

# Model 222S

## 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
- Front panel mounted Call /Test switch can be used to simulate Call output
- 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
- Space provided on front panel to label each channel
- Audible detect signal (buzzer) facilitates loop and/or detector troubleshooting

### Ordering Information:

**Model 222S-R** Two-channel detector with Relay outputs

**Model 222S-SS** Two-channel detector with Solid State outputs

\*\*Blank = Solid State Outputs

The Model 222S is a two channel, card rack type loop detector. It is designed for use in installations requiring a Type 332 / 170 detector. The Model 222S incorporates a three position Call /Test switch for each channel that can be used to simulate a continuous or momentary Call output. This feature is useful when troubleshooting problems related to detector outputs and / or controller inputs.

# Model 222S Series Specifications

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

**Loop Frequency:** Each channel has four (4) loop frequencies (normally in the range of 20 to 100 kilohertz) that are selectable by means of four front panel mounted DIP switches (two per channel). The actual loop operating frequency is a function of the loop / lead-in network and the components of the loop oscillator circuit.

**Sensitivity:** Eight (8) sensitivity levels are available for each channel. The eight settings are selectable by means of six front panel mounted DIP switches (three per channel). 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 the front panel mounted Disable DIP switch is turned On,, the channel's 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 state. Changing the Disable switch setting will reset the detector channel.

**Call / Test Switch:** The two detector channels can be independently set to provide a simulated Call output. Each detector channel has a front panel mounted, three position toggle switch that can be used to short the detector channel's output terminals in either a continuous (Call) or momentary (Test) closed state.

**Presence / Pulse Mode:** Each channel has a front panel mounted DIP switch that can be used to configure the channel to operate in one of two modes.

**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 milliseconds 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.

**100 Millisecond Minimum Output:** A PCB mounted DIP switch controls the 100 Millisecond Minimum Output feature. When any channel is set to operate in Presence Mode, two Call output modes for that channel's output are available based on the setting of the 100 Millisecond Minimum Output DIP switch. Setting the 100 Millisecond Minimum Output DIP switch to the On position activates the feature and every Call will have a minimum duration of 100ms. Setting the 100 Millisecond Minimum Output DIP switch to the Off position allows the detector to operate normally and the Call output duration is based on the amount of time a vehicle remains in the loop detection zone. This feature is useful as a means of ensuring that Calls output by the detector are seen by the controller since some controllers are unable to recognize short duration (< 100ms) events.

**Fail-Safe / Fail-Secure Operation:** During a loop failure condition, the state of a channel's output can be selected as Call in Fail-Safe mode or No Call in Fail-Secure mode. This is accomplished via two front panel mounted DIP switches. Operation in Fail-Safe mode during a loop failure is the generally accepted mode of operation for intersection control. Operation in Fail-Secure mode during a loop failure is typically used in incident detection systems used for freeway management. Changing a channel's Fail-Safe / Fail Secure setting will reset the channel.

**Audible Detect Signal:** A front panel mounted push-button can be used to enable an audible detect signal that is emitted any time a selected channel's detection zone is occupied.

**Detect / Fail Indicator:** Each channel has a super bright, high intensity, dual color (Red / Green) LED which indicates a Call output and / or the status of any current or prior loop fault condition for that channel. A green indication signifies a Call output (detect state). A red indication signifies a loop failure 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. When operating in Fail-Safe mode, this indication is also generates a Call output. When operating in Fail-Secure mode, no Call output is generated. A 1 Hz (red) flash rate indicates that a current shorted loop failure condition or an inductance change condition of greater than - 25% condition exists. When operating in Fail-Safe mode, this indication is also generates a Call output. When operating in Fail-Secure mode, no Call output is generated. 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).

**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 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 or the detector is manually reset.

**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 Input:** 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 any 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 any channel's Frequency selection switches (DIP Switches 2 and 3), the detector must be reset.

**Solid State Outputs:** Optically coupled transistors. 30 VDC maximum collector (drain) to emitter (source). 50 mA maximum saturation current. 2 VDC maximum transistor saturation voltage. The output transistors are protected by a 33 volt Zener diode connected between the collector (drain) and emitter (source).

**Relay Outputs (Optional):** The relay contacts are rated for 6 Amps maximum, 150 VDC maximum, and 180 Watts maximum switched power.

**Response Time:** Meets or exceeds NEMA TS 1-1989 specifications. 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 ms ±25 ms 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).

**Detect Outputs:** Per NEMA TS 1, conduction indicates detection output. The output is conductive in a DC power supply failure condition or during a loop failure (i.e. an open loop or shorted loop condition).

**Test Mode:** A PC board mounted DIP switch enables Test Mode. Test Mode provides a means of verifying proper operation of all of the detector's input and output circuitry including switches, LEDs, and outputs. Each channel's loop oscillator circuit is also checked to verify the correct frequency in each of the four frequency settings. The frequency portion of testing requires that each channel be connected to a 100 microhenry loop; if other inductance values are used, the frequency test results will be invalid.

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

**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.

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

**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.)

**Size:** 4.50 inches (11.43 cm) high x 1.12 inches (2.84 cm) wide x 6.88 inches (17.46 cm) deep (including connector, excluding handle). Handle adds 1.00 inch (2.54 cm) to depth measurement.

**Weight:** 6.0 oz (170 gm).

| Sensitivity | -ΔL/L  | Response Time  |                   |
|-------------|--------|----------------|-------------------|
|             |        | Fail-Safe Mode | Fail-Secure Mode  |
|             |        | 0              | 1.28%             |
| 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  |

\* Denotes Factory Default

Notes: Changing any of a channel's sensitivity switches will reset that channel. To achieve the exact response times listed above, the Sensitivity level and Fail-Safe / Fail-Secure settings for both channels must be set the same.

| Front Panel Mounted DIP Switches |                               |                  |                 | Front Panel Mounted Call/Test Switch |                       |                 |
|----------------------------------|-------------------------------|------------------|-----------------|--------------------------------------|-----------------------|-----------------|
| DIP Switch                       | ON                            | OFF              | Factory Default | Function                             | Setting               | Factory Default |
| 1                                | Channel Disabled              | Channel Enabled  | OFF             | Call/Test Mode                       | Normal Operation      | NORM            |
| 2                                | Four (4) Frequency Selections |                  | OFF             |                                      |                       |                 |
| 3                                | Four (4) Frequency Selections |                  | OFF             | PC Board Mounted DIP Switches        |                       |                 |
| 4                                | Fail-Safe Mode                | Fail-Secure Mode | ON              | Switch                               | Function              | Setting         |
| 5                                | Presence Mode                 | Pulse Mode       | ON              |                                      |                       |                 |
| 6                                | Eight (8)                     |                  | OFF             | 1                                    | Test Mode             | Off             |
| 7                                | Sensitivity Selections        |                  | ON              | 2                                    | 100 ms Minimum Output | Off             |
| 8                                | Sensitivity Selections        |                  | 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 N.O.  | 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 N.O.  | 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        |

