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# MODEL S-1212

Firmware Version 35.02

## TWO CHANNEL LOOP DETECTOR OPERATING INSTRUCTIONS

### I Factory Default Settings

Function	Channel 1	Channel 2
Loop Frequency (8 settings)	3	7
Sensitivity Level (OFF, 1 to 9, CALL)	6	6
Presence / Pulse Mode	Presence	Presence
Call Delay Time (0 to 255 seconds)	0	0
Call Extension Time (0 to 25.5 seconds)	0.0	0.0
Max Presence Time (OFF, 1 to 999 seconds)	OFF	OFF
End-of-Green (EOG)	OFF	OFF
Option 1 - Display Loop Inductance (L) *	OFF	OFF
Option 2 - Display % Loop Inductance Change (-ΔL/L) *	OFF	OFF
Option 3 - Call Extension Control	OFF	OFF
Option 4 - Noise Filter Disable *	OFF	OFF
Option 5 - Phase Green Loop Compensation	OFF	OFF
Option 6.0 - Display Vehicle Count	OFF	OFF
Option 6.1 - Reset Vehicle Count	OFF	OFF
Option 7 - Number of Loops for Vehicle Counting	04	04
Option 9 - Third Car Passage *	OFF	OFF
Option 10 - Directional Logic *	OFF	OFF
Option 11 - Audible Detect Signal **	OFF	OFF
Option 12 - Detector Disconnect **	Off	OFF
Detect ID	000	000

**NOTES:** \* These settings affect both channels.  
 \*\* These settings affect each channel independently.

### II Viewing and Programming Detector Functions

#### i Entering and Exiting Program Mode

- Enter the Program mode by momentarily pressing the **FUNC** pushbutton. Use the **FUNC** pushbutton to step through the functions described below.
- Press the **CHAN** pushbutton to select the channel to view or make changes to. The channel that is in Program mode is indicated by a flashing numbered-loop symbol at the bottom of the Liquid Crystal Display (LCD).
- To change a function's setting or to toggle a function **ON** or **OFF**, press the ▲ (UP) or ▼ (DOWN) pushbutton.
- To exit the Program mode and return to the Normal display mode, press and hold the **CHAN** pushbutton continuously for one second.

#### Loop Frequency

Loop Frequency can be adjusted from **1** to **8**. Press the ▲ (UP) or ▼ (DOWN) pushbutton to change the programmed Loop Frequency. The filled segment on the bargraph indicates the setting. The left-most segment represents setting 1 and the right-most segment represents setting 8. The LCD displays the actual operating frequency of the loop circuit. A separation of at least 5 KHz for adjacent loops, not connected to the same detector, is recommended. The factory default setting is Loop Frequency 3 for Channel 1 and Loop Frequency 7 for Channel 2. **NOTE: Changing the Loop Frequency setting will reset the detector channel. The Loop Frequency setting should not be changed while the detection zone is occupied.**

## Sensitivity Level

The Sensitivity Level can be adjusted from **1** to **9** or set to **CALL** or **OFF**. Press the ▲ (UP) or ▼ (DOWN) pushbutton to change the programmed Sensitivity Level. The lowest Sensitivity Level is 1 and the highest Sensitivity Level is 9. Each detector channel can be configured to place a permanent call by selecting **CALL** (one setting above Sensitivity Level 9). The detector channel can be disabled by selecting **OFF** (one setting below Sensitivity Level 1). If **CALL** or **OFF** is selected, the LCD flashes the message **CALL** or **OFF** during Normal display mode. Refer to **Section IV Sensitivity Setting** for instructions on how to use the bargraph to determine the proper Sensitivity Level setting for the loop / lead-in network connected to the detector channel. The factory default setting is Sensitivity Level 4 for both channels. **NOTE: Changing the Sensitivity Level setting will reset the detector channel. The Sensitivity Level setting should not be changed while the detection zone is occupied.**

## Presence / Pulse Mode

Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton toggles between Presence and Pulse modes. Presence Mode provides a Call hold time of at least four minutes (regardless of vehicle size) and typically one to three hours for an automobile or truck. When operating in Pulse Mode, an output pulse of  $125 \pm 10$  milliseconds duration is generated for each vehicle entering the loop detection zone. Each detected vehicle is instantly tuned out if it remains in the loop detection zone longer than two seconds. This enables detection of subsequent vehicles entering the loop detection zone. After each vehicle leaves the loop detection zone, the detector channel resumes full sensitivity within 0.5 seconds.

Call Extension, Call Delay, and Max Presence can all modify the operation of Presence Mode. Only Call Extension and Call Delay modify Pulse Mode operation. The factory default setting of this Presence / Pulse Mode is **OFF** (Presence Mode) for both channels.

## Call Delay Time

Call Delay Time can be adjusted from 0 to 255 seconds by pressing the ▲ (UP) or ▼ (DOWN) pushbutton. When the Call Delay Time is set to 0 seconds, pressing the DOWN pushbutton steps the value up to 255 seconds. When the Call Delay Time is set to 255 seconds, pressing the UP pushbutton steps the value down to 0 seconds. During the Call Delay period, the Detect / Fail LED flashes at a four Hz rate with a 50% duty cycle, the LCD displays a countdown of the Call Delay Time, and the output remains inactive. When a vehicle enters the detection zone, the delay begins to count down. At the end of the delay time, the output activates and the LED turns on. The factory default setting of Call Delay Time is 0 seconds for both channels.

## Call Extension Time

Call Extension Time can be adjusted from 0 to 25.5 seconds by pressing the ▲ (UP) or ▼ (DOWN) pushbutton. When the Call Extension Time is set to 0 seconds, pressing the DOWN pushbutton steps the value up to 25.5 seconds. When the Call Extension Time is set to 25.5 seconds, pressing the UP pushbutton steps the value down to 0. During the Call Extension period, the Detect / Fail LED flashes at a 16 Hz rate with a 50% duty cycle and the LCD displays a countdown of the Call Extension Time. When a vehicle leaves the detection zone, the output remains active until the extension time reaches 0. The factory default setting of Call Extension Time is 0.0 seconds for both channels.

## Max Presence Time

Max Presence Time can be adjusted from OFF to 999 seconds by pressing the ▲ (UP) or ▼ (DOWN) pushbutton. When Max Presence time is set to **OFF**, pressing the ▼ (DOWN) pushbutton steps the value to 999 seconds.

A Call output occurs either when a vehicle is detected (Delay Time = 0) or after the delay timer has counted down to zero following the arrival of a vehicle. The Max Presence timer starts timing when a Call output occurs. Any time a Call output drops while the Max Presence timer is timing, the Max Presence timer is reset to the Max Presence time setting. The Max Presence timer counts towards zero as long as the Call output exists. When the Max Presence timer reaches zero, the detector is reset. The factory default setting of Max Presence Time is **OFF** for both channels. **NOTE: If the Max Presence timer does reset the detector, no Call Extension time will occur.**

## End-of-Green (EOG)

Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton toggles between **ON** and **OFF**. See Max Presence Time above for the effects of turning this feature on. The factory default setting of End-of-Green is **OFF** for both channels. **NOTE: The End-of-Green screen is visible only if Max Presence Time is not set to OFF.**

## Option 1 - Display Loop Inductance (L)

Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton toggles Option 1 between **ON** and **OFF**. When Option 1 is **OFF**, the LCD indicates three dashed lines (- - -) during a No Call state or **CALL** and the Call strength (via the LCD bargraph display) during a Call state. When Option 1 is **ON** and the detector is operating in Normal display mode, the LCD continuously indicates the Loop Inductance value (L) in microhenries ( $\mu\text{H}$ ) between 15 and 2500  $\mu\text{H}$ . The display shows three digits if the inductance is between 15 and 999  $\mu\text{H}$ . If the inductance is greater than 999  $\mu\text{H}$ , the display alternately flashes between **1** or **2** and the lower three digits. The combination of the one and three digit displays represent inductance values from 1000 to 2500  $\mu\text{H}$ . When a vehicle is detected, the Call is indicated by means of the Detect / Fail LED and the LCD bargraph display. The countdown of the Delay, Extension, and/or Max Presence timers is **not** displayed when Option 1 is **ON**. Once activated, Option 1 will automatically turn off after five (5) minutes have elapsed. The factory default setting of Option 1 is **OFF** for both channels.

## Option 2 - Display % Loop Inductance Change (- $\Delta$ L/L)

Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton toggles Option 2 between **ON** and **OFF**. When Option 2 is **OFF**, the LCD indicates a Call when a vehicle is detected. When Option 2 is **ON**, the LCD indicates the - $\Delta$ L/L value when a vehicle is detected. The maximum - $\Delta$ L/L that occurred is displayed for two seconds unless a greater change occurs. Once activated, Option 2 will automatically turn off after five (5) minutes have elapsed. The factory default setting of Option 2 is **OFF** for both channels.

## Option 3 - Call Extension Control

Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton toggles between **ON** and **OFF**. When Option 3 is **OFF**, the detector extends all calls for the programmed extension time. When Option 3 is **ON**, the detector extends calls for the programmed extension time only when the associated Phase Green Input (Delay Override) signal is active. The factory default setting of Option 3 is **OFF** for both channels.

## Option 4 - Noise Filter Disable

Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton toggles between **ON** and **OFF**. When Option 4 is **OFF**, internal noise filtering is utilized. When Option 4 is **ON**, internal noise filtering is disabled thus providing a faster response time. Changing the setting of this option will reset both detector channels. **It is recommended that this option only be turned ON when the detector is used for speed and/or occupancy measurement applications.** The factory default setting of Option 4 is **OFF** for both channels. **NOTE: Turning this option ON for either channel turns it ON for both channels.**

### Option 5 - Phase Green Loop Compensation

Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton toggles between **ON** and **OFF**. When Option 5 is **OFF**, normal loop compensation is used. No compensation occurs during the first four minutes following the detection of a vehicle to preserve small motorcycle detection for a full four minutes. When Option 5 is **ON**, loop compensation begins when the Phase Green (Delay Override) input becomes true and the channel is outputting a Call. The channel will then begin to tune out small changes, such as adjacent lane pick up and/or loop drift. The presence time for average size vehicles is not affected (note that a small motorcycle will also be tuned out in a short period of time following the start of Phase Green). This option is useful in minimizing false detection resulting from adjacent lane pickup effect. The factory default setting of Option 5 is **OFF** for both channels.

### Option 6 - Display / Reset Vehicle Count

This option has two parameters. Option 6.0 is used to turn the display of vehicle counts **ON** and **OFF**. Option 6.1 is used to reset the vehicle count to zero. Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton toggles between **ON** and **OFF** for either parameter. When Option 6.0 is **ON**, the display will show the accumulated vehicle count since last vehicle count reset. The display will show the hundreds, tens, and ones digits until the accumulated count exceeds 999. At this point the display will alternate between the ten thousands and thousands digits and the remaining three digits for hundreds, tens, and ones. Setting Option 6.1 to **ON** resets the accumulated vehicle count. The setting automatically returns to the **OFF** state when the parameter is exited. The factory default setting of Option 6 is **OFF** for both channels.

### Option 7 - Number of Loops for Vehicle Counting

Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton scrolls through the available Option 7 loop configurations for counting. The available loop configurations are **7.00** through **7.05**. Option 7 settings **7.00** and **7.01** are for single loop configurations. A setting of **7.00** will provide a single count output only when the detector enters the detect state. If multiple vehicles occupy the detection zone at the same time, only the first vehicle will prompt a vehicle count. A setting of **7.01** will provide a count output for each vehicle that enters the detection zone. This setting allows identification of multiple vehicles that may occupy the detection zone at the same time. Settings of **7.02**, **7.03**, **7.04**, and **7.05** are used for multiple loop configurations. The last two digits specify how many loops there are in the detection zone. These settings will also provide a count output for each vehicle that enters the detection zone. The detection zone must be confined to a single lane of traffic. The factory default setting of Option 7 is **7.04** for both channels.

### Option 9 - Third Car Passage

Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton toggles between **ON** and **OFF**. Option 9 is a paired channel option. This means that it requires two detector channels to perform the function. Channel 1 is paired with Channel 2 and Channel 3 is paired with Channel 4. When this option is changed for one of the paired channels, the state of the option for the other paired channel is changed to match it. When Option 9 is **OFF** the detector channel operates normally. When Option 9 is **ON**, the output of the two paired channels are logically ANDed together. This means that neither channel will output a Call until both channels have detection. The first channel with detection will enter a pending state while waiting for detection in the other paired channel. While in the pending state, the LCD will show **Pnd**. The factory default setting of Option 9 is **OFF** for both channels. **NOTE: Option 9 is mutually exclusive with Option 10. Turning ON one option will automatically turn OFF the other option.**

### Option 10 - Directional Logic

Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton toggles between **ON** and **OFF**. Option 10 is a paired channel option. This means that it requires two detector channels to perform the function. Channel 1 is paired with Channel 2. When this option is changed for one of the paired channels, the state of the option for the other paired channel is changed to match it. When Option 10 is **OFF**, the detector channel operates normally. When Option 10 is **ON**, directional logic is enabled. Directional logic starts with a detection on one channel. This channel will go into the pending state, display **Pnd** on the LCD, and NOT output a call. When both of the paired channels have a detection, the last channel to have a detection will output a Call until the detection for the last channel ends, even if the detection ends for the first channel. None of the timing functions of the first channel with a detection will time (Delay, Extension, and Max. Presence) and the first channel will always operate in the Presence Mode regardless of programming for the channel. The factory default setting of Option 10 is **OFF** for both channels. **NOTE: Option 10 is mutually exclusive with Option 9. Turning ON one option will automatically turn OFF the other option.**

### Option 11 - Audible Detect Signal

Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton toggles Option 11 between **ON** and **OFF**. When Option 11 is **ON**, an audible signal is emitted as long as the detection zone is occupied (if the detector channel is set to operate in Presence Mode), or for a period of two seconds (if the detector channel is set to operate in Pulse Mode). Delay and Extension time have no effect on the audible signal. Once activated, Option 11 will automatically turn off after five (5) minutes have elapsed. The factory default setting of Option 11 is **OFF** for both channels. **NOTE: Only one channel can have Option 11 enabled at any given time.**

### Option 12 - Detector Disconnect

Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton toggles Option 12.0 between **ON** and **OFF**. When Option 12.0 is turned **ON**, detector disconnect is enabled for that channel and Option 12.1 is now accessible. If Option 12.1 is **OFF**, the extension timer also serves as the disconnect timer. If Option 12.1 is **ON**, the extension timer is inoperative and its programmed value is used as the disconnect timer (gap timer). When Detector Disconnect is enabled (Option 12.0 is **ON**), the detector operates normally during times when the phase green input for the channel is OFF. When the phase green input is ON, the detector will use the value programmed as extension time to determine when to disconnect the output for that channel. Therefore, if the detection zone is empty for the amount of time specified in the extension timer, the output for that channel will be disconnected. If a call does not exist when the phase green input transitions to ON, the output is immediately disconnected. The output is re-enabled when the phase green input transitions to OFF. The factory default setting of Option 12 is **OFF** for both channels.

### Detector ID

This feature is used to assign a unique identification value to the detector for communication purposes. Detector ID settings can range from **000** to **253**. Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton will increment or decrement the ID setting by one digit. **NOTE: When first initialized, the detector ID setting is 000.**

### Loop Fail

The number of loop failures logged in the loop fail register is displayed. Any time the detector enters the Fail Safe Mode due to a recognized loop failure, the loop fail register is incremented by one count. When viewing the loop fail register, pressing either the ▲ (UP) or ▼ (DOWN) pushbutton will clear the register. The number of loop fail counts is also reset to zero by any power down or when the detector channel is reset. The loop fail register is not reset when the detector channel's sensitivity level or frequency is changed.

After the detector is initialized and operating in a normal manner, the loop is continuously monitored for faulty conditions (e.g. broken wires, poor splices, bad solder connections, etc.). If the measured loop inductance value rapidly changes by more than  $\pm 25\%$ , the loop is considered to have failed. The detector then enters the Fail Safe Mode, which generates a constant Call output. When the detector is in Fail Safe Mode, the **LOOP FAIL** symbol located at the bottom of the LCD will be illuminated and the LCD will display **L lo** for low loop inductance and shorted loop situations or **L hi** for high loop inductance and open loop situations. In addition, the Detect /Fail LED will begin to emit a flashing pattern (three flashes per second). If the loop self-heals, the detector and LCD will resume normal operation. The LED will continue to flash as a means of indicating a prior loop fail condition and will continue to do so until the loop fail register is cleared.

### Firmware Version

The version and revision level of the firmware programmed into the detector are displayed. This is a view only parameter. The display alternates between the model letter and firmware version (e.g. **S35**) and the firmware revision level (e.g. **.00**).

## III Reset Procedures

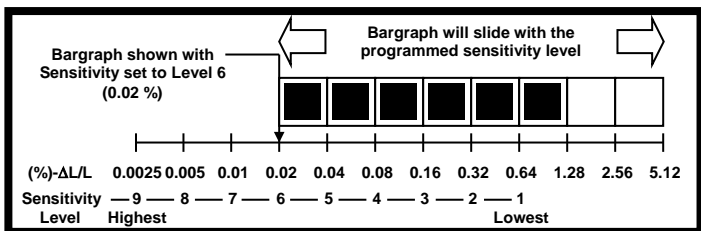
- Pressing and holding the **CHAN** pushbutton continuously for three (3) seconds will reset the displayed detector channel maintaining all previous settings.
- Changing the frequency or sensitivity setting will enter the new setting and reset the displayed detector channel. Changing any of the other parameters will take effect immediately or on the next detection, but will not reset the displayed detector channel. Simply entering the program mode without changing any parameter will not reset the displayed detector channel.
- Pressing and holding all four front panel pushbuttons simultaneously and continuously for five (5) seconds resets the detector and also restores all factory default settings.
- The detector can also be reset by connecting a logic ground signal to Pin C of the edge card connector or by the reapplication of power after a power loss.
- The Loop Fail History is cleared by all reset procedures described above except changing frequency or sensitivity. Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton while viewing the Loop Fail History will also clear the Loop Fail History.

## IV Sensitivity Setting

Sensitivity is controlled by selecting a Sensitivity Level for the detector channel. The sensitivity settings of 1 through 9 represent detection thresholds from the least sensitive to the most sensitive. Setting the proper Sensitivity Level for the loop circuit provides stability to the system and improves count accuracy. If set too high, the detector may detect adjacent traffic. If set too low, the detector may not detect small vehicles or high bed vehicles.

The LCD includes an eight (8) segment bargraph that is a representation of the relative change of inductance as seen by the detector. This automatically takes into account loop size, loop inductance, number of loops, number of turns, loop geometry, lead-in length, etc. The bargraph is a sliding scale that is related to the programmed Sensitivity Level. The first (left-most) bargraph segment represents the minimum inductance change necessary for the detector to output a Call at the currently selected Sensitivity Level. Larger inductance changes are indicated by more segments. Each additional segment indicates that the next Sensitivity Level has also been met or exceeded. When used in this manner, the bargraph can be used to determine if the sensitivity is set too high or too low, facilitating the optimal setting of the Sensitivity Level.

The diagram below shows the bargraph with the detector channel set to Sensitivity Level 6 (0.02%  $-\Delta L/L$ ). The bargraph indicates that the vehicle in the loop zone has exceeded the minimum Sensitivity Level by an additional five Sensitivity Levels or 0.64%  $-\Delta L/L$ . *The typical vehicle to be detected should cause five or six segments of the bargraph to become filled.*



If the typical vehicle to be detected is not creating a five to six segment display on the bargraph, count how many segments are being displayed and subtract six. If the number is positive, lower the sensitivity that many levels. If the number is negative, raise the sensitivity that many levels. Example: The detector channel sensitivity is currently programmed at three (3). The bargraph shows four (4) segments during a typical vehicle detection. Take four (4) (the number of segments displayed) and subtract six (6) to get minus two (-2). Since the answer is negative, raise the Sensitivity Level, currently at three (3), by two (2) to arrive at the desired Sensitivity Level of five (5).

The bargraph can also be used to take advantage of a direct relationship between the percent change of inductance caused by a single standard automobile and a small motorcycle in the same loop / lead-in configuration. Adjusting the Sensitivity Level until seven (7) segments of the bargraph are shaded when a standard automobile is present in the loop detection zone ensures that the sensitivity has been set high enough to detect a small motorcycle in the same loop detection zone. The best method to reduce adjacent loop detection is to reduce the Sensitivity Level by the number of segments that are flickering, however this will also eliminate the ability to reliably detect small motorcycles.