



# LMD224

## FOUR CHANNEL LOOP DETECTOR FOR CALTRANS CABINETS

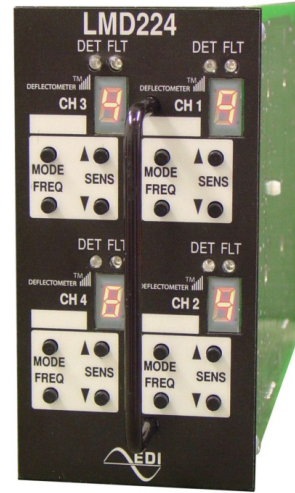
Four channel rack mount detector with DEFLECTOMETER®, four loop frequencies, three modes of operation.

### FEATURES

- Automatic Tuning
- Lightning & Surge Protection
- 4 Frequency Levels
- Separate Color Coded LED indicators
- Wide Loop Inductance Range: 20 to 2500 micro Henries

### HIGHLIGHTS

- Caltrans 332 Cabinet Compatible
- DEFLECTOMETER Call Strength Indicator
- Frequency Meter
- Output CALL Test Mode
- Advanced Loop Diagnostics
- Push Button Programming



### CALTRANS CABINET COMPATIBLE

**Caltrans 332 Cabinet Compatible:** The DEFLECTOMETER® push-button user interface far exceeds the cumbersome DIP switch based requirements of the Caltrans specifications. The LMD224 is compatible with all 332 type Input Files and is intended as a plug-in upgrade for the standard Model 224.

**DEFLECTOMETER Call Strength Indicator:** The Call Strength Indicator provides the technician with a simple one-step method for accurately setting the optimum level of sensitivity that ensures accurate vehicle detection of all vehicles, including motorcycles and high-bed trucks. When a medium size vehicle is over the roadway loop, a DEFLECTOMETER Call Strength value of "5" assures that the optimum sensitivity has been achieved. You can adjust the DEFLECTOMETER reading dynamically without moving the vehicle by using the front panel UP or DOWN sensitivity buttons.

**Frequency Meter:** The built-in Frequency Meter reports the operating frequency of the loop network. Ensuring that adjacent loops are separated by at least 5 KHZ will avoid crosstalk problems and future service calls.

**Output CALL Test Mode:** The Output Call Test Mode provides a straight forward way to test that the Controller Unit is receiving an active output from the detector. This eliminates the need for cabinet test switches and associated wiring. A huge time saving feature during system set-up and trouble-shooting.

**Controls:** Front panel push buttons allow the user to set the Sensitivity Level, Operational mode, and nominal Frequency independently on each channel. PCB mounted DIP switches allow the user to set the Delay and Extension timers.

**Setting Sensitivity - Front Panel Push Buttons:** The DEFLECTOMETER® (front panel 7-segment LED) aids in setting the DETECTOR quickly and easily to the most optimum sensitivity level to ensure the trouble-free detection of all vehicles, including motorcycles and high



bed vehicles. For typical vehicles (mid-size vehicle / small pick up) utilizing properly installed roadway loops, a Call Strength of 5 displayed on the DEFLECTOMETER® during the DETECT output period indicates an optimum sensitivity setting. For high profile vehicles (commercial trucks, 4x4's, etc.), a Call Strength value of 4 will be optimum. For low profile vehicles (sports cars, etc.), a Call Strength value of 6 will be optimum.

**Adjusting Sensitivity Using The DEFLECTOMETER®:** The DEFLECTOMETER® should read zero (0) with no vehicle over the roadway loop. When a typical mid-sized vehicle is completely in the detection zone (DET indicator On), the Call Strength value should be adjusted up or down until the DEFLECTOMETER® displays the desired optimum value of 5 (or 4 or 6 as described above).

If a typical vehicle located over the roadway loop causes the Call Strength "7" to be displayed on the DEFLECTOMETER®, the sensitivity should be decreased two levels. This can be done by pressing the front panel SENS button two times to achieve the Call Strength value of 5.

If a typical vehicle located over the roadway loop causes the number "2" to be displayed on the DEFLECTOMETER®, the sensitivity should be increased three levels. This can be done by pressing the front panel SENS button three times to achieve the Call Strength value of 5.

NOTE: The DEFLECTOMETER® call strength dynamically updates after each sensitivity level change, allowing you to change sensitivity settings while a vehicle remains in the loop detection zones.

**Adjusting Sensitivity Manually:** The detector offers 9 levels of sensitivity (1 to 9). Level 9 is the highest sensitivity. Sensitivity Level can be manually set to any desired value by pressing the front panel SENS buttons (↑ or ↓) when a vehicle is NOT over the roadway loop (DET indicator Off). The first time a SENS button (↑ or ↓) is pressed, the current Sensitivity Level is displayed on the DEFLECTOMETER® for 3 seconds. If either SENS button (↑ or ↓) is pressed again before the 3 second period ends, the Sensitivity Level will increase (SENS ↑) or decrease (SENS ↓). The new Sensitivity Level value will be displayed on the DEFLECTOMETER® display for 3 seconds. The factory default Sensitivity setting is level 6.

Sensitivity	ΔL / L
1	2.56%
2	1.28%
3	0.64%
4	0.32%
5	0.16%
6	0.08%
7	0.04%
8	0.02%
9	0.01%

**Loop Frequency / Loop Frequency Display:** One of four frequency settings may be selected via the front panel FREQ push button to alleviate interference which may occur when loops connected to different detectors are located adjacent to one another. To help prevent or diagnose crosstalk problems, the loop frequency is displayed on the front panel DEFLECTOMETER®. The current loop frequency is displayed

after pressing the FREQ button to display the current Frequency Level. The frequency is shown in KHz with a "-" symbol displayed both before and after the numeric digits shown on the DEFLECTOMETER®.

For example, after pressing the FREQ button once the display sequence might show:

"3" ⇒ "-" ⇒ "2" ⇒ "7" ⇒ "-"

This sequence would indicate Frequency Level "3" and a loop reference frequency of 27 KHz. Detectors on adjacent loops should all be separated by at least 5 KHz.

**Loop Fault Monitoring:** The Detector continuously checks the integrity of the loop. The system is able to detect shorted or open circuit loops, or sudden changes in inductance exceeding 25% of the nominal inductance. If a fault is detected, the OUT and FLT indicators continuously emit a sequence of flashes. Additionally, the DEFLECTOMETER® displays the letter "F" indicating a current loop fault. Each type of fault is identified by a unique flash sequence:

Flash Sequence	Fault
1 flash	Open Circuit Loop
2 flashes	Shorted Circuit Loop
3 flashes	25% excessive change in inductance

If the Open or Shorted fault condition self heals, the DET indicator and DEFLECTOMETER® will return to normal operation. The FLT indicator will continue to flash with the sequence signifying the type of fault that was last detected. In the case of the excessive inductance change fault, the unit will retune to the new inductance after a period of two seconds and continue operation. The fault condition will be indicated by the flash sequence of the FLT indicator.

**Operational Modes:**

**Presence:** For each channel, a Presence output mode may be selected from the front panel MODE push button. If presence mode is selected then a choice of short (S) or long (L) can be selected. Short Presence is defined as 30 minutes and Long Presence is defined as 120 minutes.

**Pulse:** For each channel, a Pulse output mode (P) may be selected from the front panel MODE push button. In Pulse mode, a 125 ms ± 25ms width pulse will be output for each vehicle entering the loop detection zone.

**Call:** For each channel, a continuous CALL output (C) may be selected from the front panel MODE push button which will simulate the presence of a vehicle. This mode is used for testing the CALL output of a channel.

**Channel Off:** For each channel, the Channel Off (-) may be selected from the front panel Mode push button. This option turns OFF the channel and disables the oscillator.

**DC Supply Voltage:** Minimum = 10.8 VDC. Maximum = 28.8 VDC.

**DC Supply Current:** Maximum = 100 mA.

**Optically Isolated Outputs:** True (low, 50 mA) = Less than 1.5 VDC. Maximum Current = 100 mA.

**Environmental:** Operating Temperature Range: -30°F to 165°F (-34°C to 74°C).

**Mechanical:** International Card with 44 pin double sided edge connector. Height = 4.5" (114.3mm). Width = 2.34" (59.4mm). Depth (excluding handle) = 6.875" (174.6mm).

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**Pin Assignment:**

Pin	Function	Pin	Function
A	Logic Ground	1	Reserved
B	DC Supply	2	Reserved
C	External Reset	3	Reserved
D	Ch 1 Loop Input	4	Ch 1 Redundant Loop Input
E	Ch 1 Loop Input	5	Ch 1 Redundant Loop Input
F	Ch 1 Output (+)	6	Reserved
H	Ch 1 Output (-)	7	Reserved
J	Ch 2 Loop Input	8	Ch 2 Redundant Loop Input
K	Ch 2 Loop Input	9	Ch 2 Redundant Loop Input
L	Chassis Ground	10	Reserved
M	Reserved	11	Reserved
N	Reserved	12	Reserved
P	Ch 3 Loop Input	13	Ch 3 Redundant Loop Input
R	Ch 3 Loop Input	14	Ch 3 Redundant Loop Input
S	Ch 3 Output (+)	15	Reserved
T	Ch 3 Output (-)	16	Reserved
U	Ch 4 Loop Input	17	Ch 4 Redundant Loop Input
V	Ch 4 Loop Input	18	Ch 4 Redundant Loop Input
W	Ch 2 Output (+)	19	Reserved
X	Ch 2 Output (-)	20	Reserved
Y	Ch 4 Output (+)	21	Reserved
Z	Ch 4 Output (-)	22	Reserved

**Response Timing:**

Sensitivity	Response Time
1	11-16 ms
2	11-16 ms
3	11-16 ms
4	11-16 ms
5	12-18 ms
6	21-28 ms
7	38-51 ms
8	77-102 ms
9	162-217 ms

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