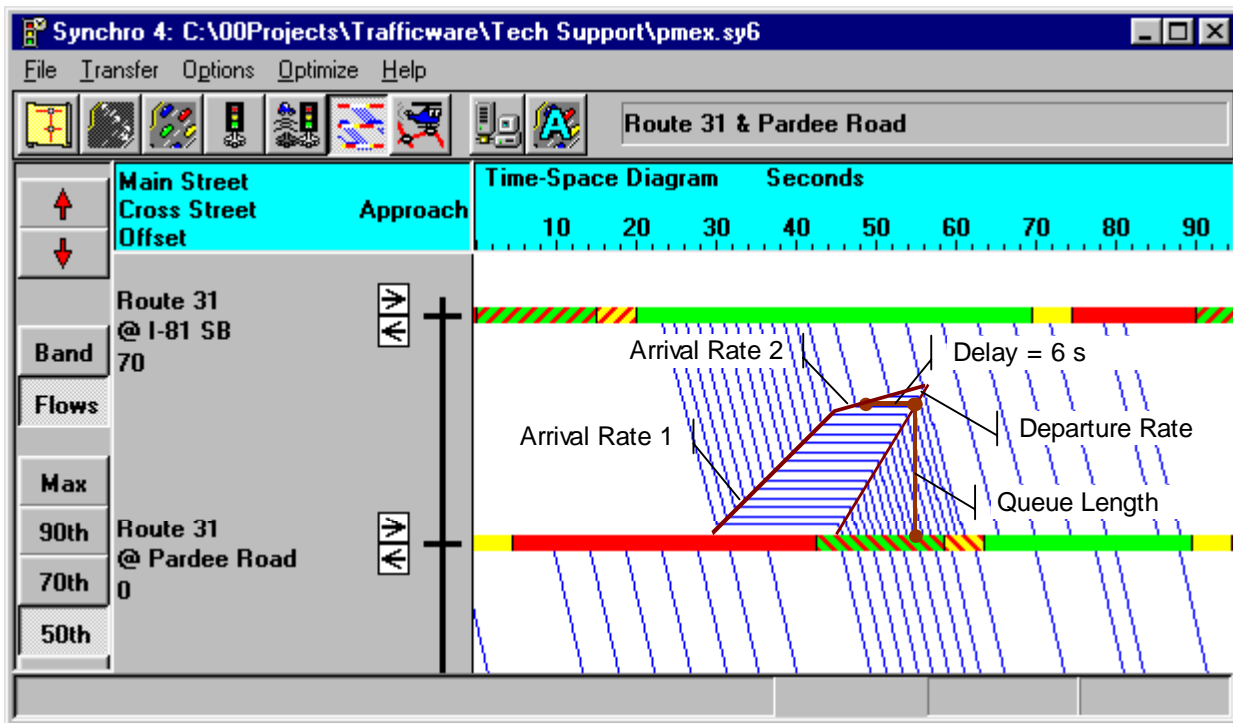


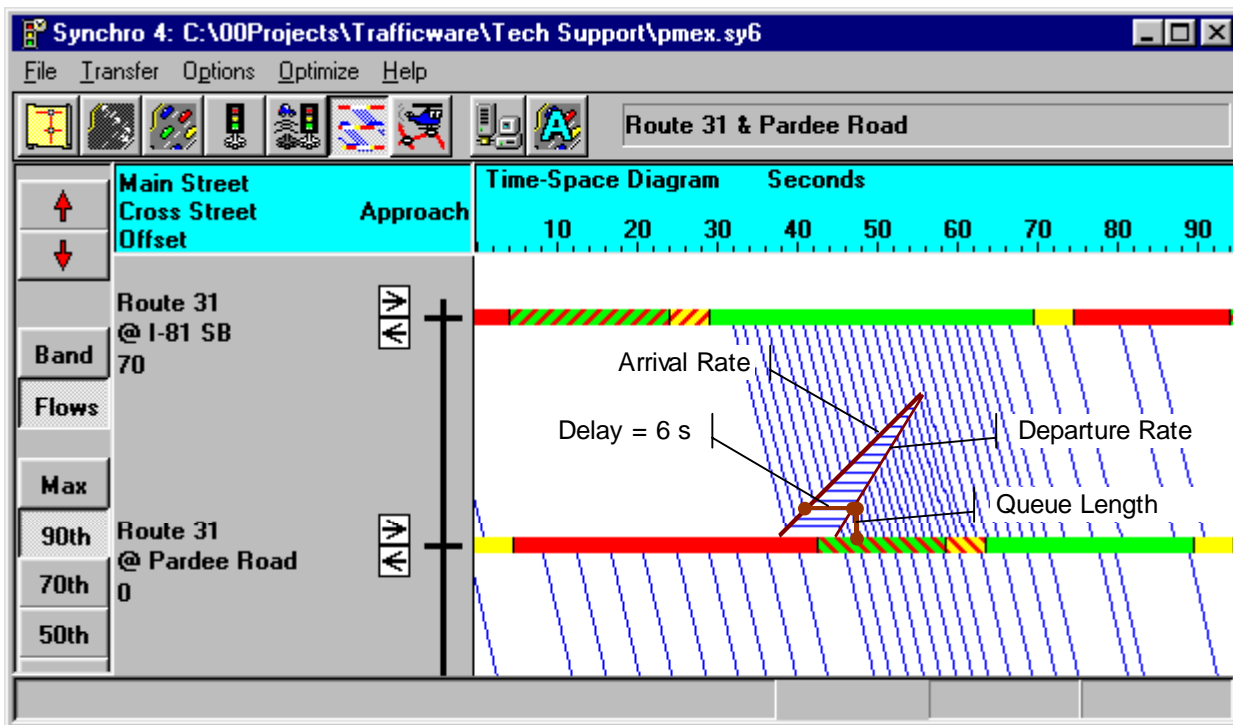
Why the 50th Percentile Queue may be larger than the 95th Percentile Queue

Sometimes the 50th Percentile Queue length shown in Synchro may be greater than the 95th Percentile Queue. The best way to illustrate one of the reasons this may occur is to view the time-space diagram. Consider the diagram shown below which shows a Synchro time-space diagram for 50th percentile traffic flow.



Notice in the 50th percentile scenario, the arrival rate varies over the cycle length at Pardee Road (arrival rate 1 and arrival rate 2). Arrival 1 is the saturated flow rate from upstream, then arrival 2 is the uniform rate from upstream. The diagram above shows these arrival types, the saturation flow rate, and then the queue length. Keep in mind that the queue length is calculated at a point 6 seconds back since these are vehicles that slow, but do not make a complete stop.

Next, consider the diagram below which shows a Synchro time-space diagram for 95th percentile traffic flow.



In this case, there are more vehicles arriving, however the key factor is WHEN they are arriving. In the 50th percentile case, notice that the vehicles are being released early from the I-81 south ramp. This causes them to arrive earlier at Pardee road and queue up as illustrated. They are being released at about 20 seconds since the side street doesn't have the volume to hold the green (and the mainline is released early). In the 90th percentile case, the vehicles are being released at closer to 30 seconds, therefore they are not arriving downstream as early and aren't creating as big of queue.

What Synchro is doing is looking at these offsets, and determining the arrival rate (v) based on this. This sets the position of the arrival rate line on the horizontal axis at Pardee Road. As you can see, this is more than a simple equation for calculating queue lengths.