



G Series

TWO CHANNEL LOOP DETECTORS FOR NEMA CABINETS

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.

FEATURES

- Front Panel DIP Switches For Each Channel
- 8 Sensitivity Levels
- Presence or Pulse Mode
- 4 Loop Frequencies
- Fail-Safe or Fail-Secure Operation
- Channel Disable
- Audible Detect Signal
- Dual Color High Intensity LEDs

HIGHLIGHTS

- 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
- Complete built-in detector integrity test
- Space provided on front panel to label each channel
- Call Delay & Extension (GT-200 Only)



NEMA CABINET COMPATIBLE

NEMA Specifications: The Model G-200 is designed to meet or exceed NEMA Standards TS 2-1998 for Type A detectors and is downward compatible to NEMA Standards TS 1-1989. The Model GT-200 is designed to meet or exceed NEMA Standards TS 2-1998 for Type C detectors and is downward compatible to NEMA Standards TS 1-1989.

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, $-\Delta L/L$, & 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 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.



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, $-\Delta L/L$, & Response Time table.)

100 Millisecond Minimum Output (G-200 Only): 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.

Call Delay (GT-200 Only): Each channel's Call Delay is adjustable from 0 to 63 seconds in one-second steps by means of PCB mounted DIP switches. Call Delay time starts counting down when a vehicle first enters the loop detection zone. If the Delay feature is activated, the output will only be turned on after the selected delay time has passed with a vehicle continuously present in the loop detection area. If a vehicle leaves the loop detection area during the delay interval, detection is aborted and the next vehicle to enter the loop detection area will initiate a new full delay interval. Whenever a channel's Phase Green Input (call delay override) signal (pins 1 or 2) is active (low state), the Call Delay function for that channel is aborted and the Call delay time is forced to zero. The detector indicates that a vehicle is being detected but that the outputs are being delayed by flashing the channel's Detect / Fail LED (green) at four Hz with a 50% duty cycle.

Call Extension (GT-200 Only): Each channel's Call Extension is adjustable from 0 to 15.75 seconds in 1/4-second steps. Call Extension time starts counting down when the last vehicle leaves the loop detection zone. In the event a vehicle enters the loop detection zone before the extension time expires, the detector will return to the detect state (regardless of the setting of the delay timer) and the extension timer will be reset. When the last vehicle leaves the loop detection zone, full Extension time is reestablished and the detector begins counting down again. The detector will indicate that the extension interval is currently timing by flashing the channel's Detect / Fail LED (green) at 16 Hz with a 50% duty cycle.

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

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 $\pm 25\%$, 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 during a loop failure. In both modes of operation, the 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 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 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 (1500m) 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 either channel's DIP switches (except the Frequency switches or Call Delay / Call Extension 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 will require a reset.

Phase Green Inputs (GT-200 Only): Meets and/or exceeds all NEMA TS 1 and TS 2 requirements. Application of a Low state voltage (0 to 8 VDC) to pin 1 (Ch. 1) and/or pin 2 (Ch. 2) causes the delay timer for the channel to abort the delay timing function.

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).

Response Time: The response time of either channel is affected by the sensitivity level setting and Fail-Safe / FailSecure 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, $-\Delta L/L$, & 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.

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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 2, a detection output (CALL) is indicated by a closed relay contact (Relay output) or a conducting state (Solid State output). When operating in Fail-Safe mode, a channel's output defaults to a CALL state for any loop failure condition on that channel. When operating in Fail-Secure mode, a channel's output defaults to a NO CALL state for any loop failure condition on that channel. In either Fail-Safe or Fail-secure mode, a channel's output defaults to a CALL state upon loss of power.

NEMA TS 2 Channel Status Outputs: Meets and/or exceeds all NEMA TS 2 status output specifications.

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. 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.

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.

Power: 10.8 to 30 VDC. Solid State output, 100 mA max.; Relay output, 130 mA max.

Power:

| Model | NEMA Detector Type | Added Feature |
|--------|--------------------|------------------------|
| G-200 | Type A | |
| GT-200 | Type C | Call Delay & Extension |

Sensitivity, -ΔL/L, & Response Time:

| Sensitivity | -ΔL/L | Response Time | |
|-------------|-------|---------------|---------------|
| | | Fail-Safe | Fail-Secure |
| 0 | 1.28% | 65 ±25 msec | 3.5 ±2.5 msec |
| 1 | 0.64% | 65 ±25 msec | 3.5 ±2.5 msec |
| 2 | 0.32% | 65 ±25 msec | 3.5 ±2.5 msec |
| 3 | 0.16% | 65 ±25 msec | 3.5 ±2.5 msec |
| 4 | 0.08% | 65 ±25 msec | 4.5 ±3.5 msec |
| 5 | 0.04% | 65 ±25 msec | 7.0 ±6.0 msec |

| Sensitivity | -ΔL/L | Response Time | |
|-------------|-------|---------------|-----------------|
| | | Fail-Safe | Fail-Secure |
| 6 | 0.02% | 65 ±25 msec | 11.5 ±10.5 msec |
| 7 | 0.01% | 65 ±25 msec | 21.5 ±20.5 msec |

Factory Default Settings:

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

Pin Assignments:

| Pin | Function | Pin | Function |
|-----|---------------------|-----|-------------------------|
| A | DC (-) Common | 1 | No Connection |
| B | DC (+) Power | 2 | No Connection |
| C | Reset Input | 3 | No Connection |
| D | Ch 1 Loop Input | 4 | Ch 1 Loop Input |
| E | Ch 1 Loop Input | 5 | Ch 1 Loop Input |
| F | Ch 1 Output, Drain | 6 | No Connection |
| H | Ch 1 Output, Source | 7 | Ch 1 TS 2 Status Output |
| J | Ch 2 Loop Input | 8 | Ch 2 Loop Input |
| K | Ch 2 Loop Input | 9 | Ch 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 | Ch 2 Output, Drain | 19 | No Connection |
| X | Ch 2 Output, Source | 20 | Ch 2 TS 2 Status Output |
| Y | No Connection | 21 | No Connection |
| Z | No Connection | 22 | No Connection |

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