

222 SERIES

TWO CHANNEL RACK MOUNT DETECTOR



- Two detector channels in a single unit
- Eight front panel DIP switches for each channel provide:
 - ◆ Eight levels of sensitivity
 - ◆ Presence or Pulse mode
 - ◆ Four loop frequencies
 - ◆ Fail-Safe or Fail-Secure operation
 - ◆ Channel disable
- Loops are sequentially scanned to eliminate crosstalk
- Loop fail event monitor remembers and indicates intermittent and current loop failures
- Detector is self tuning and provides complete environmental tracking
- Dual color (red / green), high intensity LEDs provide detect and loop fail indications
- Complete built-in detector integrity test
- Space provided on front panel to label each channel
- Audible detect signal (buzzer) facilitates loop and/or detector troubleshooting

With Audible Detect Signal

Ordering Information

Model 222-XX ← R = Relay outputs
Blank = Solid State outputs

Overview

The Model 222 is a California Department of Transportation (Caltrans) approved vehicle detector. Model 222 detectors are two channel, DIP switch programmable, card rack type loop detectors with individual channel detect and loop fail indications provided via two dual color, high intensity LEDs.



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222 SERIES SPECIFICATIONS

This is a Performance Specification. It is not intended to be used as Operating Instructions.

General Characteristics:

Loop Frequency Each channel has four (4) DIP switch selectable loop frequencies (normally in the range of 20 to 100 kilohertz) that are a function of the actual loop / lead-in network.

Sensitivity Eight (8) sensitivity levels are available for each channel. The eight settings are selectable using three DIP switches. Each of the eight sensitivity levels are binary encoded from 0 to 7 (lowest to highest sensitivity). The sensitivity level selected determines the percentage of negative inductance change of the loop circuit required for a Call output signal. (See **Sensitivity, -ΔL/L, & Response Time** table.)

Channel Disable When set to the Disable position, the channel output is continuously in the No Call state regardless of the presence or absence of vehicles over the loop. The loop oscillator is not activated when the channel is in the Disabled (ON) state. Changing this setting will reset the channel.

Presence / Pulse Mode Each channel can be independently set to operate in one of two modes by means of front panel mounted DIP switches.

Presence Mode Call hold time is a minimum of four minutes regardless of vehicle size, and is typically one to three hours for an automobile or truck.

Pulse Mode A pulse of 125 ±10 millisecond duration is generated for each vehicle entering the loop detection zone. Each vehicle detected is instantly tuned out if it remains in the loop detection zone longer than two seconds. This feature allows detection of vehicles subsequently entering the detection zone. After each vehicle leaves the loop detection zone, the channel resumes full detection sensitivity within one second. Changing the Presence / Pulse Mode switch will reset the channel.

Fail-Safe / Fail-Secure Operation During a loop failure condition, the state of the channel's output can be selected as Call in the Fail-Safe mode or No Call in the Fail-Secure mode. Fail-Safe operation during a loop failure is the standard mode of operation for intersection control. Fail-Secure operation during a loop failure is typically used for incident detection systems for freeway management. Fail-Secure selection also selects fast response for very accurate speed measurements. Changing this setting will reset the channel. (See **Sensitivity, -ΔL/L, & Response Time** table.)

Audible Detect Signal A front panel mounted pushbutton is used to enable an audible detect signal that is emitted any time a given channel's detection zone is occupied.

100 Millisecond Minimum Output When the detector is operating in Presence mode, two modes of operation are available for the Call outputs; Normal mode or 100 Millisecond Minimum Output mode. 100 Millisecond Minimum Output mode can be selected via a DIP switch on a PC board mounted two-position DIP switch module. When this feature is OFF, Call outputs will stay on only as long as the detection zone is occupied. When this feature is ON, every Call output will have a minimum duration of 100 milliseconds.

Detect / Fail Indicator Each channel has a super bright, high intensity, dual color (red / green) LED that indicates a Call output and/or the status of any current or prior loop fault condition. A continuous ON (green) state indicates a Call output. A continuous ON (red) state indicates that a current open loop failure condition or an inductance change condition of greater than +25% condition exists. A one Hz (red) flash rate indicates that a current shorted loop failure condition or an inductance change condition of greater than -25% condition exists. A flash rate of three 50 millisecond (red) pulses indicates a prior loop failure condition. A flash rate of three 50 millisecond (red) pulses followed by a 750 millisecond (green) pulse indicates a prior loop failure condition and a current Call output (detect state). If the audible detect signal is activated, any detect indication that would normally be displayed as green will be displayed as orange.

Loop Fail (Event) Monitor: If the total inductance of the loop input network goes out of the range specified for the detector, or rapidly changes by more than ±25%, the affected channel will immediately enter the programmed Fail-Safe or Fail-Secure mode of operation. Fail-Safe operation generates a continuous Call output in the Presence or Pulse mode. Fail-secure operation does not generate a Call output during a loop failure. In both modes of operation, the detect / fail LED will illuminate (red) and remain on for as long as the loop fault exists. If the loop self-heals, the channel will resume operation in a normal manner, but the detect / fail LED of the channel will begin to flash at a rate of three flashes per second as a means of indicating a prior loop fail condition. The detect / fail LED will continue its indication of a prior loop failure until the detector channel is reset, the detector channel is reset, or the detector is reset.

Specifications (Physical):

Weight 6.0 oz (170 gm.).

Size 4.50 inches (11.43 cm.) high x 1.12 inches (2.84 cm.) wide x 6.875 inches (17.46 cm.) deep (including connector, excluding handle). Handle adds 1.00 inch (2.54 cm.) to depth measurement.

Operating Temperature -40° F to +180° F (-40° C to +82° C).

Circuit Board Printed circuit boards are 0.062 inch thick FR4 material with 2 oz. copper on both sides and plated through holes. Circuit boards and components are conformal coated with polyurethane.

Connector 2 x 22 contact edge card connector with 0.156 inch (0.396 cm.) contact centers. Key slots located between pins B/2 & C/3, E/5 & F/6, and M/11 & N/12. (See **Pin Assignments** table.)

Specifications (Electrical):

Power 10.8 to 30 VDC. Solid State outputs, 100 mA maximum; Relay outputs, 130 mA maximum.

Loop Inductance Range 20 to 2000 microhenries with a Q factor of 5 or greater.

Loop Feeder Length Up to 5000 feet (1500 m) maximum with proper feeder cable and appropriate loops.

Loop Inputs Transformer isolated. The minimum capacitance added by the detector is 0.068 microfarad.

Scanning: The loop(s) connected to each detector channel are activated alternately to minimize crosstalk between adjacent loops connected to the same detector.

Lightning Protection The detector can tolerate, without damage, a 10 microfarad capacitor charged to 2,000 volts being discharged directly into the loop input terminals, or a 10 microfarad capacitor charged to 2,000 volts being discharged between either loop terminal and earth (chassis) ground.

Detector Reset Changing the position of either channel's DIP switches (except the frequency switches) will reset that detector channel. The detector can be reset by connecting a logic ground signal to Pin C (Reset Pin). Reapplication of power after a power loss will also cause the detector to reset. After changing either channel's frequency selection switches (DIP switches 2 & 3), the channel must be reset.

Solid State Outputs Optically isolated. 30 VDC max. collector (drain) to emitter (source). 100 mA max. saturation current. 2 VDC max. transistor saturation voltage. The output is protected with a 33-volt Zener diode connected between the collector (drain) and emitter (source).

Relay Outputs The relay contacts are rated for 6 Amps max., 150 VDC max., and 180 Watts max. switched power.

Response Time The response time of either channel is affected by the sensitivity level setting and Fail-Safe / Fail-Secure selection of that channel. When set to operate in Fail-Safe mode, response time is 65 ±25 milliseconds for all sensitivity levels. When set to operate in Fail-Secure mode, response time varies and depends on the sensitivity level selected. (See **Sensitivity, -ΔL/L, & Response Time** table.)

Self Tuning The detector automatically self tunes and is operational within two seconds after application of power or after being reset. Full sensitivity and hold time requires 30 seconds of operation.

Environmental & Tracking The detector is fully self-compensating for environmental changes and loop drift over the full temperature range and the entire loop inductance range.

Grounded Loop Operation The loop isolation transformer allows operation with poor quality loops (which may include one short to ground at a single point).

Test Mode A PCB mounted DIP switch enables Test Mode. Test Mode provides a means of verifying proper operation of the detector's controls and indicators (switches and LEDs). Each channel's loop oscillator circuit is also checked to verify the correct frequency in each of the four frequency settings.

Sensitivity, -ΔL/L, & Response Time

Sensitivity	-ΔL/L	Response Time	
		Fail-Safe Mode	Fail-Secure Mode
0	1.28%	65 +/-25 ms	3.5 +/-2.5 ms
1	0.64%	65 +/-25 ms	3.5 +/-2.5 ms
2	0.32%	65 +/-25 ms	3.5 +/-2.5 ms
3	0.16%	65 +/-25 ms	3.5 +/-2.5 ms
4	0.08%	65 +/-25 ms	4.5 +/-3.5 ms
5	0.04%	65 +/-25 ms	7.0 +/-6.0 ms
6	0.02%	65 +/-25 ms	11.5 +/-10.5 ms
7	0.01%	65 +/-25 ms	21.5 +/-20.5 ms

Factory Default Settings (Both Channels)

DIP Switch	ON	OFF	Factory Default
1	Channel Disabled	Channel Enabled	OFF
2	Four (4) Frequency Selections		OFF
3			OFF
4	Fail-Safe Mode	Fail-Secure Mode	ON
5	Presence Mode	Pulse Mode	ON
6			OFF
7	Eight (8) Sensitivity Selections		ON
8			ON

Pin Assignments

Pin	Function	Pin	Function
A	DC Common	1	No Connection
B	DC +	2	No Connection
C	Reset Input	3	No Connection
D	Channel 1 Loop Input	4	Channel 1 Loop Input
E	Channel 1 Loop Input	5	Channel 1 Loop Input
F	Channel 1 Output, Collector (Drain) / Relay Normally Open	6	No Connection
H	Channel 1 Output, Emitter (Source) / Relay Common	7	No Connection
J	Channel 2 Loop Input	8	Channel 2 Loop Input
K	Channel 2 Loop Input	9	Channel 2 Loop Input
L	Chassis Ground	10	No Connection
M	No Connection	11	No Connection
N	No Connection	12	No Connection
P	No Connection	13	No Connection
R	No Connection	14	No Connection
S	No Connection	15	No Connection
T	No Connection	16	No Connection
U	No Connection	17	No Connection
V	No Connection	18	No Connection
W	Channel 2 Output, Collector (Drain) / Relay Normally Open	19	No Connection
X	Channel 2 Output, Emitter (Source) / Relay Common	20	No Connection
Y	No Connection	21	No Connection
Z	No Connection	22	No Connection