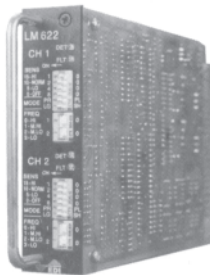


# LM 642 SERIES

## TWO CHANNEL LOOP MONITOR™

### TS-2 STANDARD WITH SYSTEM/COUNT OUTPUTS



LM 642t

The LM series of Loop Monitors™ from Eberle Design take vehicle detection one step further. They not only indicate vehicle presence with great accuracy and reliability, but also monitor the condition of the loop for diagnostic purposes.

The LM642 Series meet or exceed all standards specified in NEMA publication TS 2-1992 part 6.5 (Inductive Loop Detectors).

### DETECTION FEATURES

#### Automatic Tuning

No manual tuning is required.

#### Environmental Tracking

Ensures reliable operation by continuously adjusting for changes in ambient conditions.

#### 15 Levels of Sensitivity

Allows users to fine tune the Loop Monitor™ to their application.

#### Four Loop Frequencies and Sequential Scanning

Together, these features greatly reduce the incidence of crosstalk.

#### Three Selectable Modes

**Pulse:** For counting and volume.

**Presence:** For Normal Presence operation.

**Count:** Presence on main call output; pulse/count on system output.

#### Separate System Outputs

Enables both intersection calls and system data to be obtained simultaneously from the same the loops. In many situations, this feature saves time and money by eliminating the need for separate system loops.

### DIAGNOSTIC FEATURES

#### Color-Coded, Separate LEDs for Detect & Fault Indication

Eliminates the confusion encountered with other detectors that use only one LED to display both faults and detection. The Yellow Fault LED works independently from the Red Detect LED to display the type of fault: Short, Open or 25% change of inductance. Each type of fault is indicated by a unique sequence of flashes allowing the user to diagnose loop failures at a glance.

#### Fault Memory

Records previous fault information. If a problem self-heals, the LM642 will resume normal operation. The contents of the memory will be displayed on the Fault LED. This feature can be used to isolate the source of intermittent loop failures.

#### Loop Monitor Status Outputs

Provides loop fault status information for cabinet diagnostic purposes.

#### Options

Relay Outputs

Molex Connector for Count Outputs

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## TWO CHANNEL LOOP MONITOR™

### Specifications

#### Power Supply:

10.8 to 28.8 VDC, 50 mA max, 35mA nominal.

#### Loop Input:

The loop inputs incorporate lightning and transient protection devices and the loop oscillator circuitry is transformer isolated. The lightning protection will withstand the discharge of a 10µF capacitor charged to 2,000V across the loop inputs or between any loop input and earth ground. The transformer isolation allows operation with loops which are grounded at a single point.

#### Tuning:

Each channel of the LM642 series unit will automatically tune to any loop and lead-in combination within the tuning range upon application of power or when a valid reset signal is received. A channel may be retuned by adjusting any of the front panel controls and resetting to the desired value.

#### Tuning Range:

20 to 2500 microhenry with a Q factor greater than 5.

#### Lead-in Length:

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

#### Environmental Tracking:

The LM642 series automatically and continuously compensates for component drift and environmental effects throughout the tuning range and across the entire temperature range.

#### Grounded Loop Operation:

The LM642 series will operate when connected to poor quality loops including those that have a short to ground at a single point.

#### Sequential Scanning:

Only one channel is energized at any given time, thus reducing the possibility of crosstalk between adjacent loops connected to the same unit.

#### Fault Monitoring:

The Loop Monitor™ continuously checks loop integrity. 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 on a channel, both the detect and fault LEDs emit a sequence of flashes followed by a pause. This signal is repeated until the fault is rectified. Each type of fault is identified by a different flash sequence. While the unit is in the fault condition, the channel output will remain in the detect (call) state and status information will be available from the status outputs.

#### Flash Sequence

#### Fault

1 flash	Open Circuit Loop.
2 flashes	Short Circuit Loop.
3 flashes	25% change in inductance.

If the fault is removed, both the detect LED and the output will return to normal operation. The fault LED will continue to emit the sequence signifying the type of fault that was last detected. In the case of the excessive inductance change fault, the unit will return 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 fault LED.

#### Status Output:

Each channel includes a separate output which is used to transmit operational status information to a bus interface unit (BIU). Fault information is transmitted by means of pulse-width modulation. Pulse widths shown are ±10ms.

Status	Status Output condition
Normal operation/ No fault	Continuous ON (low)
Watchdog fail/ Power Supply fail	Continuous OFF (high)
Open circuit loop	50ms OFF, 50ms ON
Short circuit loop	100ms OFF, 50ms ON
25% change in inductance	150ms OFF, 50ms ON

#### High Intensity LED Indicators:

Each channel has two indicators, a red led indicates the detect state and also the status of the delay and extension timers, a second, yellow led, indicates the status of the fault monitor.

#### Front Panel Controls:

Front panel mounted DIP switches allow the user to set up sensitivity, operational mode and frequency independently on each channel. Units with timing capability include board mounted DIP switch selection of delay and extension time.

#### Sensitivity:

One of fifteen settings may be selected to optimize detection on varying loop and lead-in configurations. Sensitivity is stated in terms of  $\Delta L / L$  i.e. the minimum percentage change in the total inductance (loop plus lead-in) to which the unit will respond at the given level setting. Selecting level 0 will switch the channel off. In this condition, the loop oscillator is de-energized, and the output will remain in the no-call state.

Level 15	.01%	Level 11	.04%	Level 7	.16%	Level 3	.64%
Level 14	.015%	Level 10	.06%	Level 6	.24%	Level 2	.96%
Level 13	.02%	Level 9	.08%	Level 5	.32%	Level 1	1.28%
Level 12	.03%	Level 8	.12%	Level 4	.48%	Level 0	OFF

#### Frequency:

One of four settings may be selected to alleviate interference which may occur when loops connected to different detectors are located adjacent to one another.

### Operational Modes:

Pulse Mode: ..... 125ms ±25ms momentary output.  
 Presence: ..... 15 minutes presence + presence on secondary output.  
 Count: ..... 15 minutes presence + count on secondary output.  
 Note: When operating in pulse mode, a vehicle remaining over a loop will inhibit further pulse outputs from being issued for a period of 2 seconds after which time vehicles passing over the uncovered portion of the loop will be detected.

### Secondary Output:

Count or presence information is available on the secondary outputs for each channel. Counts may be performed on long loops even with multiple vehicles present.

### Delay and Extension Timing (LM642t):

Delay times up to 63 seconds in 1 second increments, and extension times up to 15.75 seconds in 0.25 second increments, may be selected by setting the appropriate board mounted DIP switches to the ON position. The DETECT LED indicator will flash at a 2 Hz rate while the delay timer is running and at a 4 Hz rate while the extension timer is running.

### Timer Control Input:

Both Delay and Extension timers may be controlled by the timer control input via the edge connector. An active input voltage level is one less than 8 VDC (reference logic ground). A voltage greater than 16 VDC is considered the inactive level. As standard, an active timer control input will inhibit both delay and extension timers. Other timer control options are available; please consult the manufacturer for details.

### Reset Input:

The LM642 series may be reset by applying a ground true logic level to the reset input Pin C for a period exceeding 250 microseconds.

### Response Times:

The following are typical response times at different sensitivity levels for units with optically isolated output. Response times on units with relay output will reflect the effects of contact bounce.

Level 15	46 ms	Level 11	14 ms	Level 7	8 ms	Level 3	6 ms
Level 14	26 ms	Level 10	12 ms	Level 6	8 ms	Level 2	5 ms
Level 13	20 ms	Level 9	10 ms	Level 5	7 ms	Level 1	5 ms
Level 12	16 ms	Level 8	9 ms	Level 4	7 ms	---	---

### Output Ratings:

Optically Isolated Output Versions: The output transistor is rated for a maximum collector voltage of 30 VDC. Maximum collector current is 500mA. In the saturated condition the collector voltage will be less than 1.5 VDC with a collector current of 100mA. Maximum off state leakage current is 500 microampere. Isolation exceeds 7,500 VAC. Secondary Outputs are open collector type referenced to logic ground.

Relay Output Versions: Contacts are rated 5A, 120 VAC, 30 VDC.

Both types of output are failsafe when connected to a NEMA standard input-- should the detector lose power, the output will give a constant call.

Channel status outputs: maximum collector voltage 60 VDC, on voltage less than 1.0 VDC at 50 mA. Max. off-state leakage current 1 microampere.

### Mechanical:

Dimensions (Excluding Handle): ..... 1.12" wide, 4.5" tall, 6.875" long.  
 Weight: ..... 7 oz.  
 Environmental:  
 Storage Temperature Range: ..... -55°C to +85°C (-67°F to 185°F).  
 Operating Temperature Range: ..... -40°C to +80°C (-40°F to 176°F).  
 Humidity Range: ..... 0 to 95% relative.

### Connections:

Edge Connector mates with connector type Cinch 50-44A-30.

PIN	LM642/LM642t
A	Logic Ground
B	+10.8 V d.c. to +28.8 V d.c.
C	Reset
D & 4	Loop Input CH 1
E & 5	Loop Input CH 1
F	CH 1 O/P Collector \ Relay O/P N.O.
H	CH 1 O/P Emitter \ Relay O/P Com.
J & 8	Loop Input CH 2
K & 9	Loop Input CH 2
L	Chassis Ground
S	CH1 Secondary Output Emitter
W	CH 2 O/P Collector \ Relay O/P N.O.
X	CH 2 O/P Emitter \ Relay O/P Com.
Y	CH2 Secondary Output Emitter
1	Timer Control Input CH 1 (LM642t only)
2	Timer Control Input CH 2 (LM642t only)
7	Status output CH 1
20	Status output CH 2

Pins M,N,P,R,T,U,V,Z,3,4,5,6,8 thru 19,21 & 22 have no connection. N.O. is Normally Open

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

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