in the Intersection Table Toolbar.



A "Save As" dialog will appear with the default file of: App.Path & "\Project Files\". The default file name is the Plan Name of the current plan selected.

When opened in Excel this output file will appear as shown below.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Date:	#####	File Name:	3N.tdd	Plan Name:	Plan - 1						
2	Int No.	Int Descrip	DistN.	Speed Nor	Speed Sou	OS	A	B	C	D	E	F
3	1	Intersectic	400	60	60	0	36	36	36	36	-	-
4	2	Intersectic	400	60	60	24	36	36	36	36	-	-
5	3	Intersectic	400	60	60	48	36	36	36	36	-	-
6												
7												

Using the tdd_csv macro this file can be formatted with the click of a button to display the data as shown below. A copy of this macro is provided in [Appendix-4](#).

Figure-9 Formatted table output.

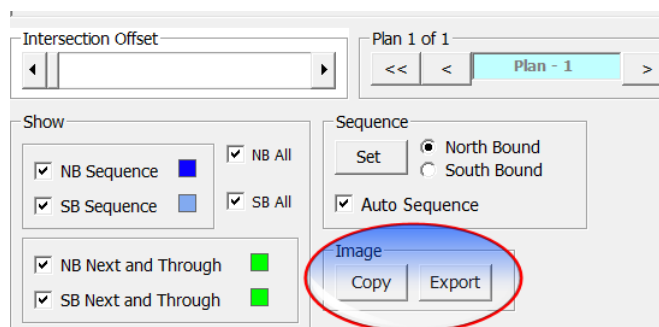
	A	B	C	D	E	F	G	H	I	J	K	L
1	Date:	20/02/2013	File Name:	3N.tdd	Plan Name:	Plan - 1						
2	Int No.	Int Description	DistN.	Speed North	Speed South	OS	A	B	C	D	E	F
3	1	Intersection - 1	400	60	60	0	36	36	36	36	-	-
4	2	Intersection - 2	400	60	60	24	36	36	36	36	-	-
5	3	Intersection - 3	400	60	60	48	36	36	36	36	-	-

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Copying & Exporting the TD Diagram

Clicking the **Copy button** in the Image frame will copy the TD Diagram to the Windows clipboard. The image can then be pasted into any other applicable application.

The **Export button** opens a Save As dialog box where the image can be saved as a .bmp file. This image will be stamped with the file name and current date.



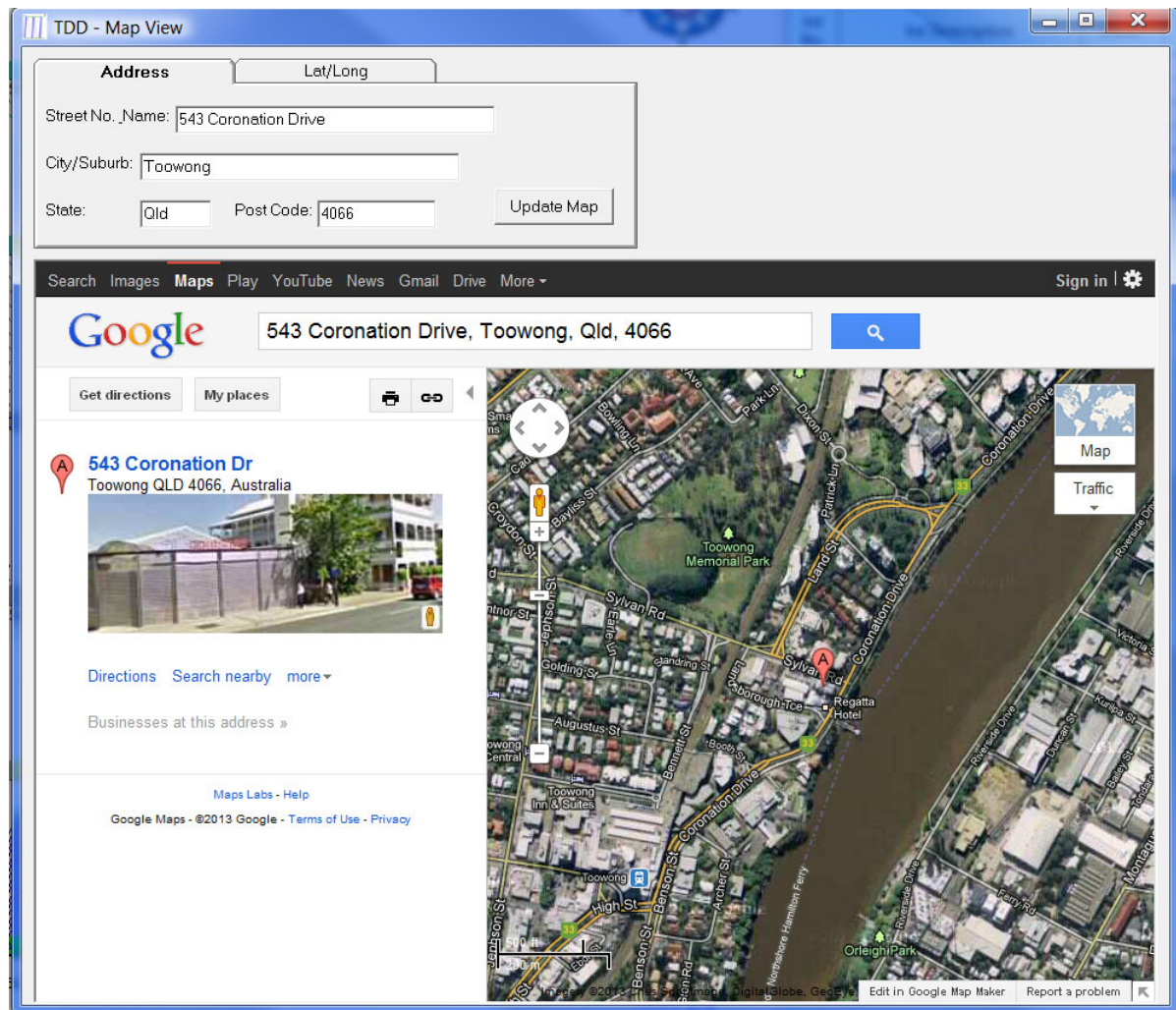
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Map View Form

The Map View form can be accessed through: Tools -> Map View.

The location details required for input are either the intersection address or the latitude and longitude of the location to be displayed. The map will then be updated with the intersections location as shown below.

Figure - 10 – Map View Form.



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Options Form

Intersection Options

Table - 1 below lists the default values that may be changed in the Intersection options Tab. These values are used for any new intersection added to the project.

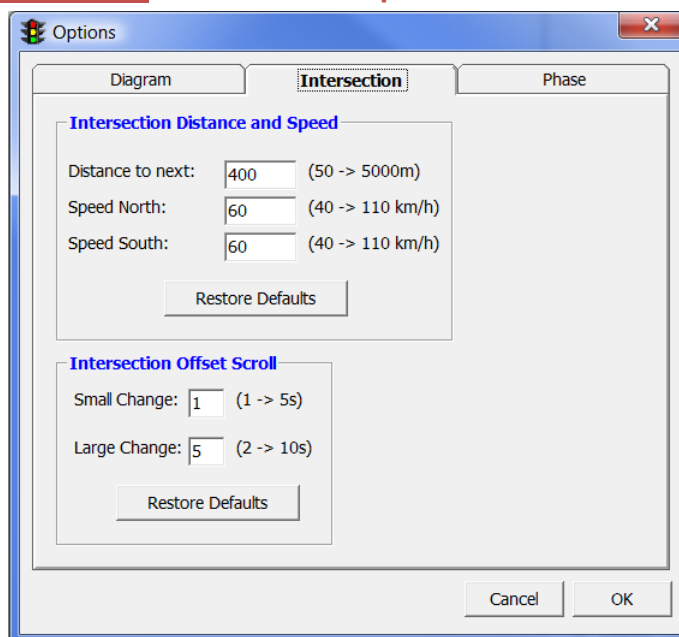
This Tab is accessed by clicking: Tools\Options\Intersection or shortcut key: Ctrl & T.

These values can be restored to the default values by clicking the “Restore Defaults” button.

Table - 1 - Intersection default values.

Parameter	Description	Units	Default Value	Data Type	Min Value	Max Value
Distance to next	Distance to the next intersection to the North	Meter	400	Integer	50	5000
Speed North	Travel speed to the next intersection to the North	Km/h	60	Integer	1	110
Speed South	Travel speed to the next intersection to the South	Km/h	60	Integer	1	110
Offset scroll – small change	Change value of scroll bar upon Intersection scroll bar arrow click	NA	1	Integer	1	5
Offset scroll – large change	Change value of scroll bar upon Intersection scroll bar inside click	NA	5	Integer	2	10

Figure - 11 - Intersection Options Tab.



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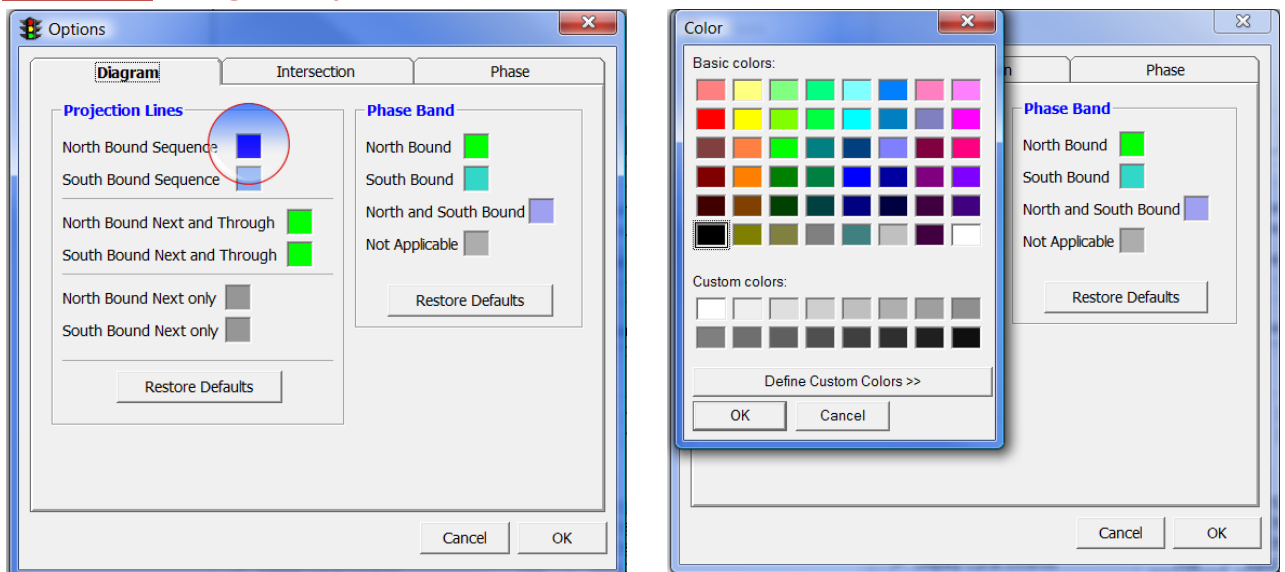
Diagram Options

Setting projection line colours & Setting phase band colours

The Diagram options tab allows for setting of the projection line and phase band colours. By clicking on the colour next to the projection line description the color dialog box will appear. The chosen colour will then be used for that projection line.

Related info; see: [Projection Lines](#); [Phase Band](#).

Figure - 12 - Diagram Options Tab.



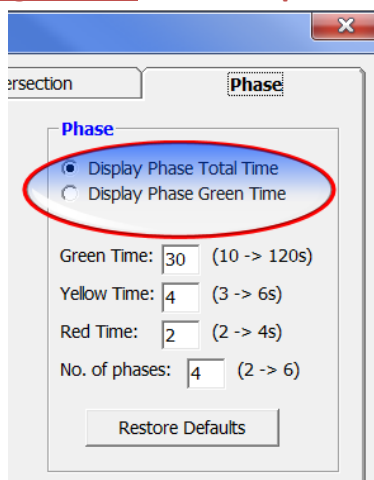
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Phase Options

Phase Time Displayed

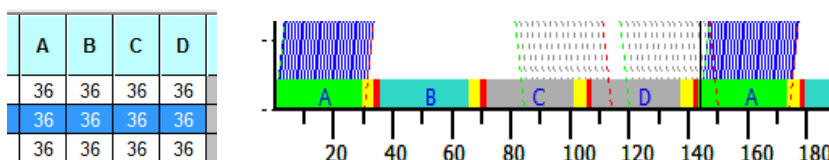
The phase time displayed in the intersection table can be toggled between either total phase time (Default) or phase green time only.

Figure - 13 - Phase Options Tab.



The figures below show the total phase time of 36 seconds displayed in the intersection table along with the corresponding TD Diagram showing the phase split of GT=30s, YT = 4s, RT = 2s.

With this option changed to “Display Phase Green Time” all phase times in the intersection table will change to 30s, the TD Diagram will remain unchanged.



Related info; see: [Phase Band](#).

Phase Time Values

The next part of the phase frame allows you to change the GT, YT, & RT and the number of phases for any new intersection added.

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Help

This manual will be saved in the program directory as a .pdf & .mht file as a part of the TDD installation process.

This manual can also be downloaded from this website:

<http://traffictdd.com>

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APPENDICIES

Appendix-1

Shortcut Keys

Action	Shortcut
File Menu	
New File	Ctrl + N
Open File	Ctrl + O
Save File	Ctrl + S
Exit	Ctrl + Q
Edit Menu	
Undo	Ctrl + Z
Redo	Ctrl + Y
Add Intersection	F6
Delete Intersection	Shift+Del
Tools Menu	
Options	Alt + O
Set Sequence – NB	Shift+F7
Set Sequence – SB	Shift+F6
Help Menu	
Manual	F7

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Appendix-3

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