

**The SmarTek Video Detection System (SVS-1)  
User Guide  
Setting Detection Zone Locations and Parameters**

**08 October 2008**



***SmarTek Systems***®

410-315-9727

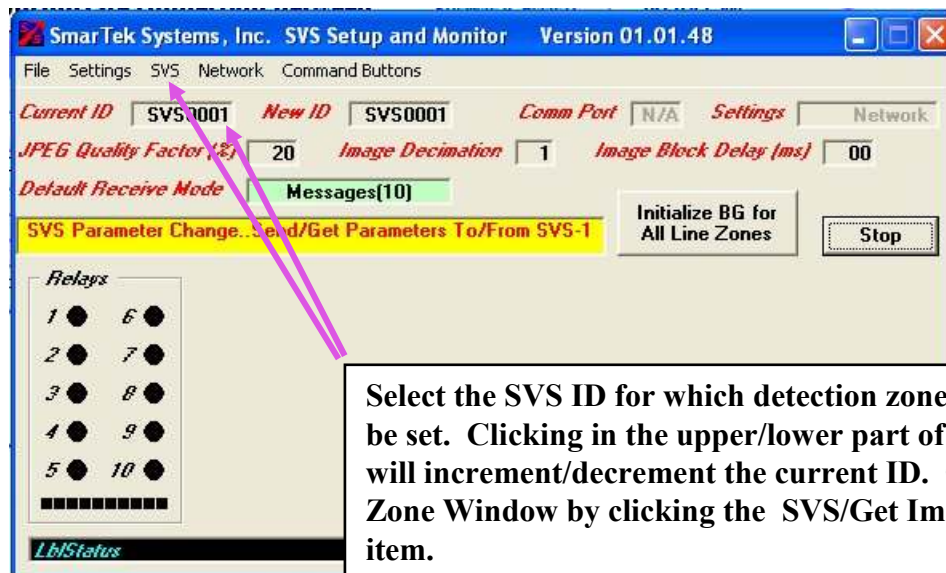
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## SVS-1 – Opening the SVS Set Line Zones Window

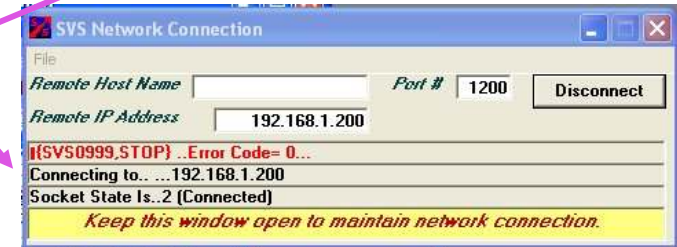
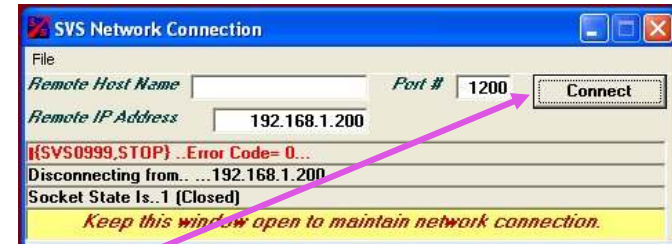
The primary function of the SVS Monitor and Setup Program is to provide the SVS-1 installer the means to quickly and easily setup detection Line Zones within each camera image field and to group/associate detection zones to form Output Relays for input to the intersection controller.

After camera installation and connection to the SVS-1 Video Image Detection System, run SVS Monitor and Setup and choose the appropriate connection between the SVS-1 and the Windows PC being used. If a network connection is selected, set the SVS-1 IP Address and Port Number in the SVS Network Connection screen. Click the Connect button and note the connection status to make sure a connection was made. Keep the Network Connection Window open.



Select the SVS ID for which detection zones and parameters are to be set. Clicking in the upper/lower part of the Current SVS ID field will increment/decrement the current ID. Open the SVS Set Line Zone Window by clicking the SVS/Get Image for Zone Setup menu item.

**Note: When setting, checking, or changing Line Zone parameters for an existing installation, use the SVS/Get SVS Parameters menu item before opening the SVS Set Line Zone Window.**

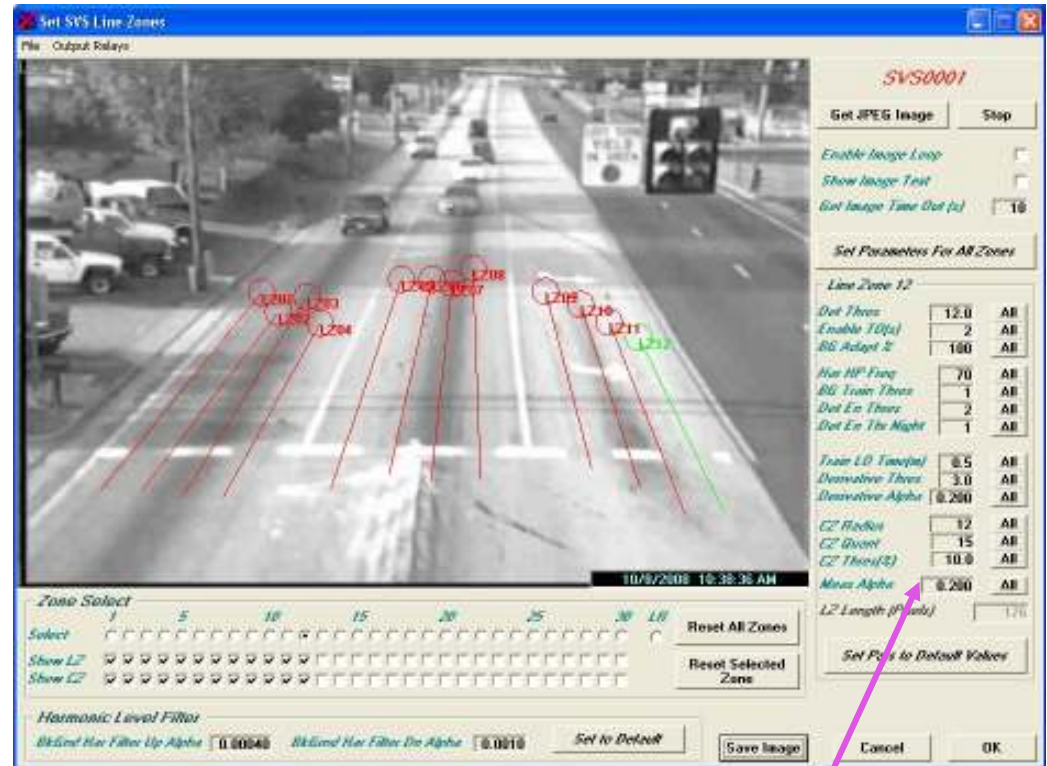


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## Setting Detection Zone Position and Size

Each detection zone is made up of a Line Zone and an associated Circle Zone centered at the up road end of the Line Zone. Image pixels associated with the Line Zone/Circle Zone combination are processed to provide vehicle detections. These vehicle detections depend on direction of vehicle entry into the Line Zone/Circle zone combination. The position and length of each line zone is specified by the user via a graphical method. The position or center of the Circle Zone is set at the up road end of the associated Line Zone. The size or radius of the Circle Zone is specified by the user. Additionally, sensitivity parameters for each Line Zone/Circle Zone combination are also set by the user (Click in the upper/lower part of each parameter field to increment/decrement each parameter).



### To set the position and length of a Line Zone:

- 1) Choose a zone by clicking 1 of 30 Select Circles in the Zone Select Frame below the image. Click the Show LZ and Show CZ Check Boxes corresponding the zone. **Selected zone will be shown in green after drawing.**
- 2) Draw the Line Zone position by left clicking (hold down left button) at the down road end of the line zone and drawing the line zone to the up road end (at this end, release the left button). The Line Zone and associated Circle Zone appear.
- 3) Repeat steps 1 and 2 to set as many zones as is needed. Each lane should have multiple line/circle zones which will be grouped using the Zone to Relay Mapping Window to form Vehicle Presence Relays (VPRs).

**If the position of any Line Zone is not acceptable, repeat steps 1 and 2.**

Line Zone/Circle Zone  
Sensitivity Parameters



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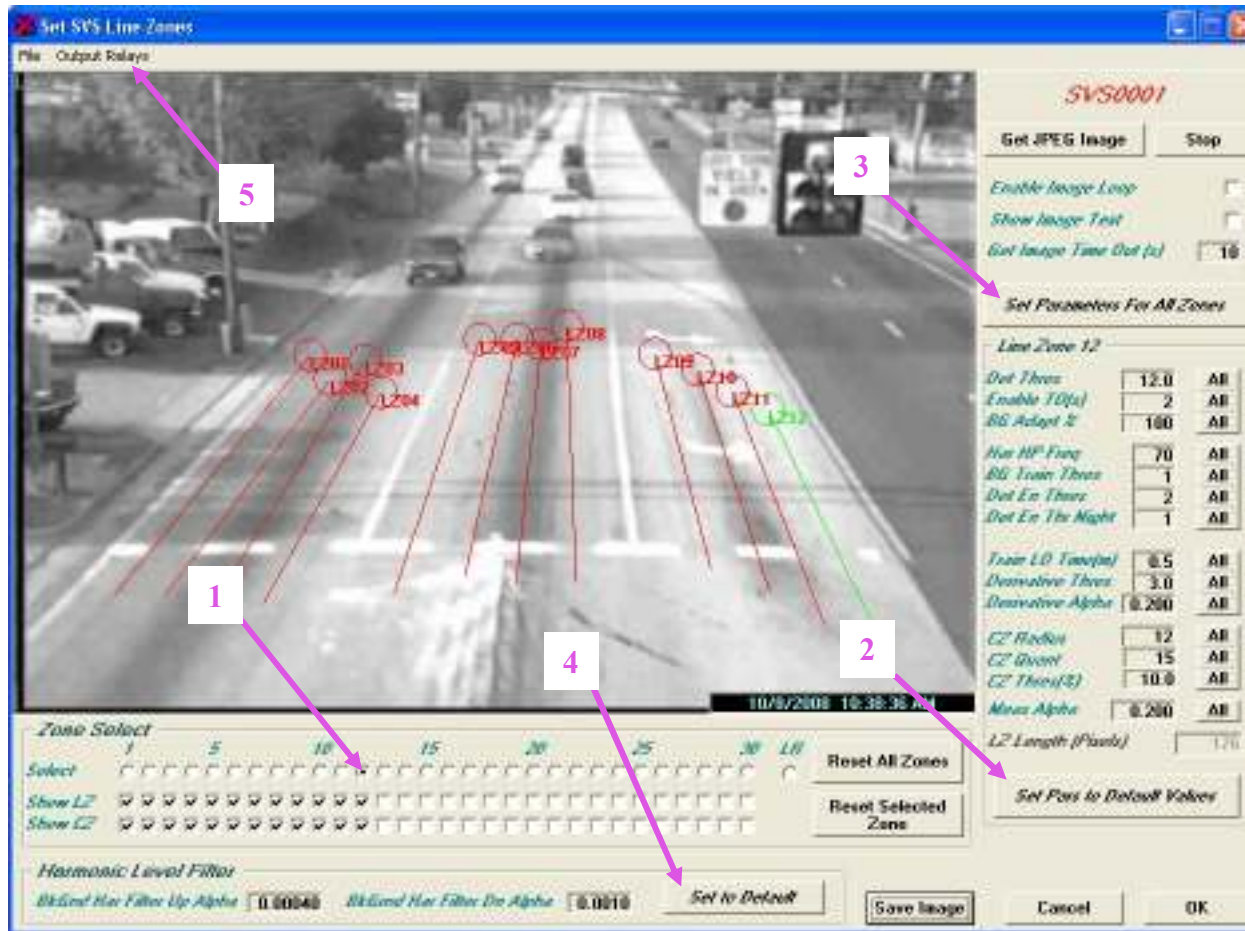
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## Setting Detection Zone Parameters

The sensitivity parameters for each Line Zone and its associated Circle Zone are displayed to the right of the camera image. For most installations, SmarTek Systems recommended parameter settings provide excellent performance. These settings are easily selected for all Line/Circle Zones as follows:



- 1) Select a line zone by clicking a **Zone Select Option Button** below the camera image.
- 2) Click the **Set Parameters to Default Values** button below the parameter display at the right of the camera image.
- 3) Click the **Set Parameters for All Zones** button above the parameter display at the right of the camera image.
- 4) Click the **Harmonic Level Filter Set to Default** button below the Zone Select Section.
- 5) Open the **Zone to Relay Mapping Window** by clicking the **Output Relays/Setup Output Relays** menu item.

**Note:** Each parameter for each zone may be changed by selecting the zone and then clicking in the upper/lower part of the parameter value field to increment/decrement the value. To set a specific parameter to the displayed value for all Line/Circle Zones, click the "All" button to the right of the parameter field.

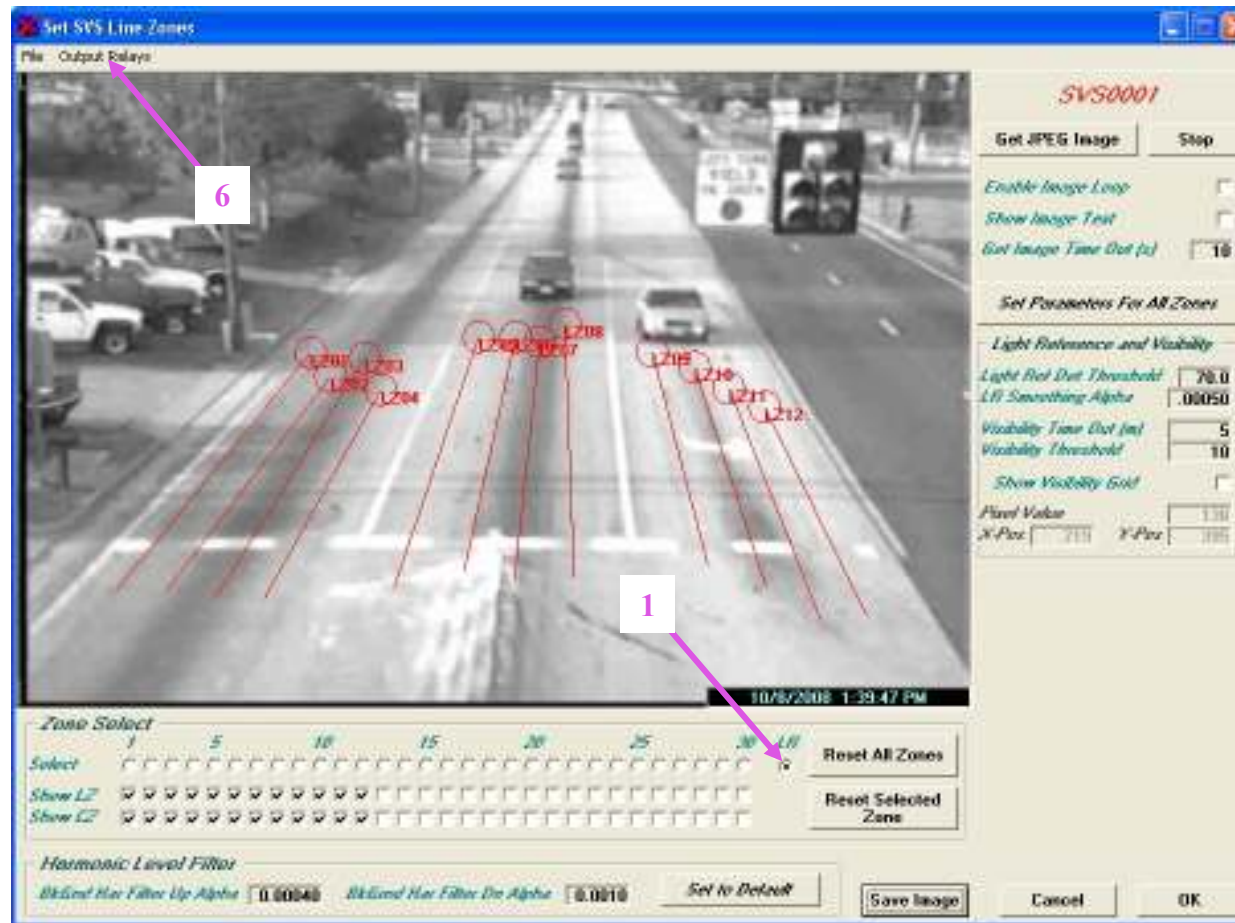


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## Setting Light Reference and Visibility Parameters

The sensitivity parameters for each Line Zone and its associated Circle Zone are displayed to the right of the camera image. For most installations, SmarTek Systems recommended parameter settings provide excellent performance. These settings are easily selected for all Line/Circle Zones as follows:



- 1) Select the Light Reference by clicking the LR Option Button below the camera image.
- 2) Set the Light Reference Detection Threshold to 70.
- 3) Set the Light Reference Smoothing Alpha to 0.0005.
- 4) Set the Visibility Time Out to 5 Minutes.
- 5) Set the Visibility Threshold to 10.
- 6) Open the Zone to Relay Mapping Window by clicking the Output Relays/Setup Output Relays menu item.

**Note:** Each Light Reference parameter and/or each Visibility parameter may need to be adjusted after observing the Image Histogram to determine the position of the dominant peak during daylight periods.



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# SVS-1 Grouping Detection Line Zone to Form Vehicle Presence Relays

This display is used to set each grouping of Detection Line Zones to form each Vehicle Presence Relay (VPR). The Detection Zone to Vehicle Presence Relay Mapping Matrix has VPR # on the vertical axis and the Detection Zone # on the horizontal axis. Each checked box specifies that a Detection Line Zone (column) will contribute to a Vehicle Presence Relay (VPR) (row).

Current Camera Channel ID

Detection Line Zone Number

Vehicle Presence Relay Number

Check Boxes Specify Detection Line Zones Contributing to each VPR

Detector Grouping Setup - SVS Line Zones to Vehicle Presence Relays (VPRs) to External Relay C

SVS0001

VPR	1	5	10	15	20	25	30	30 (sec)	Ext Delay (sec)	OB Relay En
01	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					0	1	0
02	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					0	2	0
03			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			0	3	0
04								0	0	0
05								0	0	0
06								0	0	0
07								0	0	0
08								0	0	0
09								0	0	0
10								0	0	0

Show Site/Camera Text

X (Text-Upper Left) 20 Y (Text-Upper Left) 30 Site/Cam Text SmarTek Systems...

1) Group Line Zones to Vehicle Presence Relays (VPRs) using Check Boxes (OR'ed) ...

2) Group VPRs to Relay Card Channel Using Check Boxes (O-OR'ed, A-AND'ed) on th...

Specifies mapping to Onboard Output Relay Connector (1, 2, ..., 10 0-No mapping to Onboard Output Relay)

Specifies each VPR Activation Delay in seconds

Specifies each VPR Activation Extension in seconds

After setting the parameters for all Line Zones, Circle Zones, the Light Reference, and the Detection Zones to Relay Mapping, click the OK button on each display to capture the settings. Note that these settings must be sent to the corresponding SVS-1 camera processing channel (SVS0001, SVS0002, etc.) to remove the yellow parameter mismatch warning flag.



# SVS-1 Grouping Vehicle Presence Relays to Form Output Relays

The right half of the display is used to combine (via ANDing or ORing) VPRs (rows) to form Output Relays (columns- 1A, 1B, 2A, 2B, etc.). These relays are contained in the serial message sent to a corresponding (SVS0001, SVS0002, etc.) External Relay Interface Board which is plugged into a detector card file slot.

Output Relays (1A, 1B, 2A, 2B, etc.)

Check Boxes Specify VPRs (rows) to combine (via AND or OR) to form Output Relays (columns)

Det	Det	OB	Main RL Card				Aux 1 RL Card				Aux 2 RL Card	
Ext	Delay	Relay	1A	1B	2A	2B	3A	3B	4A	4B	5A	5B
[sec]	[sec]	En	Q A	Q A	Q A	Q A	Q A	Q A	Q A	Q A	Q A	Q A
0	1	0	<input checked="" type="checkbox"/>									
0	2	0		<input checked="" type="checkbox"/>								
0	3	0			<input checked="" type="checkbox"/>							
0	0	0				<input checked="" type="checkbox"/>						
0	0	0					<input checked="" type="checkbox"/>					
0	0	0						<input checked="" type="checkbox"/>				
0	0	0							<input checked="" type="checkbox"/>			
0	0	0								<input checked="" type="checkbox"/>		
0	0	0									<input checked="" type="checkbox"/>	
0	0	0										<input checked="" type="checkbox"/>

Vehicle Presence Relays (VPRs) (Rows)

Refer to the SVS-1 User Guide – Part C (Hardware Wiring Diagram) for description of how to route each Output Relay (1A, 1B, 2A, 2B, etc.) to each card edge position (F, W, S, and Y) on the External Relay Interface Card.

After setting the parameters for all Line Zones, Circle Zones, the Light Reference, and the Detection Line Zones to Relay Mapping, click the OK button on each display to capture the settings. Note that these settings must be sent to the corresponding SVS-1 camera processing channel (SVS0001, SVS0002, etc.) to remove the yellow parameter mismatch warning flag.



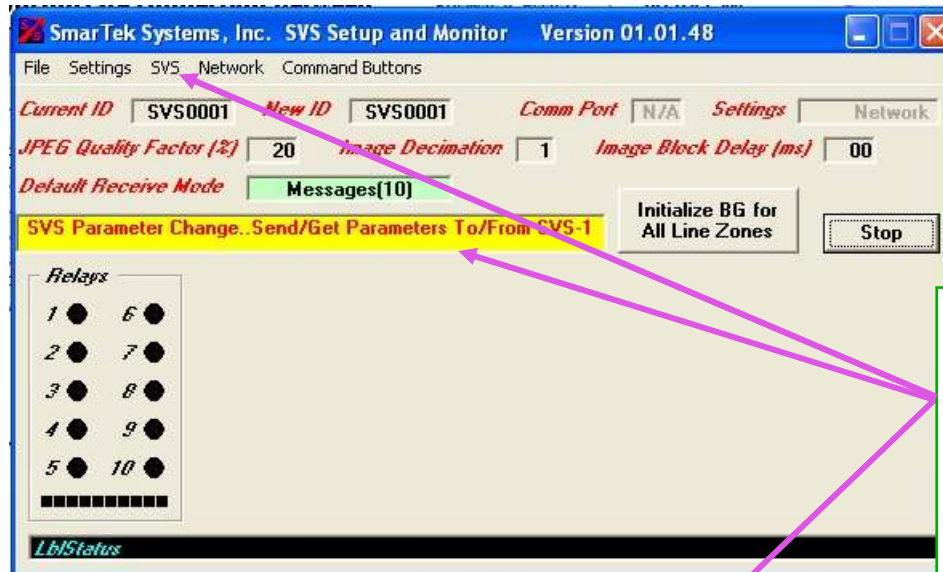
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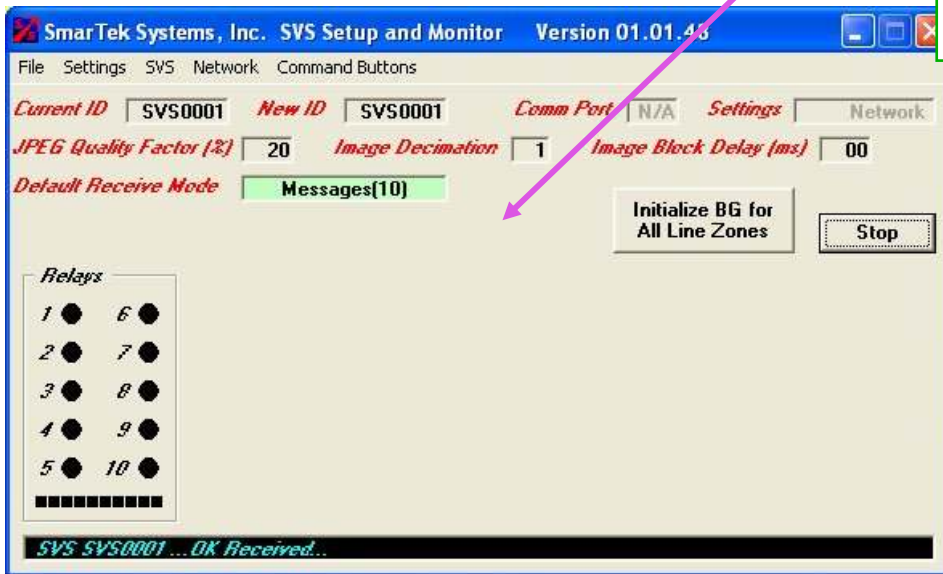
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## SVS-1 – Sending Parameters to a Specific SVS-1 Camera Processing Channel (SVS ID)



After setting up all Line Zones, Circle Zones, the Light Reference Parameters, and the Detection Zones to Relay Mapping, these settings must be sent to the corresponding SVS-1 camera processing channel (SVS ID) to remove the yellow parameter mismatch warning flag.

Use SVS/Send SVS Parameters menu item.



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## SVS-1 – Detection Zone Sensitivity Parameters

The sensitivity parameters for each Line Zone and associated Circle Zone are displayed to the right of the camera image. Choose a zone by clicking 1 of 30 option buttons in the Zone Select Frame (below the image). The following sections provide detailed descriptions for each of the Line Zone/Circle Zone parameters.

**Detection Threshold** – Specifies Line Zone detection sensitivity and may be adjusted by changing the Detection Threshold value . Increasing the Detection Threshold will decrease sensitivity. Line Zone Detection Threshold values should range between 5.0 and 15.0 with the default value being 12.0.

**Detection Enable Time Out** – Specifies the amount of time that a line zone detection is enabled after a circle zone detection is made. The circle zone is at the up road end of a line zone, hence, for directional detection, the circle zone should “fire” first and then the line zone “fires”. Additionally, this parameter specifies the maximum amount of time that is allowed to pass for a detection on the down road half of a line zone after a detection on the up road half of a line zone. Again for directional detection, the up road half of a line zone should “fire” before the down road half of a line zone “fires”. The Detection Enable Time Out parameter is in seconds with the default value being 2 second.

**Note:** Setting the Detection Enable Time Out to 221 enables Circle Zone Detection only. When this parameter is set to 221, the Enable TO(s) label is shown in red.

**Background Adaptation Percentage** – Specifies the amount that the “Vehicle Absent” Background estimate is allowed to adapt or adjust dynamically over time. A value of 100% is typically set to allow full background estimate adaptation. “Vehicle Absent” background adaption allows for non-uniform pavement scenes and non-vehicle related changes due to lighting, weather, and painted features.

After setting the parameters for a specific Line Zone (and corresponding Circle Zone), the parameters for all other zones may be set to the same values using the Set Parameters for All Zones button. This does not change positions of the zones, just the sensitivity parameters.



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## SVS-1 – Detection Zone Sensitivity Parameters (continued)

**Harmonic High Pass Frequency, Background Training Threshold, and Detection Enable Thresholds** – Specify parameters that are used to fine tune vehicle presence detection performance, Vehicle Absent Background estimation, and shadow rejection performance. The values for these parameters should not be changed without guidance from SmarTek Systems staff. The default value for the Harmonic High Pass Frequency parameter is 70 (range from 40 to 100). The default value for the Background Training Threshold is 1 for more strict training or 2 for more relaxed training (when setting this parameter, always start with a value of 1). The default value for the Detection Enable Threshold (used during daytime lighting) is 2. The default value for the Detection Enable Threshold-Night (used during night-time lighting) is 1. This parameter is used to reduce false detections of shadows caused by adjacent lane vehicles. Increasing the value of the Detection Enable Threshold parameter increases shadow discrimination, and the range of this parameter is 0 to 8. However, making this parameter value too large will degrade vehicle presence detection performance.

**Training Lockout Time** – Specifies the amount of time in seconds that background training is locked out after a dynamic event is present. The events that lock out training include a circle zone pixel variation from one video frame to another or line zone pixel value deviation from the current background estimate. The default value for the Training Lockout Time is 0.5 minutes, however, the value of this parameter should be near the cycle time of the traffic light (time red light is on).

**Derivative Threshold** – Specifies the threshold for the slope of the line zone pixel deviation from the background that when crossed causes background training lockout. The default value for the Derivative Threshold is 3.0. This parameter should not be set below 3.0.

**Derivative Alpha** – Specifies the smoothing filter coefficient for the slope of the line zone pixel deviation from the background. The default value for the Derivative Alpha is 0.2.

After setting the parameters for a specific Line Zone (and corresponding Circle Zone), the parameters for all other zones may be set to the same values using the Set Parameters for All Zones button. This does not change positions of the zones, just the sensitivity parameters.



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## SVS-1 – Setting Detection Zone Sensitivity Parameters (continued)

**Circle Zone Radius**– Specifies the size of the Circle Detection Zone. The circle zone is located at the up road end of the corresponding Line Detection Zone and is used as part of the directional detection criterion. The Circle Zone size is dependent on the specific image of the intersection stop line area. The Circle Zone radius should be chosen so that it's diameter is approximately 1/5 the width of the lane it resides in. The default value is 12.

**Circle Zone Quantization Threshold** – Specifies the pixel value quantization threshold to be used to determine which pixels contained in the circle zone are used for processing to obtain the Circle Zone detection measurement. The default value of 15 should be used. Changing this value should only be done with direction from SmarTek Systems staff.

**Circle Zone Detection Threshold** – Specifies Circle Zone detection sensitivity and may be adjusted by changing the Circle Zone Threshold value . Increasing the Circle Zone Threshold will decrease sensitivity. Circle Zone Detection Threshold values should range between 5.0 % and 20.0 % (the default value is 10.0 %).

**Measurement Alpha** – Specifies the smoothing factor to apply to all detection measurements (Circle Zone and Line Zone measurements). The default value for the Measurement Alpha is 0.200. Values can range from 0.5 (very dynamic) to 0.001 (very sluggish).

After setting the parameters for a specific Line Zone (and corresponding Circle Zone), the parameters for all other zones may be set to the same values using the Set Parameters for All Zones button. This does not change positions of the zones, just the sensitivity parameters.



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## SVS-1 – Setting Light Reference Parameters and Visibility Parameters

The parameters for the Light and Visibility Reference are displayed to the right of the camera image. Choose the Light Reference by clicking LR option button in the Zone Select Frame (below the image). The following section provides detailed descriptions for each of the Light Reference and Visibility parameters.

**Light Reference Detection Threshold**– Specifies the threshold that the position of the dominant image histogram peak is compared to for determining lighting conditions (day or night). The Light Reference Threshold value is set slightly below the position of the image histogram dominant peak during day time light conditions. The default value is 70.

**Light Reference Smoothing Alpha** – Specifies the smoothing filter coefficient for the image histogram. The range of this parameter is from 0.5 (very dynamic) to 0.0001 (very sluggish). The default value is 0.0005.

**Visibility Time Out** – Specifies the amount of time to wait when there are no vehicle detections before determining visibility conditions. The default value is 5 minutes.

**Visibility Threshold** – Specifies the threshold for comparing the visibility measurement variable (low value for no visibility and high value for good visibility). Setting the threshold too high may cause visibility false alarms. During a “No Visibility” condition, all Output Relay states are set to active indicating failure. The default value for the Visibility Threshold is 10.

**Show Visibility Reference Grid** – Specifies whether to show the Visibility Reference Grid in the Output Video signal. The Visibility Reference Grid shows up as 5 green horizontal lines in the output video display.



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