



ORACLE /2

Programmable Two Channel Inductive Loop Vehicle Detector

The ORACLE /2 Loop Monitor™ from Eberle Design takes vehicle detection well into the 21st century. The ORACLE line of programmable detectors not only indicate vehicle presence with great accuracy and reliability, but also incorporate a complete built-in loop analyzer for optimum detector set-up and loop diagnostic purposes.

All Knowing... All Telling...

The ORACLE /2 Programmable Vehicle Detector meets or exceeds all standards specified in NEMA publication TS 2-1998 clause 6.5 (Inductive Loop Detectors).

SET-UP AND DIAGNOSTIC FEATURES

- Loop Inductance Meter:** Each channel incorporates a Loop Inductance Meter which assists in determining optimum sensitivity setting by displaying the magnitude of change in inductance caused by traffic moving over the roadway loop.
- Sensitivity:** Each channel offers 15 selectable sensitivity settings available. The Loop Inductance Meter helps to easily set the detector to the optimum sensitivity setting.
- Loop Frequency:** Each channel offers 8 selectable loop frequency settings available. The detector displays the loop operating frequency (in kilohertz) which helps eliminate crosstalk conditions.
- Loop Inductance:** The total loop inductance, for each channel, is displayed (loop inductance plus lead-in inductance) in microHenries. This feature enables the user to verify that loops are installed to specifications.
- ΔL/L Percentage:** Each channel displays the percentage of inductance change during the CALL state.
- Loop Faults:** Each channel indicates and stores loop fault conditions in memory (Open Loop, Shorted Loop or 25% change in inductance).

OUTPUT AND COUNTING FEATURES

- User Selectable Output Modes:** Short presence, long presence, user defined presence, pulse, and count (AccurateCount) outputs.
- AccurateCount Vehicle Counting:** The AccurateCount output feature provides a secondary output in addition to the primary "CALL" output for every vehicle entering the loop zone. The LCD screen also displays the total accumulated vehicle count since the last reset.

ADDITIONAL FEATURES

- Easy Front Panel Set-up:** Completely programmable from the front panel toggle switches.
- LCD Back Lighting:** Bright "White" LED backlight improves visibility in poor lighting conditions.
- Multi-language:** Incorporates a multi-language interface. Consult factory for details.

EBERLE DESIGN INC.

3819 E. La Salle Street Phoenix, AZ 85040 USA
tel +1-480-968-6407 www.editraffic.com



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GENERAL CHARACTERISTICS

Controls: Two High-Reliability sealed front panel toggle switches, for each channel, are used to select operational and display settings. One switch is designated "SELECT" and is used to accept the setting displayed and to move to the next menu item. The second switch is designated "UP/DOWN". Moving this switch UP increases the value of the setting displayed and DOWN decreases the value.

Loop Frequency: Each channel's LCD screen displays the actual loop frequency to alleviate interference which may occur when loops connected to different detectors are located adjacent to one another. One of eight settings (normally in the range of 20 to 60 kilohertz) may be selected for each channel via the "SET UP" menu.

Sensitivity: Each channel's LCD screen displays the sensitivity level and a Loop Inductance Meter to make it easy to set-up sensitivity. See *Loop Inductance Meter*. One of 15 settings, plus Channel-Off may be selected for each channel via the "SET UP" menu, to optimize vehicle detection on varying loop and lead-in configurations. Sensitivity is stated in terms of $-\Delta L/L$ i.e. as the minimum percentage change in the total inductance (loop plus lead-in) to which the unit will respond at the given level.

Sens.	$-\Delta L/L$	Sens.	$-\Delta L/L$	Sens.	$-\Delta L/L$
15	0.01%	10	0.06%	5	0.32%
14	0.015%	9	0.08%	4	0.48%
13	0.02%	8	0.12%	3	0.64%
12	0.03%	7	0.16%	2	0.96%
11	0.04%	6	0.24%	1	1.28%

Channel-Off: When set to the Channel-Off state, for either channel, the detector output is continuously in the NO-CALL state regardless of the presence or absence of vehicles over the loop. The Channel-Off state is indicated by the front panel LCD displaying "CHANNEL DISABLED" for the sensitivity setting.

Call Delay Timer: Each channel's delay time can be set between 1 and 63 seconds in 1 second increments via the "SET UP" menu. Call Delay time starts counting down when a vehicle enters the loop detection area. See *High Intensity Color-Coded LED Indicators*. Delay time is overridden by a green signal at the timer control input.

Call Extension Timer: Each channel's extension time can be set between 0.25 and 15.75 seconds in 0.25 second increments via the "SET UP" menu. Call Extension time starts counting down when the last vehicle clears the loop detection zone. See *High Intensity Color-Coded LED Indicators*. Any vehicle entering the loop detection zone during the Extension time period causes the channel to return to the DETECT state. The Extension timer can be enabled upon a green signal or can be selected to extend always.

Presence / Pulse / 3rd Car Logic Modes: Presence, Pulse, or 3rd Car Logic output mode may be selected, for each channel, via the "SET UP" menu. If presence mode is selected then a choice of short, long, or user defined presence can be selected. Short Presence is 30 minutes and Long Presence is 120 minutes. In user defined mode, a setting between 1 and 99 minutes can be entered. On the expiration of short or long presence any detect CALL will be reset. In user defined mode, the detect CALL can be selected to reset on timer expiration (IMMED) or at the next End-Of-Green (EOG) signal after the expiration of the timer. The green signal is applied to the timer control via the edge card connector. In Pulse mode, a 125 ms±25ms width pulse will be output for each vehicle entering the loop. If the loop is occupied, a 2 second rephase time must elapse before further output pulses can occur. 3rd Car Logic is a special feature which utilizes both channels of the ORACLE /2. A call is output on the selected channel when both channels signal a detect condition. When "3rd Car" is selected for one of the two channels the other channel enters a "slave" state. The only functions that can be set up are *sensitivity, frequency, channel ID and display type*.

Loop Inductance Display: Each channel's LCD screen displays the actual loop inductance (loop and lead-in inductance) in the range of 20 to 2500 microHenries.

Loop Inductance $-\Delta L/L$ Display: Each channel's LCD screen displays the percentage of inductance change during the CALL state.

Loop Inductance Meter: Each channel's LCD screen displays a meter which assists in determining optimum sensitivity setting by showing the change in inductance caused by traffic moving over the loop and how this meter is affected by the sensitivity selected. Optimum sensitivity setting is reached when the meter displays a 100% deflection.

Vehicle Counting Display: For each channel, when a vehicle occupies the loop zone, the LCD counter accumulates one vehicle count per output. The counter is capable of accumulating 99,999 vehicle counts before rolling over to zero. If AccurateCount mode is enabled, the LCD will reflect actual counts from the secondary "Count" output on pins G & I. See *AccurateCount Mode*.

AccurateCount Mode: For each channel, the AccurateCount (Count) output feature can be enabled via the "SET UP" menu to produce a secondary output in addition to the primary CALL output for every vehicle entering the loop zone. Each vehicle entering the loop will cause an output pulse of 125ms±25ms, irrespective of the size of the loop.

AccurateCount Loop Configurations: For each channel, when the AccurateCount (Count) feature is enabled, you must then select a loop configuration, via the "SET UP" menu, for either a single square or rectangle loop or four (4) 6' x 6' square loops connected together.

Display Type: Each channel can be set to *Normal, Count, or Diagnostic*. This sets the screen that is displayed when the detector starts up or when RUN is selected. In Normal display mode, the Channel ID, Sensitivity, Mode, and Loop Frequency are displayed along with the Loop Inductance Meter. In Count display mode, the actual vehicle count accumulated since the channel was last reset is displayed along with the loop frequency. In Diagnostic display mode, the loop inductance and frequency are displayed. Additionally, when the channel is in the "Detect" condition, the display changes to show the $-\Delta L/L$ shift in inductance.

Fault Log: The LCD screen displays the last 5 loop fault conditions, for each channel, via the "LOGS" menu. A reset will not remove the Fault Log from memory. To clear the Fault Log memory, momentarily remove power from the detector.

Factory Default Settings: Simultaneously pressing channel 1's "UP/DOWN" switch down and channel 2's "UP/DOWN" switch up while cycling power will reset the detector to factory default positions.

SPECIFICATION

Construction: Printed circuit boards are double sided 2 oz. (56.70 gm.) copper with plated through holes. Circuit boards are conformally coated for environmental protection.

Environmental:

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

Storing Temperature Range: -50°F to 185°F (-45°C to +85°C)

Humidity Range: 0 to 95% relative.

Mechanical:

Dimensions/Connector: International Card 4.500"H x 6.875"D x 2.000"W (excluding handle) with 44 pin double sided edge connector

Weight: 0.6 lb. (272 gm.)

Lead-in Length: The unit will operate with lead-in (feeder) lengths up to 5,000 feet (1,524 m.) with appropriate loops and proper lead-in cable.

ELECTRICAL

Power Supply: 10.8 to 28.8 VDC, 100 mA max.

ELECTRICAL (Continued)

Loop Inductance (Tuning) Range: 20 to 2500 micro Henry with a Q factor greater than 5.

Loop Input (Lightning Protection): The loop input incorporates lightning and transient protection devices and the loop oscillator circuitry is transformer-isolated. The lightning protection will withstand the discharge of a 10 uF capacitor charged to 2,000V across the loop inputs or between either loop input and earth ground. The transformer isolation allows operation with a loop which is grounded at a single point.

Reset: Each detector channel can be manually reset via the "RESET" menu.

Timer Control Input: Also known as Call Delay Override. Both delay and extension timers may be controlled by the timer control input via the front panel connector. An active input voltage level is one less than 8 VDC (reference logic ground). A voltage less than 16 VDC is considered the inactive level. As standard, an active timer control input will inhibit the delay timer. Other timer control options are available; please consult the manufacturer for details.

Output Ratings:

Optically Isolated Output (ORACLE /2): The output transistors are rated for a maximum collector voltage of 80 VDC. Maximum collector current is 100mA. In the saturated condition the collector voltage will be less than 1.5Volts with a collector current of 50mA. Maximum off state leakage current is 1 microampere. Isolation exceeds 7,500 VAC.

Relay Output (ORACLE /2R): Contacts are rated 5A, 120 VAC, 30 VDC. Relay outputs are failsafe - Should the detector lose power, the output will give a constant CALL output.

Pin Assignment (Connections):

ORACLE /2 (ORACLE /2R)

Pin	Channel
A	Logic Ground
B	DC Power 10.8 VDC to 28.8 VDC
C	Reset
D & 4	Loop Input Channel 1
E & 5	Loop Input Channel 1
F	Channel 1 Output Collector (Relay Output N.O.)
H	Channel 1 Output Emitter (Relay Output Common)
J & 8	Loop Input Channel 2
K & 9	Loop Input Channel 2
L	Earth Ground
S	Secondary Output Channel 1
W	Channel 2 Output Collector (Relay Output N.O.)
X	Channel 2 Output Emitter (Relay Output Common)
Y	Secondary Output Channel 2
1	Green "Timer" Input Channel 1
2	Green "Timer" Input Channel 2
7	Status Output Channel 1
20	Status Output Channel 2

NOTE: Relay Contacts are shown with power applied, loops connected and no vehicle present.

OPERATIONAL

Display: The Liquid Crystal Display (LCD) incorporates a "White" LED backlight. The backlight is energized when any switch is actuated and remains on for 2 hours after the last switch actuation. The backlight improves visibility in poor lighting conditions.

High Intensity Color-Coded LED Indicators: Two indicators are used per channel:

Red DETECT Indicator:

- Solid ON = Vehicle Detect.
- Delay Timing = 2 Hz flash rate.
- Extension Timing = 4 Hz flash rate.
- Open Circuit = 1 single flash followed by a pause.
- Shorted Circuit = 2 flashes followed by a pause.
- 25% Change in Inductance = 3 flashes followed by a pause.

Yellow FAULT Indicator:

- Open Circuit = 1 single flash followed by a pause.
- Shorted Circuit = 2 flashes followed by a pause.
- 25% Change in Inductance = 3 flashes followed by a pause.

Loop Fault Monitoring: Each detector channel continuously checks the integrity of the loop. The system is able to detect open or shorted circuit loops, or sudden changes in inductance exceeding 25% of the nominal inductance. If a fault is detected, both the DETECT (Red) and FAULT (Yellow) LEDs continuously emit a sequence of flashes. Each type of fault is identified by a different flash sequence:

Flash Sequence

Flash Sequence	Fault
1 flash (per second)	Open Circuit Loop.
2 flashes (per second)	Shorted Circuit Loop.
3 flashes (per second)25% change in inductance.

In addition to the LED flash sequence, the LCD will display the type of fault condition during the FAULT state. If the fault condition is removed, the LCD "Fault" indication and the DETECT (Red) LED will return to normal operation. The fault (Yellow) LED 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 (possible loss of a loop within a series of loops), the unit will log the fault and return to the new inductance after a period of two seconds. The logged fault will be stored in memory and will be indicated by the fault LED emitting the flash sequence relating to the excessive inductance change fault.

Response Times:

Level	Response	Sens.	Response	Sens.	Response
15	135 ms	10	50 ms	5	15 ms
14	100 ms	9	45 ms	4	15 ms
13	80 ms	8	45 ms	3	15 ms
12	65 ms	7	15 ms	2	15 ms
11	60 ms	6	15 ms	1	15 ms

Self Tuning: Each detector channel will automatically tune to any loop and lead-in combination within the tuning range upon application of power. See also "Reset".

Environmental Tracking: The detector automatically and continuously compensates for component drift and environmental effects throughout the tuning range and across the entire temperature range.

Grounded Loop Operation: The detector will operate when connected to poor quality loops including those that have a short to ground at a single point.