III. How to Reset the Detector:

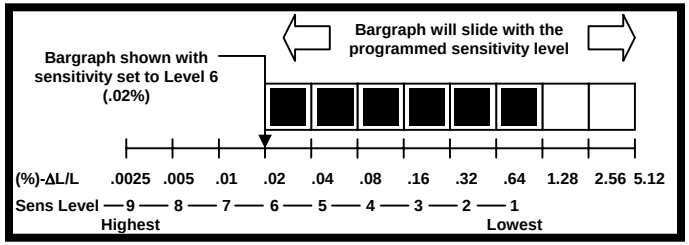
- Momentarily press the CHAN pushbutton until the channel to be reset is selected. Press and hold the CHAN pushbutton continuously for three (3) seconds. After three seconds the channel is reset maintaining all previous settings.
- Changing the frequency or sensitivity setting will enter the new setting and reset the channel. Changing any of the other parameters will take effect immediately or on the next detection, but will not reset the detector channel. **Simply entering the program mode without changing any parameter will not reset the channel.**
- Pressing and holding all four pushbuttons **simultaneously** and continuously for five (5) seconds resets both channels and also restores the default settings to both channels.
- Changing the setting of Option 4 (Noise Filter Disable) will reset both detector channels.
- The detector can be reset by removing and reapplying power.
- **Loop Fail History** is cleared by all reset procedures described above except changing the setting of Option 4 or 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 each channel. The sensitivity settings of 1 through 9 represent thresholds from the least sensitive to the most sensitive. Setting the proper sensitivity level for the loop circuit provides stability to the system. 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 relative 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 will indicate more segments. Each additional segment indicates that the next sensitivity level has also been met or exceeded. Therefore the bargraph indicates if the sensitivity is set too high or too low, easily facilitating the ideal setting of the sensitivity level.

The diagram below shows the bargraph with the channel set to Sensitivity Level 6: 0.02% -ΔL/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% -ΔL/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 for the channel until seven (7) segments of the bargraph are shaded when a standard automobile is present in the loop zone ensures that the sensitivity has been set to detect a small motorcycle in the same loop zone. If the left most segments of the bargraph are flickering when vehicles pass in the adjacent lane, the Phase Green Compensation can be turned on to minimize the effects of adjacent lane detection (see Option 5). The second method of reducing adjacent lane 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.

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ISO 9001 REGISTERED

O P E R A T I N G I N S T R U C T I O N S F O R

Model E-1000 Series

Firmware Version 34

FOUR CHANNEL LOOP DETECTOR

I. Factory Default Settings:

Function	Channel 1	Channel 2	Channel 3	Channel 4
Frequency (8 steps)	2	4	6	8
Sensitivity (OFF, 1 to 9, CALL)	6	6	6	6
Presence / Pulse	Presence	Presence	Presence	Presence
CALL Delay Time (0 - 255 seconds)	0	0	0	0
CALL Extension Time (0 - 25.5 seconds)	0.0	0.0	0.0	0.0
Max Presence Time (OFF, 1 - 999 seconds)	OFF	OFF	OFF	OFF
End Of Green	OFF	OFF	OFF	OFF
Option 1 (Loop Inductance, L) *	OFF			
Option 2 (% Inductance Change, -ΔL/L) *	OFF			
Option 3 (CALL Extension Time Control)	OFF	OFF	OFF	OFF
Option 4 (Noise Filter Disable) *	OFF			
Option 5 (Phase Green Loop Compensation)	OFF	OFF	OFF	OFF
Option 9 (Third Car Passage) **	OFF		OFF	
Option 10 (Directional Logic) **	OFF		OFF	
Option 11 (Audible Detect)	OFF	OFF	OFF	OFF
Option 12 (Detector Disconnect)	OFF	OFF	OFF	OFF

*Notes: * These settings are per unit, not per channel.*
*** These settings affect two channels*

II. How to View and Program Detector Functions:

- 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 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 mode, press and hold the CHAN pushbutton continuously for one second.

LOOP FREQUENCY

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 will display 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. **NOTE:** Changing the frequency will reset the detector channel. Care should be taken to ensure that the detector channel is not reset while the detection zone is occupied.

SENSITIVITY

Press the ▲ (UP) or ▼ (DOWN) pushbutton to change the programmed sensitivity. The lowest Sensitivity Level is 1 and the highest Sensitivity Level is 9. The channel can be configured to place a permanent call by selecting CALL (one setting after Sensitivity Level 9). The channel can be disabled by selecting OFF (one setting before Sensitivity Level 1). If CALL or OFF is selected, the LCD flashes the message ***CALL*** or ***OFF*** during NORMAL DISPLAY mode. See *Section IV Sensitivity Setting* for instructions on how to use the bargraph to determine the proper sensitivity setting for the loop / lead-in network connected to the channel. **NOTE:** Changing the sensitivity will reset the detector channel. Care should be taken to ensure that the detector channel is not reset while the detection zone is occupied.

PRESENCE / PULSE

Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton toggles between PRESENCE and PULSE modes. PRESENCE mode outputs a call as long as the detection zone is occupied. CALL EXTENSION, CALL DELAY, and MAX PRESENCE can all modify the operation of the PRESENCE mode. PULSE mode generates a 125 millisecond pulse when a vehicle is first detected. Only CALL EXTENSION and CALL DELAY modify PULSE mode operation.

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 0, pressing the DOWN pushbutton steps the value to 255 seconds. When the Call Delay Time is 255 seconds, pressing the UP pushbutton steps the value to 0. During the DELAY PERIOD, the channel's LED flashes at a four Hz rate with a 50% duty cycle and the LCD shows a countdown of the Call Delay Time.

CALL EXTENSION TIME

Call Extension Time can be set from 0.0 to 25.5 seconds by pressing the ▲ (UP) or ▼ (DOWN) pushbutton. When the Call Extension Time is 0.0, pressing the DOWN pushbutton steps the value to 25.5 seconds. When the Call Extension Time is 25.5 seconds, pressing the UP pushbutton steps the value to 0.0. During the EXTENSION PERIOD, the channel's LED flashes at a 16 Hz rate with a 50% duty cycle and the LCD shows a countdown of the Call Extension Time.

MAX PRESENCE TIME

Max Presence Time can be adjusted from OFF to 999 seconds by pressing the ▲ (UP) or ▼ (DOWN) pushbutton. When the time is set to OFF, pressing the DOWN pushbutton steps the value to 999 seconds. If Max Presence Time is set to anything other than OFF, an EOG selection appears on the LCD after the Max Presence selection.

A call output occurs when either 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. If EOG (End of Green) control is OFF, the detector channel resets at the time the Max Presence timer reaches zero. If EOG is ON, the detector channel goes into a wait state when the Max Presence timer reaches zero. The channel remains in the wait state until either the call drops, or the green input signal to the channel transitions from the ON condition to the OFF condition. If the call drops, no reset action occurs. If the Max Presence timer is in the wait state when the green input signal transitions from the ON condition to the OFF condition, the detector channel is reset with the vehicle over the loop. When the Max Presence timer is in the wait state, the ***MAX PRESENCE - EOG*** message flashes on the LCD. **NOTE:** If the Max Presence timer does reset the channel, no CALL EXTENSION time will occur.

EOG (END OF GREEN) NOTE: Only appears if MAX PRESENCE TIME is not set to OFF.

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.

OPTION 1: LOOP INDUCTANCE

Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton toggles between ON and OFF. When Option 1 is OFF the LCD indicates three dashed lines (- - -) during the No Call state. When Option 1 is ON the LCD continuously indicates the Loop Inductance value in microhenries while in the NORMAL DISPLAY mode. After 15 minutes, Option 1 turns OFF. The display shows three digits if the inductance is between 15 and 999 µH. If the inductance is greater than 999 µH, the display alternately flashes between ***1*** or ***2*** and the lower three digits. The four digits represent inductance values from 1000 to 2500 µH. When a vehicle is detected the Detect LED and bargraph display indicate the call. The count down of the Delay, Extension, and Max Presence timers is **not** displayed when Option 1 is ON. **NOTE:** Turning this option ON for any channel turns it ON for all channels.

OPTION 2: INDUCTANCE CHANGE -ΔL/L

Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton toggles between ON and OFF. When Option 2 is OFF, the LCD indicates a steady Call when a vehicle is detected. When Option 2 is ON, the LCD indicates the -ΔL/L value when a vehicle is detected. The maximum -ΔL/L that occurred is displayed for two seconds unless a greater change occurs. **NOTE:** Turning this option ON for any channel turns it ON for all channels.

OPTION 3: CALL EXTENSION TIME CONTROL

Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton toggles between ON and OFF. When Option 3 is OFF, the detector channel 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.

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 all detector channels. *It is recommended that this option only be turned ON when the detector is used for speed and/or occupancy measurement applications.* **NOTE:** Turning this option ON for any channel turns it ON for all 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.

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***. **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 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 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. **NOTE:** Option 9 is mutually exclusive with Option 10. Turning ON one option will automatically turn OFF the other option. 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.

OPTION 11: AUDIBLE DETECT SIGNAL

Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton toggles between ON and OFF. When Option 11 is ON for a channel, an audible signal is emitted any time that channel's detection zone is occupied. This option can only be turned ON for one channel at a time. The last channel to have Option 11 turned ON will be the only one with Option 11 turned ON. Delay and Extension time have no effect on the audible signal. Option 11 will automatically turn off after 15 minutes.

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.

LOOP FAIL

The number of loop failures logged in the loop fail register is displayed. Any time a channel enters the Fail Safe Mode due to a recognized loop failure, the loop fail register is incremented by one count. Pressing either the ▲ (UP) or ▼ (DOWN) pushbutton will clear the loop fail register. The number of loop fail counts is also reset to zero by any power down, when the harness is disconnected from the detector, or when the channel is reset. The loop fail register is not reset when the setting of Option 4 (Noise Filter Disable) is changed or when the channel's sensitivity or frequency is changed.

After each detector channel is initialized and operating in a normal manner, the channel is continuously monitored for faulty loop conditions (e.g. broken wires, poor splices, bad solder connections, etc.). If the measured loop inductance value rapidly changes by more than ±25%, the channel is considered to have failed. The channel then enters the Fail Safe Mode, which generates a constant Call Output. When a channel 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 corresponding channel's 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 firmware version and revision for the detector is displayed. This is a view only parameter. The display alternates between the model letter and firmware version (example ***E34***) and the firmware revision number (example ***.00***).