CONFIGURING & TROUBLESHOOTING UTAH SPM’S

SPM Workshop
Wednesday, January 27th

Mark Taylor
Traffic Signal Operations Engineer
Utah Department of Transportation

Jamie Mackey
Statewide Signal Engineer
Utah Department of Transportation

Scott Stevenson
Traffic Engineer Consultant
PineTop Engineering
Agenda

- Mark Taylor (UDOT)
  - Detection

- Jamie Mackey (UDOT)
  - SPM Configuration Tool
  - Signal Numbering Convention

- Scott Stevenson (PineTop Engineering)
  - Troubleshooting Guidelines
Detection Technologies Used

- Some Inductive Loops – wired in series & grouped by Lane Groups
- Some Video – Traficon, AutoScope, Iteris, Gridsmart
- Some Sensys Networks Magnetometers
- Mostly Wavetronix Radar
  - 699 intersections & 1273 approaches running Advance
  - 708 intersections & 2153 approaches running Matrix
Advanced Detection – Arterials Ch. 1
(Installed at speeds 40 mph+)

1.0 S Passage time is used in controller

All three things are being done with 1 channel.

If stop bar detection is present, queue clearance is not used.

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Large Trucks – DZ

Small Trucks/Vehicles - DZ

Queue Clearance of Waiting Vehicles
Channel 2 used for approach volume counts with a 10 foot zone approximately 400 feet from the stopbar.
UDOT Detection Setup StopBar
(Sidestreet & Most MainLine)

Wavetronix Matrix Smartsensor Radar

- Thru Presence Ch.: 65 ft.
  - Lane-by-Lane
- Left Presence Ch.: 50 ft.
  - Lane-by-Lane
- Queue Ch.: 15 ft Long @ 50’ Back
  - 3 second delay
- Count ch. at Stopbar
  - Ex. Ch. 5–8 (underneath)
- YRA ch. at stopbar
  - Yellow & Red Actuations
    - E.g.: Red Light Running
  - Ex. Ch. 9-11.
  - 15 mph speed filter
  - No YRA in right lanes
Depending on the sensor positioning, layout, and available channels, sometimes we provide exit counting channels.
The larger the detection zone, the smaller the passage time (PT). Smaller PT reduces vehicle delay for waiting vehicles on other phases.
### Signal Timing Manual Ver. 1 – Table 5-10

**Table 5-10 Passage time duration for presence mode detection**

<table>
<thead>
<tr>
<th>Maximum Allowable Headway, s</th>
<th>Detection Zone Length, ft</th>
<th>85th Percentile Approach Speed, mph</th>
<th>Passage Time (P7), s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>3.0</td>
<td>6</td>
<td>2.2</td>
<td>2.3</td>
</tr>
<tr>
<td>15</td>
<td>1.9</td>
<td>2.1</td>
<td>2.2</td>
</tr>
<tr>
<td>25</td>
<td>1.6</td>
<td>1.8</td>
<td>2.0</td>
</tr>
<tr>
<td>35</td>
<td>1.3</td>
<td>1.6</td>
<td>1.8</td>
</tr>
<tr>
<td>45</td>
<td>1.0</td>
<td>1.3</td>
<td>1.6</td>
</tr>
<tr>
<td>55</td>
<td>0.7</td>
<td>1.1</td>
<td>1.3</td>
</tr>
<tr>
<td>65</td>
<td>0.4</td>
<td>0.8</td>
<td>1.1</td>
</tr>
<tr>
<td>75</td>
<td>0.1</td>
<td>0.6</td>
<td>0.9</td>
</tr>
</tbody>
</table>

25 mph: 2.2 - .4 = 1.8 s.  
30 mph: 2.3 - .8 = 1.5 s.  
35 mph: 2.4 – 1.1 = 1.3 s.  

40 mph: 2.5 – 1.4 = 1.1 s.  
45 mph: 2.6 – 1.5 = 1.1 s.  

Ave: 1.4 S savings with 65 foot zone.
Matrix Wavetronix Counting Accuracy Results
(UDOT Research Report No. UT-15.14 – August 2015)

<table>
<thead>
<tr>
<th>Number of Approach Lanes</th>
<th>Volume Level</th>
<th>95 Percent Confidence Interval of the Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low (≤100 v/h/ln)</td>
<td>Mid (101-250 v/h/ln)</td>
</tr>
<tr>
<td></td>
<td>Lower</td>
<td>Upper</td>
</tr>
<tr>
<td>2</td>
<td>97.6%</td>
<td>103.9%</td>
</tr>
<tr>
<td>3</td>
<td>97.5%</td>
<td>102.0%</td>
</tr>
<tr>
<td>4</td>
<td>94.1%</td>
<td>100.1%</td>
</tr>
<tr>
<td>5</td>
<td>91.9%</td>
<td>97.2%</td>
</tr>
<tr>
<td>6</td>
<td>93.8%</td>
<td>96.8%</td>
</tr>
</tbody>
</table>
Wavetronix Advance Counting Accuracy Results
(UDOT Research Report: Pending)

<table>
<thead>
<tr>
<th>Number of Lanes</th>
<th>Position 1 (Back Side of Mast Arm)</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low (≤100 v/h/ln)</td>
<td>Mid (101-250 v/h/ln)</td>
</tr>
<tr>
<td></td>
<td>Lower</td>
<td>Upper</td>
</tr>
<tr>
<td>1</td>
<td>92.7%</td>
<td>115.8%</td>
</tr>
<tr>
<td>2</td>
<td>82.3%</td>
<td>113.7%</td>
</tr>
<tr>
<td>3</td>
<td>84.3%</td>
<td>92.7%</td>
</tr>
</tbody>
</table>

Speed Accuracy

85th Percentile Speed Difference [Advance Speed - Gun Speed] (mph)
Questions?