

# T-400 SERIES



*Engineering Excellence!*

## FOUR CHANNEL SHELF MOUNT DETECTOR



- Meets and exceeds NEMA TS 1 specification.
- Six front panel DIP switches for each channel provide:
  - Seven levels of sensitivity plus off.
  - Presence or Pulse mode.
  - Four loop frequencies.
- 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, high intensity LEDs:
  - Green indicates detect.
  - Red indicates loop fail.
- 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 T-400-R** Four channel detector with Relay outputs.

**Model T-400-SS** Four channel detector with Solid State outputs.

#### Overview:

The Model T-400 series is designed to meet or exceed NEMA Standards TS 1-1989. Model T-400 detectors are four channel, shelf mount type loop detectors. Individual channel detect and loop fail indications are provided via four dual color, high intensity LEDs. Available with both Relay and Solid State outputs, the Model T-400 series offers advanced multiple channel detection capabilities in a compact package.

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# T-400 SERIES SPECIFICATION

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

**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:** Seven (7) sensitivity levels (plus off) are available for each channel. The eight settings are selectable using three (3) front panel mounted DIP switches. Each of the seven sensitivity levels are binary encoded from 1 to 7 (lowest to highest sensitivity). A setting of 0 turns the channel off. 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.

**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 setting of the Presence / Pulse Mode switch will RESET the channel.

**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 for that channel. 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. This indication is also generates a CALL output. 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. This indication is also generates a CALL output. 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 a channel's 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 mode of operation. Fail-Safe operation generates a continuous call output in the Presence or Pulse mode. The channel's Detect / Fail LED will provide an indication of the type of loop failure (see Detect / Fail Indicator, above) and will continue to do so 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 (red) 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 is reset, or power is removed.

**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 any channel's DIP switches (except the Frequency switches) will reset that detector channel. Pressing the front panel mounted reset switch will reset the detector. Reapplication of power after a power loss will also cause the detector to reset. After changing any channel's Frequency selection switches (DIP switches 1 & 2), the channel will require a 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 any channel is 120 ± 40 milliseconds regardless of the sensitivity level setting. 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:** A detection output (CALL) is indicated by a closed relay contact (Relay output) or a conducting state (Solid State output). A channel's output defaults to a CALL state for any loop failure condition on that channel or upon loss of power.

**Test Mode:** A PCB mounted jumper 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:** 34 oz (963.9 gm).

**Size:** 6.45 inches (16.38 cm) high x 2.50 inches (6.35 cm) wide x 6.35 inches (16.13 cm) deep (excluding connector). Connector adds .675 inches (1.71 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:** MS 3102A-22-14P 19 pin male. See **PIN ASSIGNMENTS** table.

**Power:** 89 to 135 VAC, 50/60 Hz, 6 Watts max.

## TABLES

### SENSITIVITY, -ΔL/L, & RESPONSE TIME:

Sensitivity Setting	0	1	2	3	4	5	6*	7
-ΔL/L	OFF	0.64%	0.32%	0.16%	0.08%	0.04%	0.02%	0.01%
Response Time (ms)	N/A	120 ±40	120 ±40	120 ±40	120 ±40	120 ±40	120 ±40	120 ±40

\* Denotes factory default.

**Note:** Changing a channel's sensitivity switch will RESET the channel.

### PIN ASSIGNMENTS:

Pin	Function (Relay Outputs)	Function (Solid State Outputs)
A	Power, Neutral, 120 VAC	Power, Neutral, 120 VAC
B	Channel 4 Output, Relay Common	Channel 4 Output, Emitter (Source)
C	Power, Line, 120 VAC	Power, Line, 120 VAC
D	Channel 1 Loop Input	Channel 1 Loop Input
E	Channel 1 Loop Input	Channel 1 Loop Input
F	Channel 2 Loop Input	Channel 2 Loop Input
G	Channel 2 Loop Input	Channel 2 Loop Input
H	Chassis Ground	Chassis Ground
J	Channel 3 Loop Input	Channel 3 Loop Input
K	Channel 3 Loop Input	Channel 3 Loop Input
L	Channel 4 Loop Input	Channel 4 Loop Input
M	Channel 4 Loop Input	Channel 4 Loop Input
N	Channel 1 Output, Relay Normally Open	Channel 1 Output, Collector (Drain)
P	Channel 1 Output, Relay Common	Channel 1 Output, Emitter (Source)
R	Channel 2 Output, Relay Common	Channel 2 Output, Emitter (Source)
S	Channel 2 Output, Relay Normally Open	Channel 2 Output, Collector (Drain)
T	Channel 3 Output, Relay Common	Channel 3 Output, Emitter (Source)
U	Channel 3 Output, Relay Normally Open	Channel 3 Output, Collector (Drain)
V	Channel 4 Output, Relay Normally Open	Channel 4 Output, Collector (Drain)

### FACTORY DEFAULT SETTINGS:

Switch	Function	Setting	Factory Default
1	Frequency	0	OFF
2			OFF
3	Presence / Pulse	Presence	ON
4	Sensitivity	6	OFF
5			ON
6			ON