



CONFIGURING & TROUBLESHOOTING UTAH SPM'S

SPM Workshop

Wednesday, January 27th

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Agenda

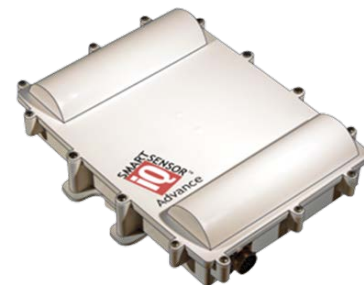
- ❖ Mark Taylor (UDOT)
 - Detection

- ❖ 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 Wavetrenix 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.

Large Trucks – DZ

Small Trucks/Vehicles- DZ

Queue Clearance of Waiting Vehicles

1-EB DZQ50 2 3 4 5 6 7 8

Name EB DZQ50

Type Priority

Enabled

Level 1 Level 2 Q

Discovery Range(feet):

>= 740

Range (feet): 100 to 810

Speed (mph): 030 - 100

ETA (seconds): 03.3 - 06.8

810

740

100

90

1-EB DZQ50 2 3 4 5 6 7 8

Name EB DZQ50

Type Priority

Enabled

Level 1 Level 2 Q

Discovery Range(feet):

< 740

Range (feet): 100 to 810

Speed (mph): 030 - 100

ETA (seconds): 03.3 - 05.6

810

100

90

1-EB DZQ50 2 3 4 5 6 7 8

Name EB DZQ50

Type Priority

Enabled

Level 1 Level 2 Q

Queue Clearance

Enabled

Range (feet): 080 to 145

Speed (mph): 001 - 035

ETA (seconds): 02.5 - 05.5

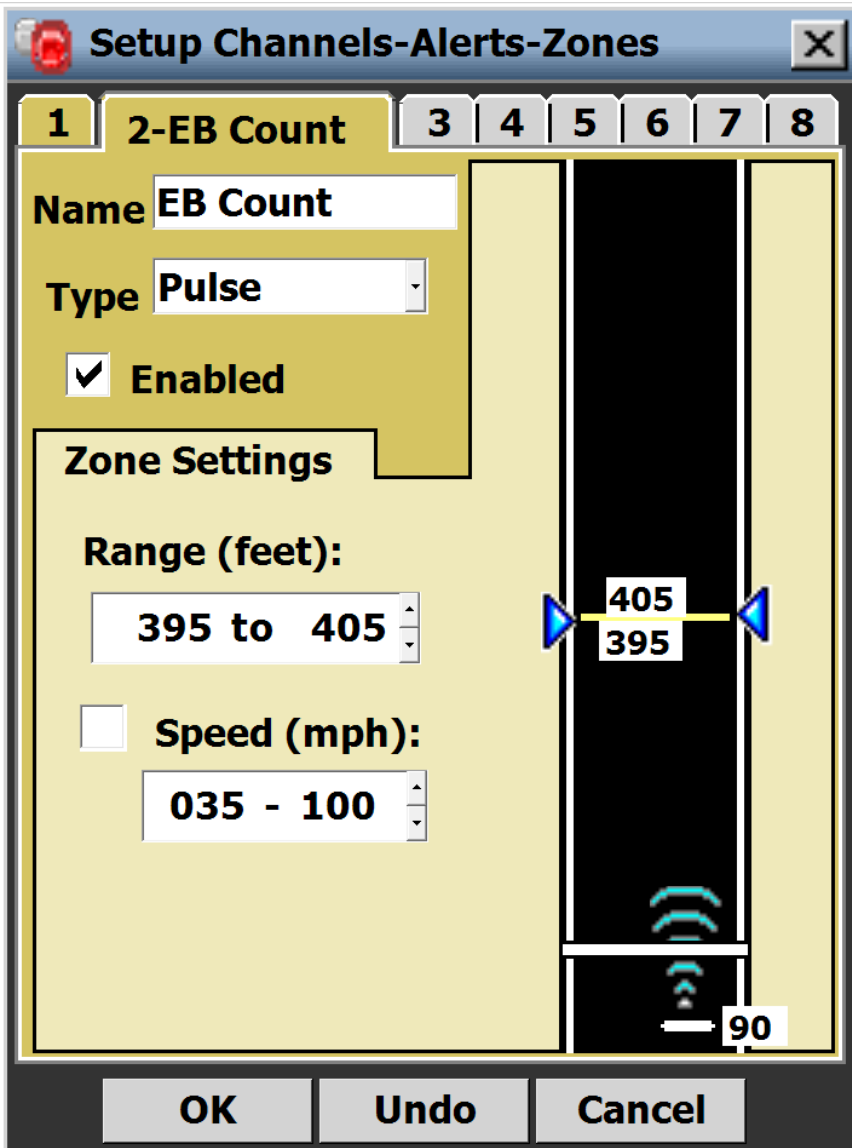
145

80

90

Advanced Detection – Arterials Ch. 2

(Installed at speeds 40 mph+)

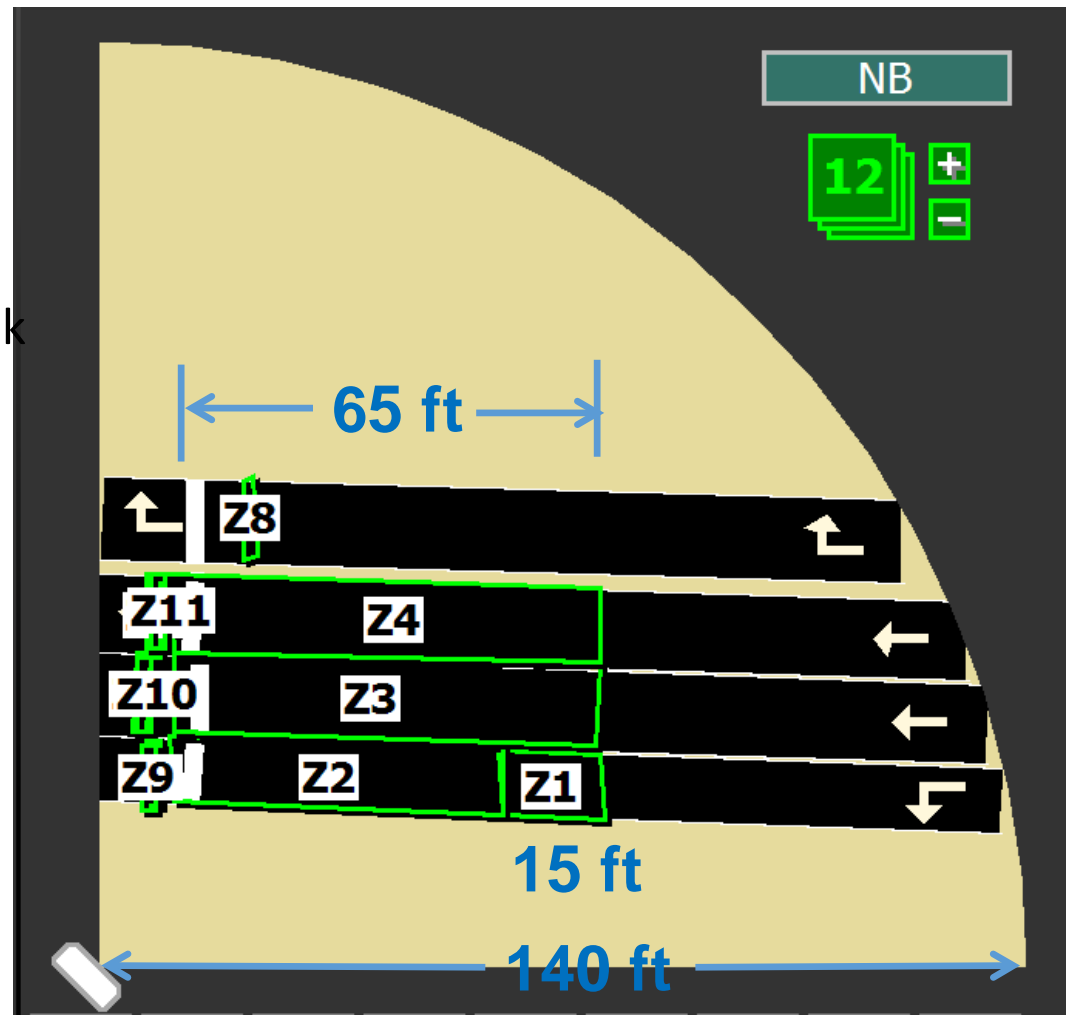


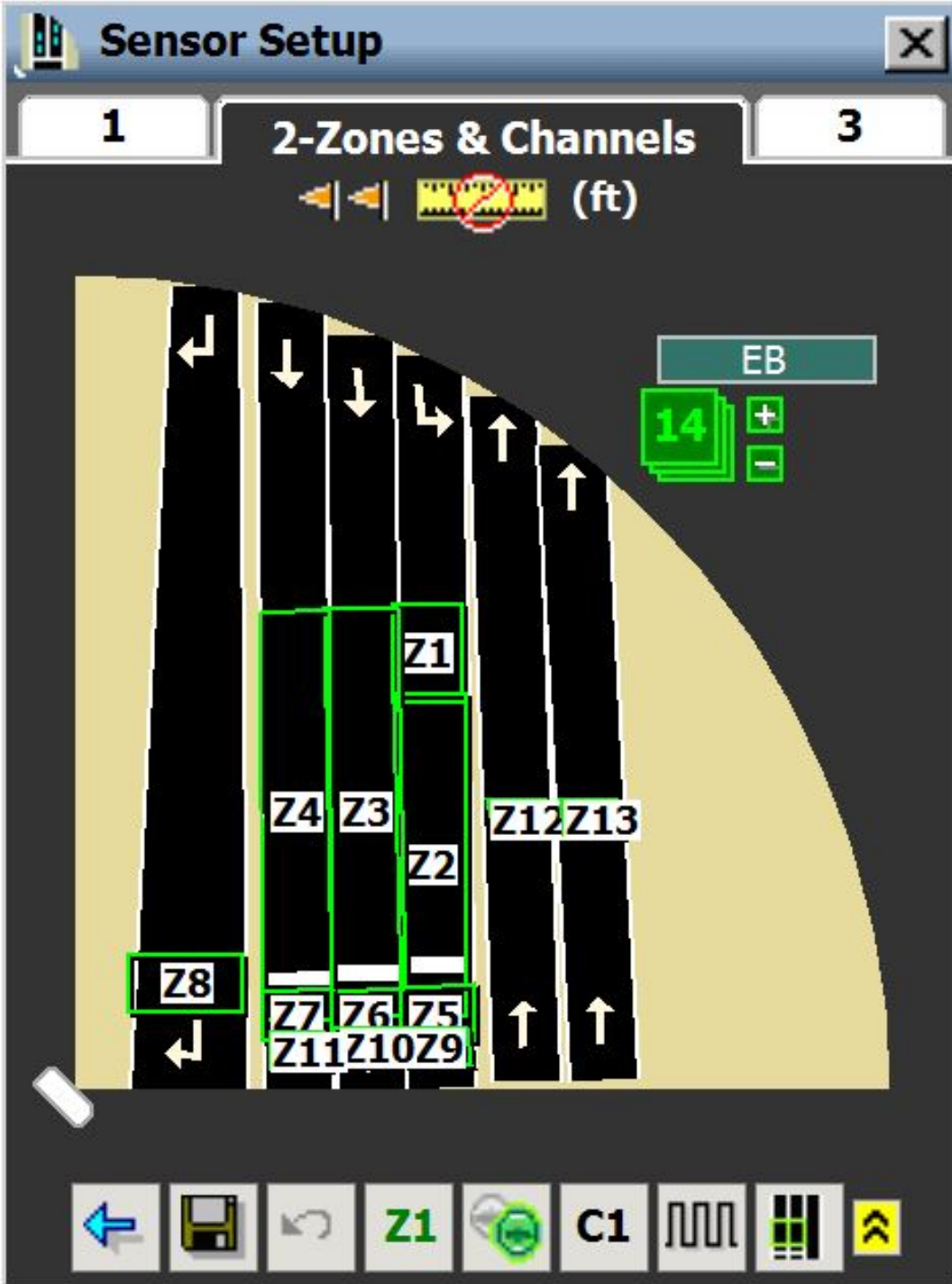
Channel 2 used for approach volume counts with a 10 foot zone approximately 400 feet from the stopbar.

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

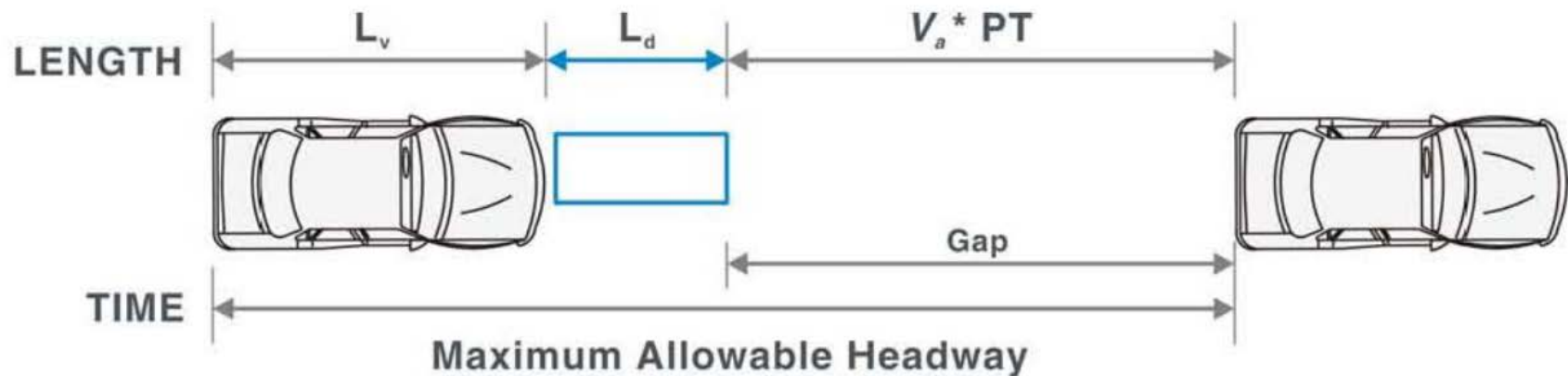




Depending on the sensor positioning, layout, and available channels, sometimes we provide exit counting channels.

Signal Timing Manual Ver.1 Figure 5-4

Figure 5-4 Relationship between passage time, gap, and maximum allowable headway



*** 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

Maximum Allowable Headway, s	Detection Zone Length, ft	85 th Percentile Approach Speed, mph ¹				
		25	30	35	40	45
Passage Time (PT), s						
3.0	6	2.2	2.3	2.4	2.5	2.6
	15	1.9	2.1	2.2	2.3	2.4
	25	1.6	1.8	2.0	2.1	2.2
	35	1.3	1.6	1.8	1.9	2.1
	45	1.0	1.3	1.6	1.7	1.9
	55	0.7	1.1	1.3	1.6	1.7
	65	0.4	0.8	1.1	1.4	1.5
	75	0.1	0.6	0.9	1.2	1.4

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.

Click 650 - Main

PROPERTIES

Click 650 - Main

PROPERTIES

SENSORS

CHANNELS

VERIFICATION

BIU 9 BIU 10 BIU 11 BIU 12 MMU

BIU 9 BIU 10 BIU 11 BIU 12 MMU

Detector Channel

Detector Channel Map

Detector Channel	Phase	Description	Logic ID
17	5	WB LT Queue	
18	2	WB LT	
19	2	WB Thru 1	
20	2	WB Thru 2	
21	---	WB LT Count	
22	---	WB Thru 1 Count	
23	---	WB Thru 2 Count	
24	---	WB RT Count	
25	---	WB Thru Lane 1 Exit Count	
26	---	WB Thru Lane 2 Exit Count	
27	4	NB LT	
28	4	NB Thru 1	
29	4	NB Thru 2	
30	---	NB LT Count	
31	---	NB Thru 1 Count	
32	---	NB Thru 2 Count	

Detector Channel	Phase	Description	Logic ID	Display Approach	Sensor Channel	Add
49	5	WB Left Lane 1 RLM	a	WB	9	+
50	2	WB Thru Lane 1 RLM	a	WB	10	+
51	2	WB Thru Lane 2 RLM	a	WB	11	+
52	---	EB Thru Lane 2 Exit Count	a	WB	13	+
53	1	EB Left Lane 1 RLM	a	EB	9	+
54	6	EB Thru Lane 1 RLM	a	EB	10	+
55	6	EB Thru Lane 2 RLM	a	EB	11	+
56	---	SB Thru Lane 1 Exit Count	a	NB	9	+
57	4	NB Left Lane 1 RLM	a	NB	7	+
58	4	NB Thru Lane 1 RLM	a	NB	8	+
59	---	SB Thru Lane 2 Exit Count	a	NB	10	+
60	---	NB Thru Lane 1 Exit Count	a	SB	11	+
61	8	SB Left Lane 1 RLM	a	SB	8	+
62	8	SB Thru Lane 1 RLM	a	SB	9	+
63	8	SB Thru Lane 2 RLM	a	SB	10	+
64	---	NB Thru Lane 2 Exit Count	a	SB	12	+

Save

Save

Config last saved: 12-

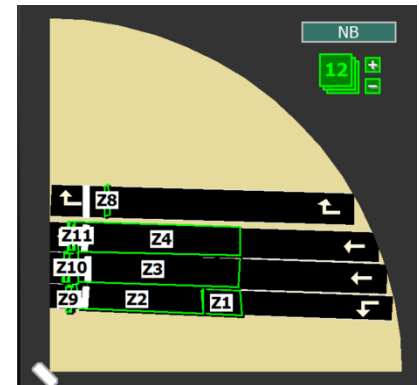
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Matrix Wavetronix Counting Accuracy Results

(UDOT Research Report No. UT-15.14 – August 2015)

95 Percent Confidence Interval of the Mean

Number of Approach Lanes	Volume Level					
	Low (≤ 100 v/h/ln)		Mid (101-250 v/h/ln)		High (> 250 v/h/ln)	
	Lower	Upper	Lower	Upper	Lower	Upper
2	97.6%	103.9%	97.3%	104.6%	95.3%	104.8%
3	97.5%	102.0%	94.6%	102.5%	97.4%	99.9%
4	94.1%	100.1%	91.7%	100.1%	90.8%	98.6%
5	91.9%	97.2%	88.8%	96.3%	80.3%	98.0%
6	93.8%	96.8%	79.7%	88.6%	74.9%	90.2%

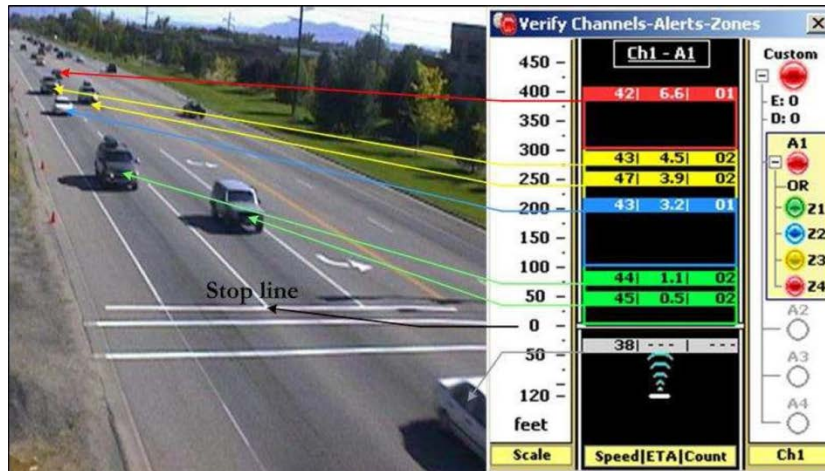


Wavetronix Advance Counting Accuracy Results)

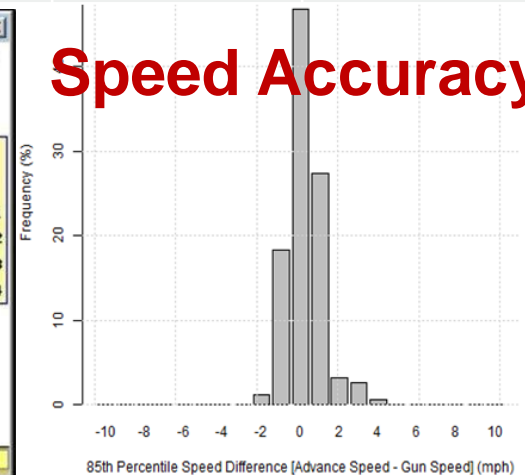
(UDOT Research Report: Pending)

95% Confidence Interval

Number of Lanes	Position1 (Back Side of Mast Arm)					
	Low (≤ 100 v/h/ln)		Mid (101-250 v/h/ln)		High (> 250 v/h/ln)	
	Lower	Upper	Lower	Upper	Lower	Upper
1	92.7%	115.8%	97.6%	105.9%	81.2%	104.7%
2	82.3%	113.7%	83.6%	97.7%	86.1%	94.9%
3	84.3%	92.7%	80.4%	91.5%	71.1%	81.5%



Speed Accuracy



Questions?

