VISSIM TUTORIALS
This document includes several tutorials that provide help in modifying a VISSIM network.

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VISSIM is a microscopic, time step, and behavior based simulation model developed to model urban traffic and public transit operations. In order to simulate traffic at a real signalized intersection properly, a VISSIM model should consist of the following elements:
- Links and connectors,
- Vehicle Inputs,
- Routes,
- Desired speed decisions,
- Reduced speed areas,
- Priority rules,
- Signal controllers,
- Signal heads, and
- Detectors.

[Acknowledgement: Some of this material is excerpted from the VISSIM help file documents.]
Tutorial #1 – Modifying a VISSIM Network
This tutorial describes the procedure to modify an existing VISSIM model that does not include three important components: the signal controller, the signal heads, and the detectors. Detailed information about these elements can be found in the VISSIM online help.

Step 1. Starting VISSIM.
Unzip the input folder for your intersection. Start VISSIM and open the file. The desktop view of VISSIM is shown below. Run the simulation and observe what happens. What is missing from the simulation network?

![Desktop view of VISSIM](image)

Figure 1. Desktop view of VISSIM
Step 2. Create signal controller group.

In VISSIM, every signal controller (SC) is represented by its individual SC number and signal groups (or phases) as its smallest control unit.

1. Select "Signal Control", then "Edit Controllers".
2. Right click the left panel and then click [new] in the pop up menu for a new signal control. Select "Ring Barrier Controller" controller type from the pull-down menu for Type.

![Figure 2](image1)

![Figure 3](image2)
3. From the “Ring Barrier Controller” tab, select “Edit Signal Groups.”

Figure 4. Ring barrier controller tab

The following dialog box will appear.

Figure 5. Timing parameter screen for Ring Barrier Controller
• Click on the “plus” by “Base Timing”, then the “plus” by “Timing by SG”, then the “plus” by “Basic”. Check only the boxes as shown below. (SG Number, SG Name, Min Green, Vehicle Extension, Max 1, Yellow, Red Clearance, Start Up, and Dual Entry).
• Enter a SG Number (Phase number) for each phase that will be provided for your intersection.
• Enter the “name” that describes the directional movement that is controlled by that phase (for example: “NBL”).
• Enter the timing data for the minimum green time, the vehicle extension time, the maximum green time, the yellow time, and the red clearance time, as noted in Task 3.
• The startup phases should be those that control the major street through movements (usually phases 2 and 6).
• Dual entry should be selected at least for the major street through movements, and possibly for the minor street through movements.

Figure 6. Basic timing data
Figure 7
4. Next, select the sequence box. Then, click on the “plus” on Detectors and “plus” on “Vehicles.” Check Detector Number (that will correspond to the numbers on the sketch that you created earlier), Call, and Extend SG (both of which should correspond to the phase or SG number).

Figure 8. Selecting timing data
An example of a completed Ring Barrier Controller timing sheet is shown below. When you have completed entering your timing, sequence, and detector data, select “OK”, and then select a file name.

Important: Make sure that “Frequency”, in the upper right corner of the figure below, is set to “10.”

Figure 9. Adding barriers
Step 3. Create signal heads.
A signal head is the actual device showing the status of the associated signal group (phase). Signal heads are coded in VISSIM for each travel lane individually at the location of the signal stop line. Vehicles wait approximately 0.5m behind a signal head/stop line that displays red. Vehicles approaching an amber signal will proceed through the intersection if they cannot come to a safe stop in front of the stop line.

1. Select "Signal heads" from the tool bar:
2. Select the location of a signal head for each lane by clicking the link and then right clicking the location where the signal head should be.
3. Set the number equal to the detector number from the sketch that you prepared earlier.
4. Set the signal group equal to the phase number.
5. Select either "left turn arrow" or "circular" for each signal head.

Figure 10. Signal head screen
Step 4. Add detectors.

“Real life vehicle/pedestrian detection is achieved using various methodologies including induction loops, video cameras, push buttons, track circuits etc. VISSIM models each detector type in the same way: a network element of user-definable length. A message impulse is transmitted to the signal controller as soon as a vehicle reaches this element with its front and another one when it leaves it with its tail. This information is then interpreted by the signal control logic.”

1. Select “Detectors” from the tool bar:
2. Select the location of the detector for each link by clicking the link and then right clicking the location where the detector should be. The detector should be located just upstream from the signal head.
3. Set the detector number according to your sketch.
4. Select “presence” as the detector type.

Figure 11. Detector screen
Step 5. Set simulation parameters.
Parameters for the simulation are set in the “Simulation Parameters” window that is accessible by selecting “Simulation”, then “Parameters.”

Set the following values in the Simulation Parameters dialog box:
- Simulation period is 3600 seconds
- Simulation resolution is 10 time steps per second
- Simulation speed is 1 or 2 simulation seconds per second for observing and “maximum” when you are not directly observing the simulation but only collecting data. Note also when you are just collecting data, you can type “control Q” twice to not show the animation, greatly speeding up the simulation.

![Figure 12. Simulation parameters](image-url)
Step 6. Output/Results.
There are a variety of output data that you can collect. For this activity, you will collect the following data:

- Queue length
- Delay
- Travel time
- Green phase duration

The data are stored in text files and can be imported into Excel for easier analysis. These files include:

- Vehicles
  - Nodes (.kna)
  - Data collection (.mer)
- Signal control
  - Signal changes (.lsa)
Select “Evaluations” from the menu list. Select the Vehicles tab, then “Nodes” and “Travel Times”.

![Figure 13. Evaluation files](image-url)
Select “Nodes Configuration”, then select the parameters that you want to store (as shown below).

![Node evaluation configuration](image)

**Figure 14. Node evaluation configuration**

Then select “Filter” and enter the time for the data collection, as shown below.

![Node evaluation filter](image)

**Figure 15. Node evaluation filter**
Select “Travel Times Configuration”, and then enter the “time” data as shown below.

![Travel time measurement configuration](image)

**Figure 16. Travel time measurement configuration**
Select “Distribution of green times” from the Signal Control tab. Select “Filter” and enter the times as shown below.

Figure 17
Once you run the simulation, the output files will show the data that you have collected.

The Node evaluation data are stored in the .kna file and illustrated below.

![Node evaluation file output example](image1.png)

**Figure 18. Node evaluation file output example**

The Travel Time evaluation data are stored in the .rsz file and illustrated below.

![Travel time evaluation file output example](image2.png)

**Figure 19. Travel time evaluation file output example**
The distribution of signal times data are stored in the .lzv file and illustrated in the two figures below.

**Figure 20. Distribution of signal times data output example**

<table>
<thead>
<tr>
<th>SC 1, Signal group 2, Green Times: (Mean: 58.5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14   1 *</td>
</tr>
<tr>
<td>103  1 *</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SC 1, Signal group 2, Red Times: (Mean: 41.3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0    1 *</td>
</tr>
<tr>
<td>28   1 *</td>
</tr>
<tr>
<td>96   1 *</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SC 1, Signal group 3, Green Times: (Mean: 57.0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>23   1 *</td>
</tr>
<tr>
<td>91   1 *</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SC 1, Signal group 3, Red Times: (Mean: 63.5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19   1 *</td>
</tr>
<tr>
<td>108  1 *</td>
</tr>
</tbody>
</table>

**Figure 21. Distribution of signal times data output example**
Tutorial #2: Setting Up a Node Evaluation
This tutorial includes information on how to set a node evaluation, what evaluation files to consider, how to set traffic volumes, and how to collect vehicle speed and length data in VISSIM.

- The “data collection” point is used to collect a variety of data at a single point.
- Select the “data collection” icon from the toolbar on the left. Figure 1 shows the data collection icon boxed in red.
- Select a link with the left mouse button.
- Right click on the location for the data collection point.
- The recommended location for collecting the event data that will be used for the headway calculations is immediately downstream of the signal head. Figure 2 shows the recommended placement of the data collection point. The data collection point is marked with a blue line and the signal heads are marked with red lines.
- When the data collection point has been established, select the kinds of data that you want to collect from “Evaluation”, then “Data collection”. Make sure that both “compiled data” and “raw data” are selected.
- Under “configuration”, select “Number veh”, “Speed”, and “Length”.

Figure 22
Tutorial #3: Changing Input Volumes

- Select the “vehicle input” icon on the toolbar on the left side of the VISSIM screen. Below, the figure shows the vehicle input icon boxed with a red border.
- Double-click on the blue line at the entry point to the link on which you want to change the volumes.
- Enter the desired volume in the table. Below, Error! Reference source not found. shows the volume cell boxed with a red border.

Figure 23
Tutorial #4: Setting left turn and right turn traffic volumes to zero

- Select the “routes” icon on the toolbar on the left side of the VISSIM screen. Below, Error! Reference source not found. shows the routes icon boxed with a red border.
- Double-click on the red line which is located in the through lane upstream of the signal.
- Set the values of the fifth column to zero for the left turn and right turn movements. Error! Reference source not found. shows the appropriate column boxed with a red border. To double check which route is being changed, the VISSIM adds a yellow line on the network showing the path of the selected route.

![Vehicle input](image)

Figure 24
Tutorial #5: Phase Termination Analysis
[add notes and examples]
Tutorial #6: How to Set up Permitting Left Turn Phasing

- Change the LT signal head “type” to “circular”.
- Change the signal head “group” to the same number as the corresponding TH movement.
- In the RBC controller, delete the LT phase numbers and data.
- Set up “priority rules” for the LT permitted movement (see figures below):
  - Select the “priority rules” icon (yield sign) from the toolbar on the left.
  - Select the left turn connector for the LT movement of interest.
  - Place the stop location for the LT vehicle (near the beginning of the connector), using the right mouse button.
  - Select the conflicting TH link connector. Place the “conflict point” using the right mouse button. In the “priority rule” dialog box, set the minimum headway to 200 feet. Select “OK.”

[Possible text changes: “Also, for all intersections, permitted left turns will not work properly unless the detectors of the left turning movements are paired with the according through movement. For instance, when completing this activity for network 5 (PRD and US 95) the EB and WB left turning lanes were backing up into the through movement lanes because detection for these movements were not being considered with the through movements. To fix this, the students must go into the controller and change the vehicle detector call designation for each left turn movement to match the through movement.”]
There are two things that I would consider. First, if I remember correctly, Kevin and I set up priority rules for each group, so tutorial number six shouldn't be necessary for any of the students to work through. That said, it looks like the new networks (network 5 and 6) both use conflict areas instead of priority rules. Conflict areas serve the same purpose as priority rules, except they are much easier to set up and manage, so I would actually recommend changing the other networks to all operate on conflict areas instead of priority rules. This should also include rewriting the directions in Tutorial 6 to be specific to conflict areas rather than priority rules.