

Installation Instructions

DS938Z Ceiling Mount

Passive Infrared Intrusion Detector with Self-Test

1.0 General Description

The DS938Z is a high performance passive infrared intrusion detector. It is equipped with advanced PIR detection and supervision circuits and is designed to provide an alarm condition upon detection of an intruder passing through its area of coverage.

Employing balanced dual-opposed sensing elements, the DS938Z passive infrared (PIR) detector makes use of the fact that all objects give off (emit) infrared energy, and that the warmer an object is, the greater the amount of infrared energy given off. The DS938Z uses PIR receiver technology designed to detect the change in infrared energy caused when a target of a different temperature from a stable background passes through its field of coverage.

The coverage pattern consists of sensor zones arranged to form a circular coverage pattern.

Using Motion Analyzer II circuitry, the detector must first see a change in infrared energy in one zone followed by a change of energy in the remaining zone. Therefore, disturbances that occur in only one finger do not constitute motion and are ignored. This "catch sensitivity" may be changed in the field by the installer to provide the degree of sensitivity required by the installation.

Self-test and supervision circuits provide reliable operation in a variety of installation environments. The result is a highly advanced detector offering superior performance with freedom from false alarms.

2.0 Specifications

- **Coverage:** 360° by 60 ft. (18.3 m) diameter coverage when mounted on 8 to 18 ft. (2.4 to 5.5 m) high ceilings. Pattern consists of 64 zones grouped into 16 barriers, with one additional zone looking straight down from the unit (sabotage). Each barrier is 30 ft. (9.2 m) long and 4.4 ft. (1.3 m) wide at 30 ft. (9.2 m). Choice of two optical modules depending on ceiling height.

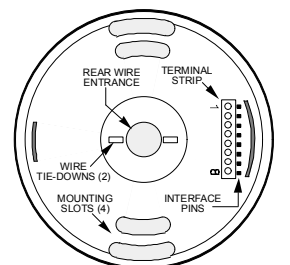
NOTE: For UL Certificated installations, the coverage is 360° by 54 ft. (16.5 m) when mounted from 10 to 13 ft. (3.1 to 4.0 m) using the AR8-13 Array and when mounted from 15 to 18 ft. (4.6 to 5.5 m) using the AR13-18 Array.

- **Input Power:** 6.0 to 15.0 VDC; 18 mA.
- **Standby Power:** There is no internal standby battery. Connect to DC power sources capable of supplying standby power if primary power fails. Eighteen mA-H required for each hour of standby time needed. *Four hours (72 mA-H minimum) are required for UL Certificated installations.*
- **Sensitivity:** Field selectable for Standard, Intermediate, or High.
- **Alarm Relay:** Silent operating Form "C" relay. Contacts rated 125 mA, 28 VDC maximum for DC resistive loads. *Do not use with capacitive or inductive loads.*
- **Tamper:** Normally Closed (with cover in place) tamper switch. Contacts rated at 28 VDC, 125 mA maximum.

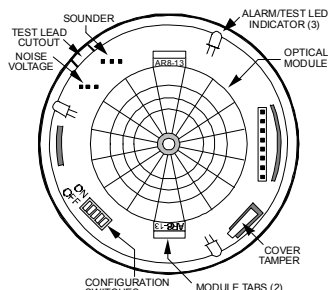
- **Trouble Output:** A solid state open collector conducts to terminal 1 (-) when the detector is in a trouble condition. Maximum current load is 25 mA.
- **Temperature:** The storage and operating range is -20° to +120°F (-29° to +50°C). *For UL Certificated installations, the range is +32° to +120°F (0° to +50°C).*
- **Sonalert™ Connector:** Using a Sonalert™ type sounder (low voltage) will provide an audible tone when the unit is in alarm. *Use of the sounder is intended only as an aid for walk testing during installation.*

Sonalert™ is a trademark of Mallory.

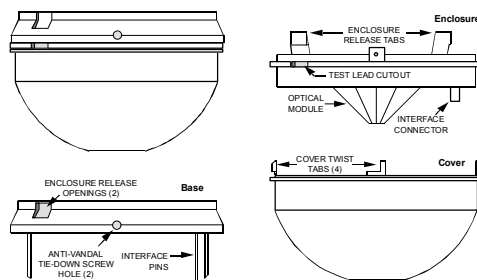
- **Optional Accessory:** TC6000 Test Cord.



Mounting Base



Top View of Enclosure with Cover Removed



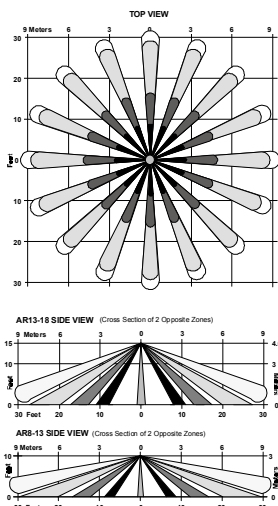
3.0 Mounting

Select a location likely to intercept an intruder moving across the coverage pattern (review patterns on page 2). **The recommended mounting height is 8 to 18 ft. (2.4 to 5.5 m).**



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NOTE: The mounting surface should be solid and vibration free (e.g., drop tiles should be secured if the area above the tiles is used as an air return for HVAC systems).

- Do not mount near air handling system outlets, or in areas of extreme drafts.
- Remove the cover by turning it counterclockwise.
- Remove the base from the enclosure by pressing the two enclosure release tabs inward while lifting the enclosure away from the base.

HINT: Slightly rock the enclosure side-to-side during removal to overcome the friction caused by the base-to-enclosure terminal pins.

- Route wiring as necessary to the rear of the base and through the center hole.

NOTE: Be sure all wiring is unpowered (de-energized) before routing.

- Firmly mount the base. Depending on local regulations, the base may be directly surface mounted using anchors, mollies, or wing-nuts, or may be mounted to standard four inch octagonal or square electrical boxes.

NOTE: The DS938Z base will not completely cover a four inch square box. Where aesthetics are important, a four inch octagonal box is recommended.

HINT: Mounting to removable ceiling tiles is not recommended unless a sandwich is made of the base, ceiling tile, and a back plate behind the tile. Covers used for four inch octagonal and square boxes make a suitable back plate (when used with bolts and wing nuts, as an example).

4.0 Selecting the Optical Module (AR8-13 or AR13-18)

- Replace the enclosure onto the base.
- For ceilings between 8 and 13 ft. (2.4 and 4.0 m) from the floor, use the optical module marked AR8-13. This marking can be found next to the two optical module tabs.

For ceilings between 13 and 18 ft. (4.0 and 5.5 m) high, use the optical module marked AR13-18.

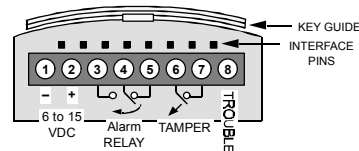
To replace an optical module, push the optical module tabs towards the center until the module snaps free of the circuit board. Holding the new module by the tabs, snap the new module into place.

Avoid fingerprints on the mirrored surfaces. Should the mirrored surfaces become soiled or otherwise marked, they can be cleaned using a soft, clean cloth and any commonly available, mild window cleaner.

5.0 Wiring

CAUTION: ONLY APPLY POWER AFTER ALL CONNECTIONS HAVE BEEN MADE AND INSPECTED.

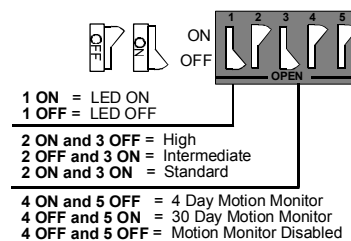
NOTE: Do not coil excess wiring inside unit.



- **Terminals 1 (-) & 2 (+):** Power limits are 6 to 15 VDC. Use no smaller than #22 AWG (0.8 mm) wire pair between the unit and the power source.
- **Terminals 3, 4, & 5:** Alarm relay contacts rated 125 mA, 28 VDC maximum for DC resistive loads. Use terminals 4 & 5 for Normally Closed circuits. *Do not use with capacitive or inductive loads.*
- **Terminals 6 & 7:** Normally Closed tamper contacts rated at 28 VDC, 125 mA.
- **Terminal 8:** Trouble Output.

6.0 Configuration Switch Settings

The DS938Z has several features that are controlled using the configuration switches.



6.1 LED Operation (S1)

- **ON:** Allows the Alarm/Test LED to operate when activated by motion.
- **OFF:** The LED will not operate on alarm activation, but will indicate a supervision trouble condition.

6.2 Sensitivity Mode (S2 and S3)

Sensitivity modes depend on the type of coverage desired and the installation environment.

- **Standard Sensitivity:** Tolerates environment extremes on this setting, but requires the largest amount of intruder motion to achieve an alarm.
- **Intermediate Sensitivity:** The recommended setting for most installations. Use in locations where an intruder is expected to cover only a small portion of the protected area. Tolerates normal environments on this setting. **The detector is shipped in Intermediate Sensitivity mode.**

- **High Sensitivity:** The setting for fast response to intruder signals. For use only in extremely quiet environments where ceiling drafts, and thermal and illumination transients are not anticipated.

If both switches are in the OFF position, the unit will default to the Intermediate setting.

NOTE: Although the sensitivity modes provide different degrees of tolerance to environmentally caused alarms, the installer should assure peak background noise voltage readings do not exceed ± 0.15 VDC. (See Section 8.0 Final Tests).

6.3 Motion Monitor (S4 and S5)

Set switches S4 and S5 for the desired Motion Monitor time (see Section 9.0 Supervision Features). **The detector is shipped with the Motion Monitor feature disabled.**

6.4 Signal Gain

The DS938Z permits selection of the signal gain depending upon the environment to be protected. The gain select jumper is located under the optical module.

- **High Gain:** Recommended for large coverage applications up to 60 ft. (18.3 m) in diameter. The DS938Z is shipped in this setting. If the gain select jumper is missing, the unit will default to High Gain.
- **Low Gain:** Recommended for applications where the area to be covered is 40 ft. (12.2 m) or less in diameter and for applications where High Gain may be too sensitive for environmental extremes.

NOTE: Setting the DS938Z for Low Gain reduces the coverage area to 40 ft. (12.2 m) in diameter.

7.0 Setup and Walk Testing

- Attach a TC6000 Test Cord to the Noise Voltage terminals. Since the outside terminals are common, polarity is not important and the black lead may be toward or away from the optical module.
- Attach a Sonalert™ to the sounder pins at this time if one will be used during walk testing.

NOTE: The use of a Sonalert™ type device (sounder) will provide an audible tone during the time the unit is in alarm. Of the three available connector pins, the center pin is positive (+) with respect to either outside pin (outside pins are common (-)).

Sonalert™ is a trademark of Mallory.

- **Place the cover on the unit,** and twist-lock it clockwise into place.

NOTE: Be sure the TC6000 and Sonalert™ leads are dressed through the cutout.

- Apply power to the unit.
- Wait at least two minutes, after applying power, to start walk tests.

NOTE: Walk testing should be done across the coverage pattern as shown.

- The edge of the coverage pattern is determined when the Alarm/Test LED indicator (and optional Sonalert™, if installed) first turns on.
- Walk test the unit from all directions to determine the boundaries.
- After completion of the walk tests, remove the Sonalert™ (if installed).

8.0 Final Tests

8.1 Noise Measurement

NOTE: Meter readings are very important in determining background disturbance levels and catch margin sensitivity.

- Connect a 20,000 ohm/volt (or greater) DC VOM to the Noise Voltage connector using the TC6000 as shown. Set meter scale for about 3.0 VDC.
- The base reference level for reading background noise or target voltages is approximately 2.0 VDC. Installations in quiet environments, therefore, will result in a steady meter reading between 1.9 and 2.1 VDC. Look for areas and sources of thermal disturbances if the meter fluctuates greatly.

8.2 False Alarm Prevention

- Turn on all heating and cooling sources that would normally be in operation during times of protection. Stand away from the unit and outside the coverage pattern, then monitor the background noise for at least **three minutes**.

Readings should not deviate from the reference level more than ± 0.15 VDC. For readings outside these limits; eliminate the cause, rotate the unit slightly, or mask out the mirror segment(s) looking down at the thermal disturbance.

8.3 Coverage Margin

- Again walk across the farthest edge of required coverage.

A minimum voltage change of 1.0 VDC from the reference level is required in the wintertime when the background temperature is cool. This will make up for summertime, when the background is warmer. If testing the unit in the summertime, the minimum recommended voltage change is 0.75 VDC.

- When testing is completed, remove the TC6000 Test Cord, and twist-lock the cover into place.

9.0 Supervision Features

The DS938Z performs several supervision features that, combined with the advanced motion detection capabilities of the detector, provide an extremely high level of security. A supervision trouble condition is indicated at the detector by the Alarm/Test LED (see the Supervision Display Chart).

- The LED indicates the cause of the supervision trouble using coded pulses. The supervision trouble signal activates the Trouble Output available at terminal 8, which should be connected to a 24-hour zone.

The supervision features function as follows:

Supervision Display Chart

LED	CAUSE
ON	Unit Alarm
2 Flashes	Motion Monitor Timeout
4 Flashes	PIR Self-test Failure

- **PIR:** The operation of the PIR is electronically checked approximately every 12 hours. If the PIR fails, the Alarm/Test LED will flash four times and the Trouble Output will activate.
- **Motion Monitor Supervision:** This feature verifies that the detector has a clear view of the detection area and has not been blocked. When selected using switches S4 and S5, a supervision timer is activated. A trouble condition will be indicated if the detector has not alarmed at least once during the selected time period (this feature can be disabled by placing both switches in the Off position). The time period selected should be long enough to allow adequate time for holiday weekends.

Refer to Section 6.0 (Configuration Switch Settings) for proper switch settings.

If the time period selected has elapsed from the last alarm, the LED will flash two times and the Trouble Output will activate.

Setting the Motion Monitor timer to shorter periods can be used to force a protection walk test of remotely located zones.

It is recommended that the 30 day timer be selected. This verifies that the unit is operational and avoids nuisance trouble conditions caused by holidays, vacations, etc.

10.0 Other Information

10.1 Anti-vandal Tie-down

- After the cover has been installed and twisted into place, the entire assembly can be secured together using the supplied anti-vandal screws. There are two of them; one for each side (see drawings on page 1 for the location of the screw holes).

10.2 Optical Module Masking

- Peel-off masks are provided with the unit for each segment of the optical module to allow for customized coverage, or to block out areas of objects that may cause thermal disturbances. The mask is self-adhesive and pre-cut in the shape of the optical module.
- To block out a particular zone or group of zones, peel off a section of the mask that corresponds to the appropriate zone, and stick it on the mirror segment. Use Section 13.0 (DS938Z Mirror Module to Pattern Reference) to identify mirror segments and zones.

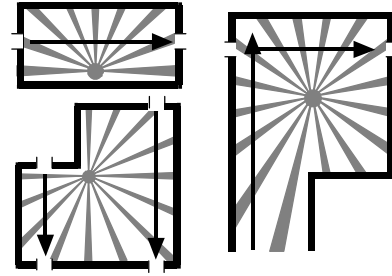
10.3 Maintenance

- At least once a year, the range and coverage should be checked according to Sections 7.0 and 8.0 (Setup and Walk Testing and Final Tests).
- To ensure continued daily operation, the end user should be instructed to daily walk through the far end of the coverage pattern. This assures an alarm output prior to arming the system.

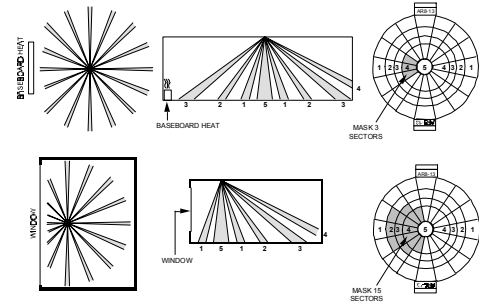
10.4 U. S. Patent Numbers

- The DS938Z is protected by the following U. S. patents: #4,764,755 and #5,083,106.

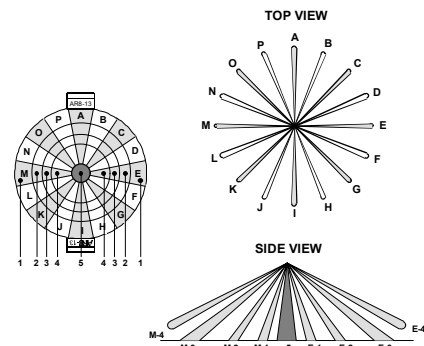
11.0 Typical Placements to Achieve Coverage



12.0 Optical Masking to Avoid Environmental Problems



13.0 DS938Z Mirror Module to Pattern Reference



NOTE: The location of the zone to be masked depends on the position of the detector. Therefore, determine the mirror surface to be masked before removing the mirror from the detector. When replacing the mirror, make sure it is facing the same direction as before it was removed.

Before attempting any masking, be sure the chosen mirror surface is the correct one. When attempting to remove any masking, many adhesives will either destroy the mirror surface or leave enough residue behind to reduce coverage performance.

When disabling the look-down segment, do not mask segment 5 directly as this will disable the entire detector. Instead, mask the segment on the dome directly below segment 5.

Avoid soiling or leaving fingerprints on the mirror surfaces. Should they become soiled or otherwise marked, they can be cleaned using a soft, clean cloth and any commonly available mild window cleaner.

Drawings are not to scale and are intended as pattern identifiers only.