MODEL E/2-1501

Firmware Version 35.02

FOUR CHANNEL LOOP DETECTOR

OPERATING INSTRUCTIONS

I Factory Default Settings

Function	Default Setting			
	Channel 1	Channel 2	Channel 3	Channel 4
Loop Frequency (8 settings)	2	4	6	8
Sensitivity Level (OFF, 1 to 9, CALL)	4	4	4	4
Presence / Pulse Mode	Presence	Presence	Presence	Presence
Call Delay Time (0 to 255 seconds)	0	0	0	0
Call Extension Time (0 to 25.5 seconds)	0.0	0.0	0.0	0.0
Max Presence Time (OFF, 1 to 999 seconds)	OFF	OFF	OFF	OFF
Option 1 - Display Loop Inductance (L) *	OFF	OFF	OFF	OFF
Option 2 - Display % Loop Inductance Change (-ΔL/L) *	OFF	OFF	OFF	OFF
Option 9 - Third Car Passage	OFF	OFF	OFF	OFF
Option 11 - Audible Detect Signal	OFF	OFF	OFF	OFF

* NOTE: These settings affect all four channels.

II Front Panel Detect / Fail Indicators

Each channel has a red light emitting diode (LED) to indicate a Call output, Delay Timing, Extension Timing, or Failed Loop condition. A continuous ON state indicates a Call output. Delay Timing is indicated by a four Hz flash rate with 50% duty cycle (125 ms ON, 125 ms OFF). Extension Timing is indicated by a 16.6 Hz flash rate with 50% duty cycle (30 ms ON, 30 ms OFF). A flash rate of three 50 millisecond pulses indicates a current or prior loop failure condition. ***NOTE: To conserve power, the four, front panel mounted channel Detect / Fail LEDs are disabled five (5) minutes after the last actuation of any front panel pushbutton. Pressing any front panel pushbutton will reactivate the LEDs.***

III 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.

ii Program Mode Functions

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 2 for Channel 1, Loop Frequency 4 for Channel 2, Loop Frequency 6 for Channel 3, and Loop Frequency 8 for Channel 4. ***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 Channels 1, 2, 3, and 4. ***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 ±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 option is ***OFF*** (Presence Mode) for Channels 1, 2, 3, and 4.

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, 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 Channels 1, 2, 3 and 4.

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, 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 Channels 1, 2, 3 and 4.

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 Channels 1, 2, 3, and 4. ***NOTE: If the Max Presence timer does reset the detector, no Call Extension time will occur.***

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 (µH) between 15 and 2500 µH. 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 combination of the one and three digit displays represent inductance values from 1000 to 2500 µH. 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 Channels 1, 2, 3, and 4.

Option 2 - Display % Loop Inductance Change (-ΔL/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 -ΔL/L value when a vehicle is detected. The maximum -ΔL/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 Channels 1, 2, 3, and 4.

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***.

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 Channels 1, 2, 3, and 4. ***NOTE: Only one channel can have Option 11 enabled at any given time.***

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 ±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. ***E35***) and the firmware revision level (e.g. ***.00***).

IV Reset Procedures

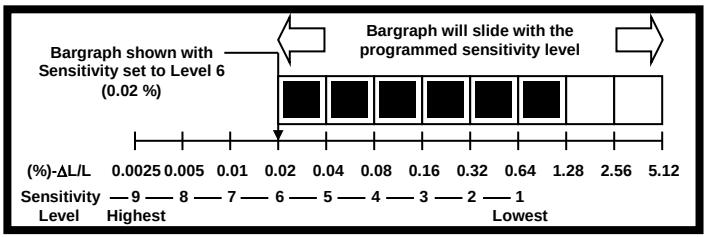
- Pressing and holding the **CHAN** pushbutton continuously for three (3) seconds will reset the displayed detector channel maintaining all previous settings.
- Changing the frequency or sensitivity setting will enter the new setting and reset the displayed detector channel. Changing any of the other 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.

V 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% -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 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.