PIRAMID XL2
Passive **I**nfra**R**ed **A**nd **M**icrowave **I**ntruder **D**etector

Outdoor Motion Sensor Models
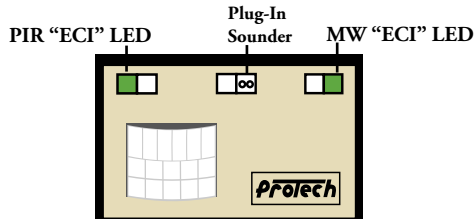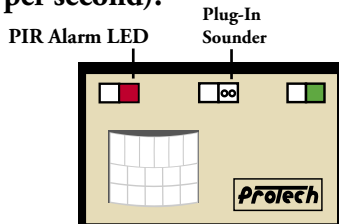### SDI-76XL2 and SDI-77XL2
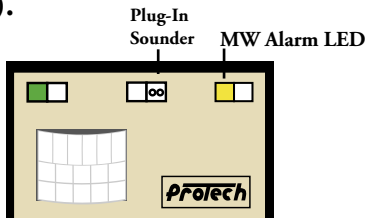
Walk Test LED Explanation

Green Is Good - Green "ECI" (Environmental Caution Indicator) LED's ON mean each technology is stable and ready for walk-test. **Optional XL-Sounder is silent.**

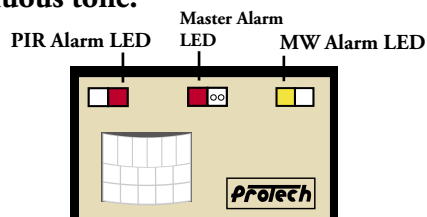PIR "ECI" LED   Plug-In Sounder   MW "ECI" LED

Passive Infrared Sensor is in Alarm - Passive Infrared Alarm RED LED is ON, but sensor is not in alarm. **Optional XL-Sounder beeps slow (2 beeps per second).**

PIR Alarm LED   Plug-In Sounder

Microwave Sensor is in Alarm - Microwave Alarm YELLOW LED is ON, but sensor is not in alarm. **Optional XL-Sounder beeps fast (8 beeps per second).**

Plug-In Sounder   MW Alarm LED

Sensor is in Alarm - Master Alarm RED LED is ON, because Passive Infrared Alarm RED LED and Microwave Alarm YELLOW LED are ON simultaneously. **Optional XL-Sounder sounds a continuous tone.**

PIR Alarm LED   Master Alarm LED   MW Alarm LED

TECH SUPPORT
800-428-9662

SENSOR SETTINGS

(Record Final Sensor Settings Below)

Model No:_____

Serial No:_____

Lens Module:_____

Circle Sensor Settings

Sensitivity Setting:
(Min.) 1 2 3 4 5 6 7 8 9 10 (Max.)

Range Setting:
10 20 30 40 50 60 70 80 90 100 (% of Max.)

Bird/Animal Immunity Switch Setting:
[Standard]   [Enhanced]

TABLE OF CONTENTS

QUICK INSTALLATION REFERENCE

1. Install mounting bracket. (pg. 3)
2. Review Application Guidelines—Do's and Don'ts for best mounting location. (pg. 10-24)
3. Remove electronic assembly from housing and install sensor housing/shroud assembly on bracket.
4. Route cable through 1/2" conduit connector into sensor housing. (pg. 4)
5. Remove Terminal Block from main printed circuit board and wire according to the wiring diagram on page 4 .
6. **For initial walk-test only**, set sensor range and sensitivity at maximum. (pg. 5)
7. Plug-in "wired" terminal block. Route cable under "cable holders". (pg. 4)
8. Slide electronic assembly into housing. Tighten the four faceplate screws. (pg. 5)
9. Loosen swivel slightly so sensor is held in place, but can be aimed upward, downward and side-to-side without using the Allen Wrench each time. (pg. 5)
10. Install XL-Sounder audible tester accessory. (pg. 8)
11. Locate protection pattern by walk testing. (pg. 5) Careful aiming of the sensor can optimize pattern coverage. (pg. 5-6)
12. Once the desired protection pattern coverage is obtained, tighten the swivel locking screw to lock the sensor in place.
13. For best false-alarm-free performance, it is critical that you reduce the Sensitivity Control to the lowest possible setting while maintaining acceptable walk-test performance. (pg. 6-8)
14. If possible, reduce the Range Control.
    Note: the "Rule of Thumb" is to adjust the sensor's sensitivity and range to the lowest possible settings to attain the desired coverage.

A BASIC DESCRIPTION

GENERAL

The PIRAMID XL2 (Passive Infrared And Microwave Intrusion Detector) is an outdoor dual technology sensor designed to provide volumetric protection in a wide variety of outdoor applications. The sensor uses the unique combination of "Stereo Doppler" Microwave and Passive Infrared technologies.

PIRAMID XL2 is configured for "And Gate" operation; i.e. both technology portions must activate simultaneously for the sensor to alarm. The microwave portion detects the motion of the intruder, whereas the passive infrared portion detects a change in infrared radiation. When both technologies activate at the same time, the sensor initiates an alarm condition.

For optimum performance it is best to use the PIRAMID XL2 as a motion sensor to protect specific assets and strategic areas. Generally the sensor is not used along a perimeter fence area like an outdoor P.E. Beam unless in a proprietary system with "on-site" response or with video verification.

SPECIFICATIONS

Nominal Input Voltage: 12VDC
Input Voltage Limits: 9 VDC Min. to 20 VDC Max.
Current Consumption: 150mA@ 12VDC
Temperature: -30°F to 140°F, -34°C to 60°C
Relay Contact Rating: .1A, 50V
Frequency: 10.525 GHz (USA)
10.587 GHz (Europe)
9.90 GHz (Europe)
9.47 GHz (Europe)

Protection Pattern Coverage
SDI-76XL2 = 50 ft. x 50 ft. (15m x 15m)
SDI-77XL2 = 90 ft. x 50 ft. (27m x 15m)

Optional Protection Patterns with Lens Module Change:
SDI-77XL2-B = 100 ft. x 35 ft. (30m x 10.5m)
SDI-77XL2-C = 125 ft. x 20 ft. (38m x 6m)
SDI-77XL2-D = 100 ft. x 9 ft. (30m x 3m)
Changing the Lens Module (see inside back cover)

Pet Alley Lens Modules:
Lens A-Pet = Wide Angle
Lens B-Pet = Medium Angle
Lens C-Pet = Narrow Angle

Note: SDI-77XL2 is equipped from the factory with Lens A.

INSTALLATION

MOUNTING PIRAMID XL2

1. The PIRAMID XL2 comes equipped with a wall mount bracket. Install the wall mount bracket where the sensor will be located. Ensure that it is firmly mounted and free from extreme vibration. Avoid visual obstructions that may block the sensor's field of view.

UNIVERSAL POLE MOUNT

2. For a pole mount installation, PROTECH offers two universal pole mounts as accessory items. Model PH-4 is suitable for poles with a diameter of $1^1/2$" to $4^1/2$"(3.8cm to 11.4cm). Model PH-4A is suitable for poles with a diameter of $4^1/2$" to $8^1/2$" (11.4cm to 21.6cm). The wall mount bracket mounts to the PH-4/PH-4A Universal Pole Mount.

BEST MOUNTING LOCATION

3. The sensor should be mounted so that the most likely direction of travel by the intruder is toward or away from the sensor.

4. PIRAMID XL2 provides good transverse detection capability only when adjusted in the higher sensitivity settings (10, 9 and 8). Operating the sensor in these higher settings may increase nuisance alarms. Therefore, to enable effective detection in the lower sensitivity settings (1, 2, 3, etc.), it is best to locate the sensor to detect approaching and receding movement.

5. Remove the Microwave Electronic Assembly from the Housing/Shroud Assembly by loosening the four screws on the sensor's faceplate. Attach the housing/shroud assembly to the mounting bracket using the hex head bolt provided.

MOUNTING HEIGHT

6. The optimum mounting height of the sensor can vary considerably depending on the model's lens module, security requirement and environmental conditions. Refer to the table below for recommended mounting heights.

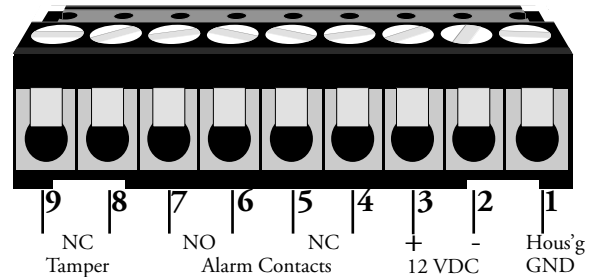| LENS MODULE	LENS DESCRIPTION	MOUNTING HEIGHT
LENS-A	Wide Angle – Standard	8-15 ft. / 2.4-4.6m
LENS-B	Medium Angle – Standard	8-12 ft. / 2.4-3.7m
LENS-C	Long Narrow – Standard	7-9 ft. / 2-2.7m
LENS-A-PET	Wide Angle – Pet Alley	4-6 ft. / 1.2-2m
LENS-B-PET	Medium Angle – Pet Alley	4-6 ft. / 1.2-2m
LENS-C-PET	Long Narrow – Pet Alley	4-6 ft. / 1.2-2m

Sensor Mounting Height Based On Lens Module Selection

WIRING AND PRELIMINARY SET-UP

MINIMUM WIRE SIZE:

1. With the housing/shroud assembly attached to the mounting bracket, feed the wire through the conduit connector into the sensor housing. For power connections, PROTECH recommends a minimum 18 AWG wire for wire runs greater than 50 ft (15.5m).

2. Remove terminal strip from the microwave electronic assembly and wire according to the diagram below.

REMOVABLE TERMINAL STRIP

9	8	7	6	5	4	3	2	1
NC Tamper		NO	Alarm Contacts	NC		+	- 12 VDC	Hous'g GND

3. Observe the correct polarity at the power terminals.

SHIELDED CABLE RECOMMENDED

4. For best shielding from Radio Frequency Interference (RFI) and transients due to lightning or electrostatic discharge, PROTECH highly recommends the use of shielded cable. When shielded cable is used, the cable shield (and/or drain wire) should be connected to Terminal 1 (HOUS'G GND) at each sensor. Terminal 1 is connected by a **spring contact** to the housing, but is not otherwise connected to the electronic circuitry. The other end of the shield should be connected to a common ground (generally the same ground used for the power supply or control unit). Regardless of the type of cable used, Terminal 1 (HOUS'G GND) should always be connected to a good earth ground.

CABLE HOLDERS

5. After wiring the removable terminal strip, plug it back into the Microwave Electronic Assembly. Route cable under "cable holders" which are provided on the circuit board.

6. Slide the Microwave Electronic Assembly back into the housing, pulling the excess wire out of the rear of the housing. Tighten the four-faceplate screws uniformly to obtain a weather seal between the front bezel and the housing gasket.

7. Make sure the **tamper switch** actuator arm is fully depressed when it contacts the rear of the housing for a NORMALLY CLOSED contact on terminals 8 and 9.

8. In most installations, it is best to aim the sensor at a slightly downward angle as this minimizes the small "dead zone" directly beneath the sensor. This also helps to terminate the sensor's protection pattern within the protected area.

9. Apply power (8.5 to 20 VDC) to terminals 2(-) and 3 (+) and allow at least 1 minute of **stabilization time** before walk testing.

10. Check the **LED On/Off Switch** to verify that it is in the "ON" position. The LED On/Off Switch controls the "Walk Test" LED's and the **Voltage OK LED.**

11. Observe the Green **Voltage OK LED** on the printed circuit board to verify that it is "ON". The Voltage OK LED will TURN ON continuously when the input voltage reaches 10.5 VDC and will TURN OFF when the input voltage drops below 9.5 VDC.

WALK-TESTING

1. The **Analytic Walk Test LED's** are very difficult to see in bright sunlight. Therefore, PROTECH highly recommends that the **XL-SOUNDER Audible Tester** be utilized for sensor walk-test. The XL-SOUNDER will enable a single installer to walk-test the sensor and will greatly reduce installation time!

HELPFUL HINTS FOR WALK TESTING

2. It is best to start with range and sensitivity settings at maximum. Loosen swivel locking screw just enough so that the sensor will be held in place but can be aimed slightly upward and downward in approximately 1 degree increments. It is best to locate the IR protection pattern first. The IR sensor portion is most sensitive to movement across the pattern and

therefore walk testing should entail taking a few steps across (transverse) the area at the maximum desired range. Once the desired IR protection pattern is located, tighten the swivel-locking screw to lock the sensor in place. The microwave protection pattern overlaps the passive infrared pattern and should be present.

Now that the proper sensor alignment is locked in place, try to reduce the sensitivity first. The lower the setting, the better the false alarm rejection. Next, try to reduce range. The "Rule of thumb" is to adjust the sensor's range and sensitivity to the lowest possible settings to attain the desired coverage.

IMPORTANT: The most critical adjustment for false alarm rejection is the SENSITIVITY CONTROL. Settings of 1, 2, 3, and 4 are best for false-alarm-free performance.

SENSOR ADJUSTMENTS

The key to success in many applications is the proper adjustment of the sensor's Range Control Switch, Sensitivity Control Switch and Bird/Animal Control Switch. Note: Refer to diagram on Pages 13 and 14 for detail.

RANGE CONTROL SWITCH

The Range Control Switch adjusts the overall size of the sensor's detection area. It may be necessary to set the sensor at the higher settings (70, 80, 90 and 100 percent of maximum) to attain the desired protection pattern coverage.

Note: Although the sensor can be set at maximum range and operate properly, the "rule of thumb" is to set at the lowest setting to attain the desired range.

SENSITIVITY CONTROL SWITCH

The Sensitivity Control Switch adjusts the amount of movement required for an alarm condition. The Sensitivity Control Switch is very precise as the PIRAMID XL2 can determine the exact "distance in inches (cm.)" that an object must move to initiate an alarm. The following table shows the amount of movement required based on the switch setting.

SENSITIVITY	SETTING	MOVEMENT REQUIRED IN INCHES / CM
HIGHEST	10	4"/ 10CM
	9	8"/ 20CM
	8	12"/ 30CM
	7	16"/ 40CM
	6	20"/ 50CM
	5	24"/ 60CM
	4	28"/ 70CM
	3	32"/ 80CM
	2	36"/ 90CM
LOWEST	1	40"/ 100CM

VERY IMPORTANT:

The most critical adjustment for false alarm rejection is the SENSITIVITY CONTROL. Settings of 1, 2, 3 and 4 are best.

The PIRAMID XL2 provides good detection in all ten sensitivity settings with respect to movement toward or away from the sensor. Keep in mind that in the lower sensitivity settings (1, 2, 3, 4, and 5) transverse detection ("crosscatch") is very sluggish. Therefore, it is important for the sensor to be located so that the most likely point of travel is slightly toward or slightly away from the sensor.

Proper mounting location of the PIRAMID XL2 will enable lower sensitivity settings. Lower sensitivity settings will enhance false-alarm-free performance.

Note: Each sensor should be periodically walk-tested to ensure that the required detection is attained.

ENHANCED BIRD/ANIMAL IMMUNITY CONTROL SWITCH

A two-position switch adjusts the sensor's immunity to birds and small animals. Note: The PIRAMID XL2 sensor is shipped from PROTECH in the *Standard Immunity Setting.*

Standard Immunity Setting - Offers excellent immunity with respect to birds and small animals and is the best setting in most applications. The PIRAMID XL2 sensor will provide good nuisance

alarm rejection as well as good detection sensitivity in the *Standard Immunity Setting.*

Enhanced Immunity Setting - Often used as a last resort to eliminate nuisance alarms caused by an abundance of birds and animals in the protected area. The use of a Pet Alley Lens Module (Lens A-Pet, Lens B-Pet and Lens C-Pet) in conjunction with the *Enhanced Immunity Setting* would also be highly recommended in animal prone applications. In the *Enhanced Immunity Setting,* overall detection sensitivity of the PIRAMID XL2 sensor will be reduced approximately 20%.

Caution: In the Enhanced Immunity Setting the speed of detection is significantly reduced. Therefore, the PIRAMID XL2 may not detect an intruder or a vehicle traveling at a rate of speed above $3^1/2$ Feet (1m) Per Second.

WALK-TEST PROCEDURE
FOR ANALYTIC WALK TEST LED's

1. Remain motionless outside the protection area until both Green LED's are on steadily.

2. Walk into the surveillance area while observing all LED's.

3. Both Green LED's turn off (responding to motion and changes in infrared radiation) followed by the Microwave Yellow LED and the Passive Infrared Red LED turning on.

4. Master Alarm Red LED in the center of the sensor faceplate turns on when both the Microwave Yellow LED and Passive Infrared Red LED are on simultaneously.

IMPORTANT: SEE BACK COVER OF INSTALLATION GUIDE FOR WALK TEST LED FUNCTION.

WALK-TEST PROCEDURE
FOR XL-SOUNDER AUDIBLE TESTER

The model XL-SOUNDER plugs into the face of the sensor and is a tremendous aid in walk-testing PIRAMID XL2 sensors. PROTECH strongly urges its use.

Sensor with
XL-SOUNDER

Sensor with
XL-MINISOUNDER

SOUNDER INSTALLATION PROCEDURE

1. Plug Sounder into the receptacle next to the Master Alarm LED in the upper center of the sensor's faceplate. Note: The XL-Sounder can be conveniently clipped to the sensor's Weather Shroud.

2. Sounder activates immediately upon being plugged into the receptacle.

SOUNDER WALK-TEST FUNCTION

The sounder provides three distinct sounds to assist in the walk test procedure.

Sounder Silent = Neither Technology Portion in Alarm
Slow Beep = Passive Infrared Technology Only in Alarm
Fast Beep = Microwave Technology Only in Alarm
Continuous Tone = XL Sensor in Alarm (Both PIR and MW Technologies in Alarm Simultaneously)

1. When the Passive Infrared Sensor Portion alarms you will hear a slow "beep" at a rate of approximately 2 beeps per second. The slow beep will continue only while the passive infrared sensor remains in alarm. The slow beep will stop when the passive infrared sensor resets.

2. When the Microwave Sensor Portion alarms you will hear a fast "beep" at a rate of approximately 8 beeps per second. The fast beep will continue only while the microwave sensor portion remains in alarm. The fast beep will stop when the microwave portion resets.

3. When both the passive infrared and microwave sensors are in alarm simultaneously, you will hear a continuous tone indicating the sensor is in alarm. Unplug and remove sounder after walk testing is complete.
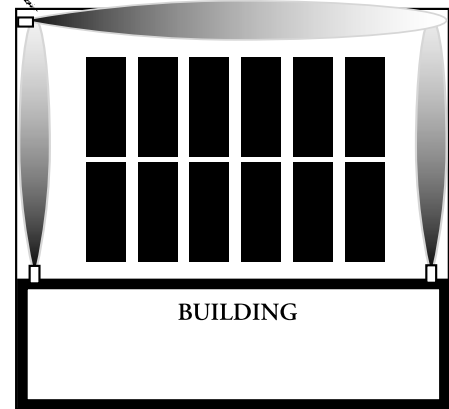
Note: PROTECH highly recommends driving a large vehicle around the outside perimeter at less than 10 MPH to ensure the protection pattern is contained within the protected area.

USE AS A MOTION SENSOR NOT AS A PERIMETER SENSOR

DON'T use the PIRAMID XL2 as a perimeter sensor. You will have to adjust the sensor's sensitivity at a very high setting for good transverse detection. The sensor is likely to experience nuisance alarms when adjusted in the higher sensitivity settings.
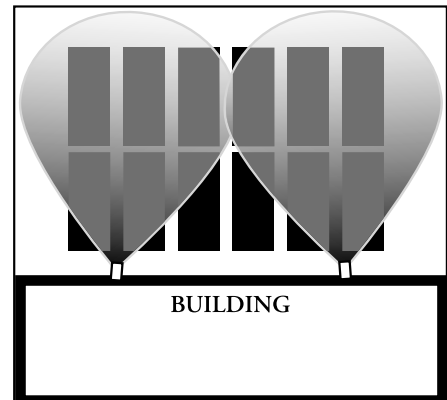

DO use the PIRAMID XL2 as a motion sensor with a "wide field of view" lens module. You will be able to adjust the sensor's sensitivity setting in the lower positions to help ensure virtually false-alarm-free performance.
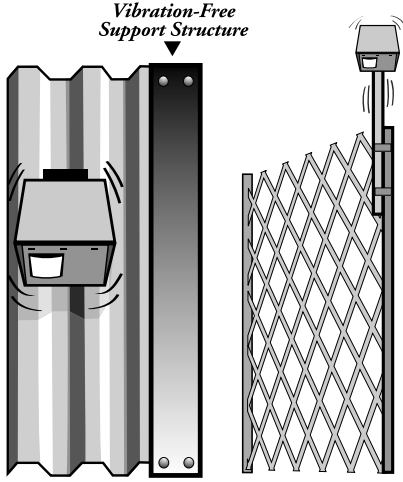
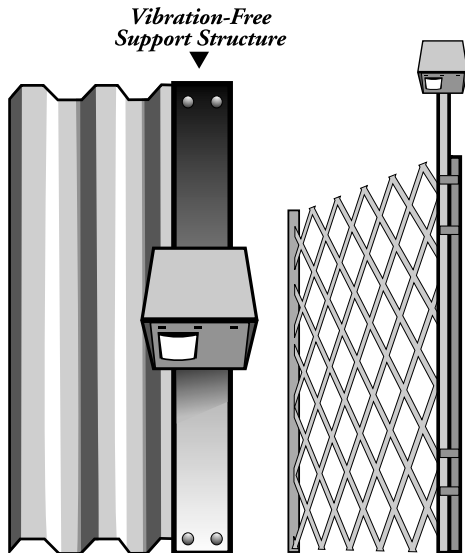## CHOOSE A SOLID MOUNTING BASE FOR THE SENSOR

DON'T mount the sensor on a surface prone to extreme vibration, such as chain link fence without support or on the flimsy siding of a metal building.

✗ DON'T

Vibration-Free Support Structure ▼

DO mount on a solid wall or pillar. If mounting on a metal building, be sure to find a support structure to ensure a vibration free mounting.
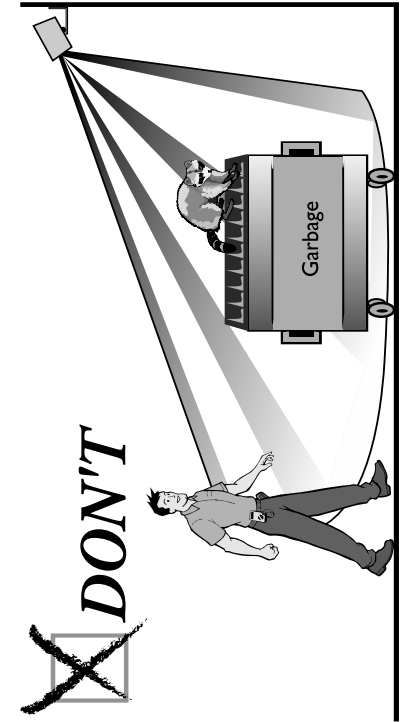

✔ DO

Vibration-Free Support Structure ▼

11

BEWARE OF GARBAGE ATTRACTING ANIMALS AND BIRDS

DO store garbage cans and trash bins out of the sensor's field of view.

✔ DO

Garbage

DON'T leave garbage cans and trash bins in the sensor's field of view, as they are known to attract animals and birds. Small animals and birds close to the sensor appear as much larger targets and are difficult for the sensor to ignore.
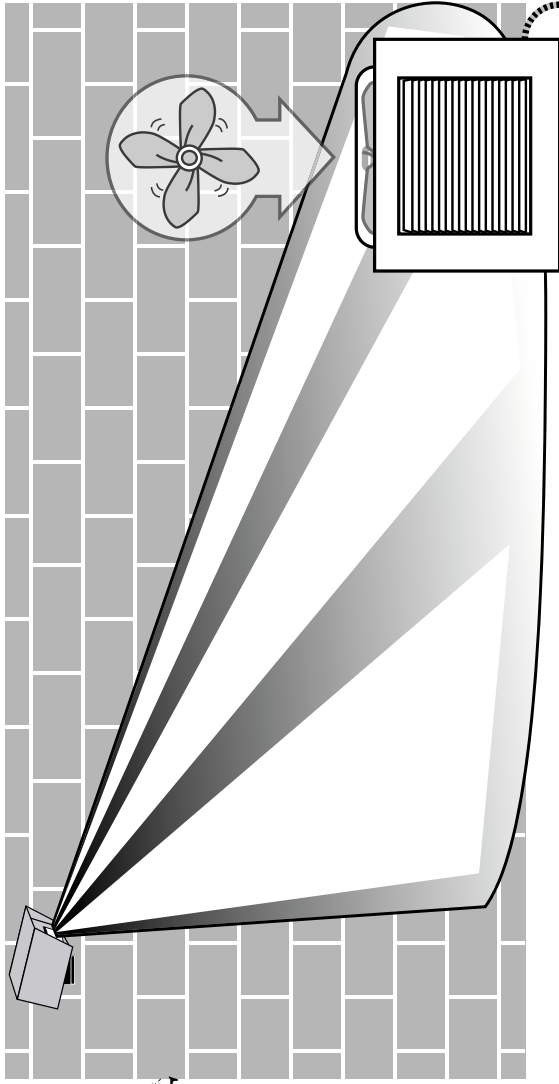

✗ DON'T

Garbage

12

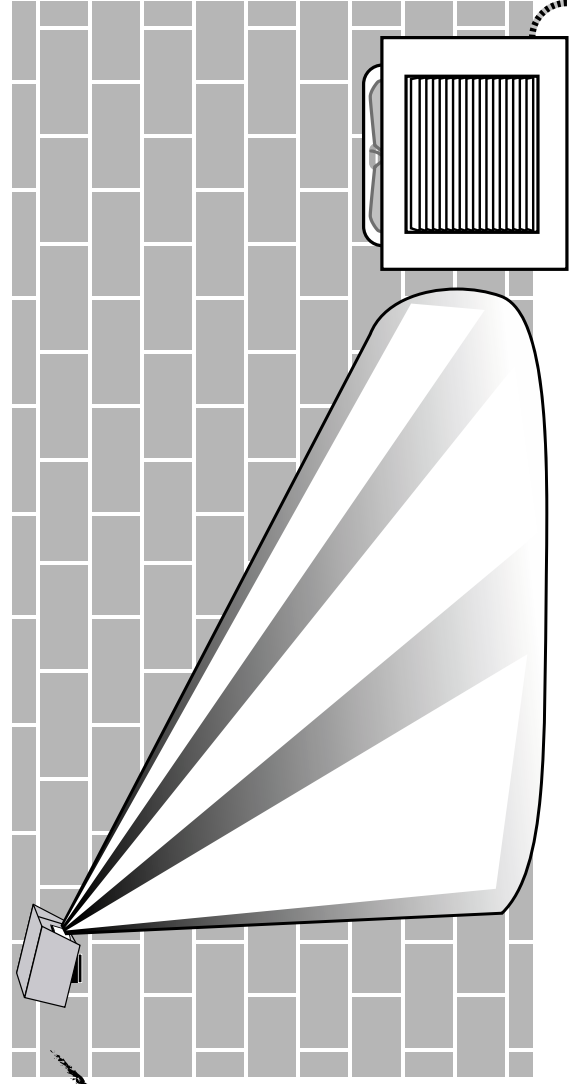**BEWARE OF FAN BLADES IN THE SENSOR'S FIELD OF VIEW**

DON'T aim the sensor at moving fan blades as the movement of the blades may cause false alarms.

DON'T

13

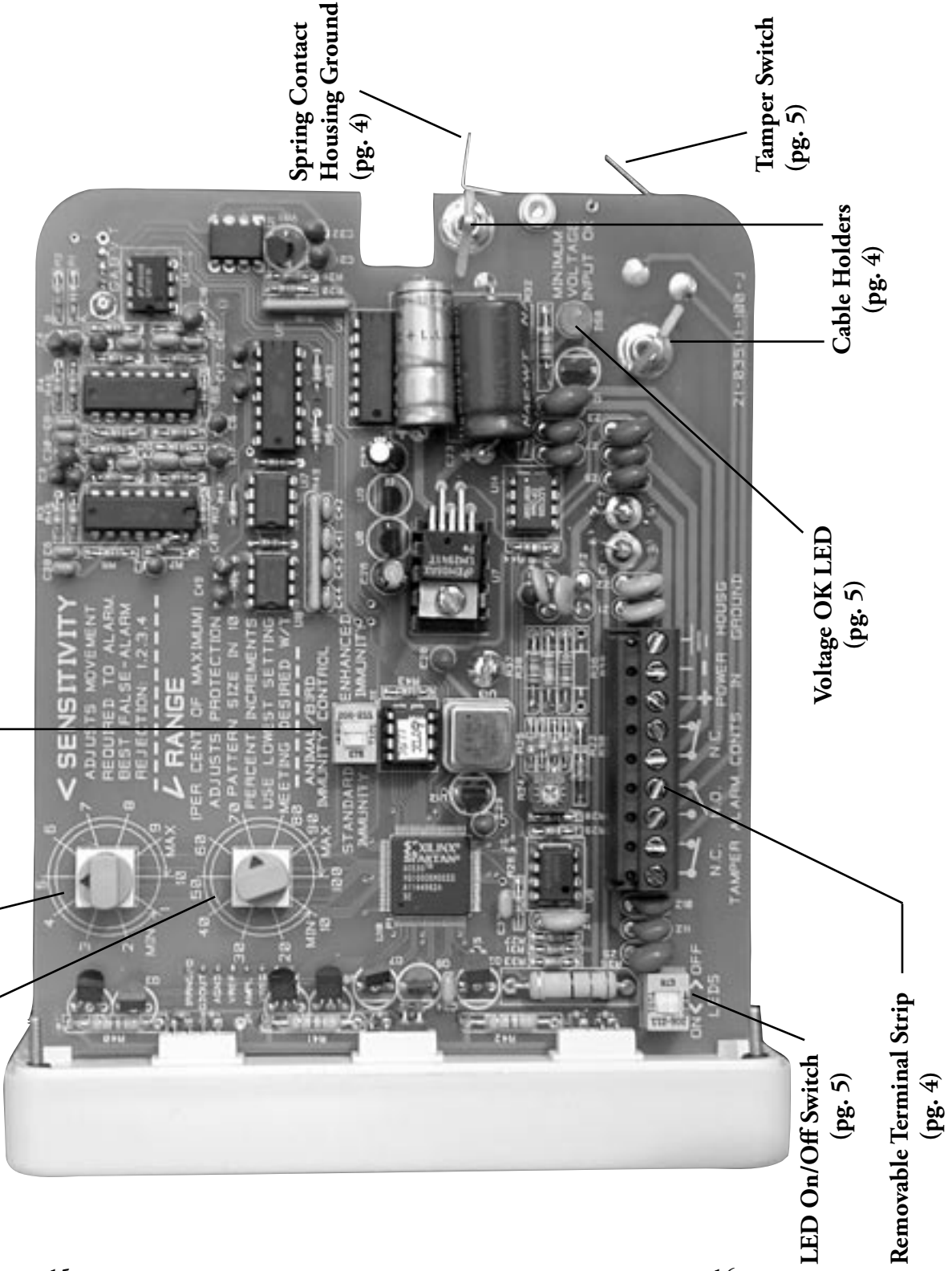**DO** aim and/or mount the sensor to avoid looking at fan blades.

DO

14

PRINTED CIRCUIT BOARD PIRAMID XL2

Spring Contact Housing Ground (pg. 4)

Tamper Switch (pg. 5)

Cable Holders (pg. 4)

Voltage OK LED (pg. 5)

Enhanced Bird/Animal Immunity Control Switch (pg. 7-8)

Sensitivity Control Switch (pg. 6)

Range Control Switch (pg. 6)

LED On/Off Switch (pg. 5)
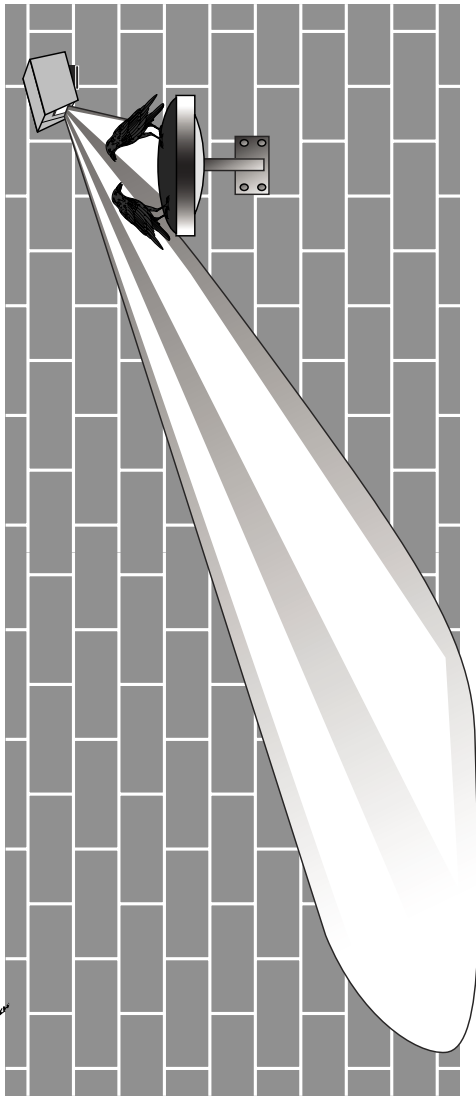
Removable Terminal Strip (pg. 4)

15

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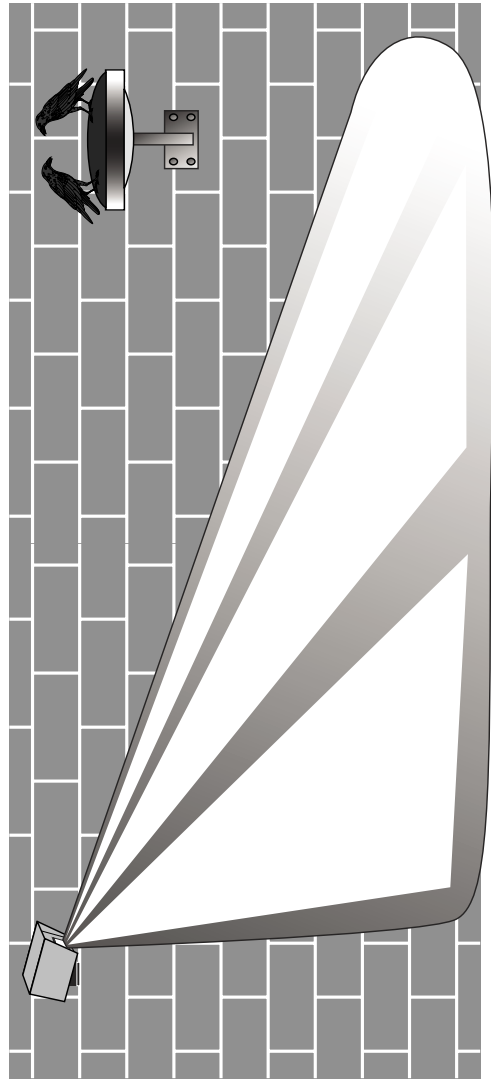## BEWARE OF BIRDS PERCHING IN THE SENSOR'S FIELD OF VIEW

DON'T mount the sensor where lighting fixtures, signs or building structures that can serve as a perch for birds or animals directly in front of the sensor.
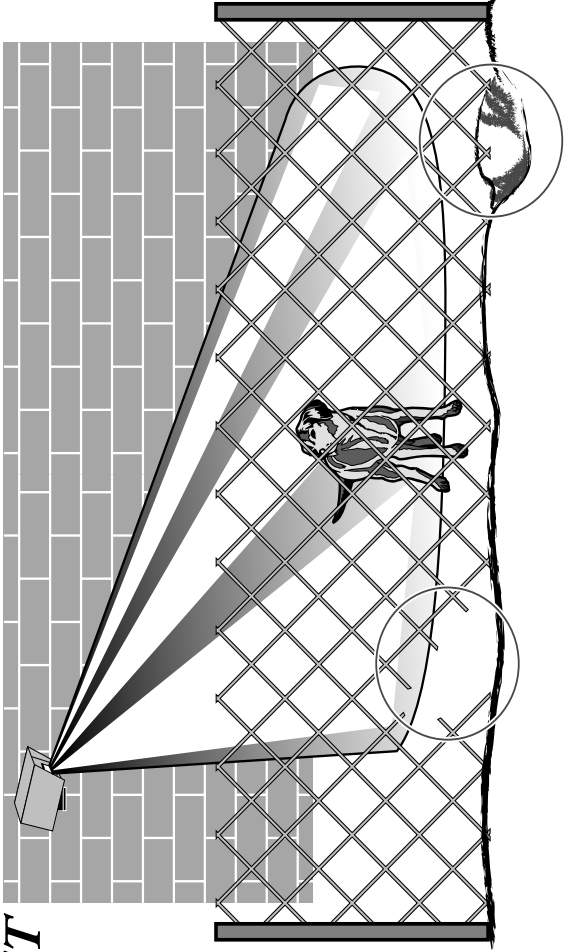
DON'T

17

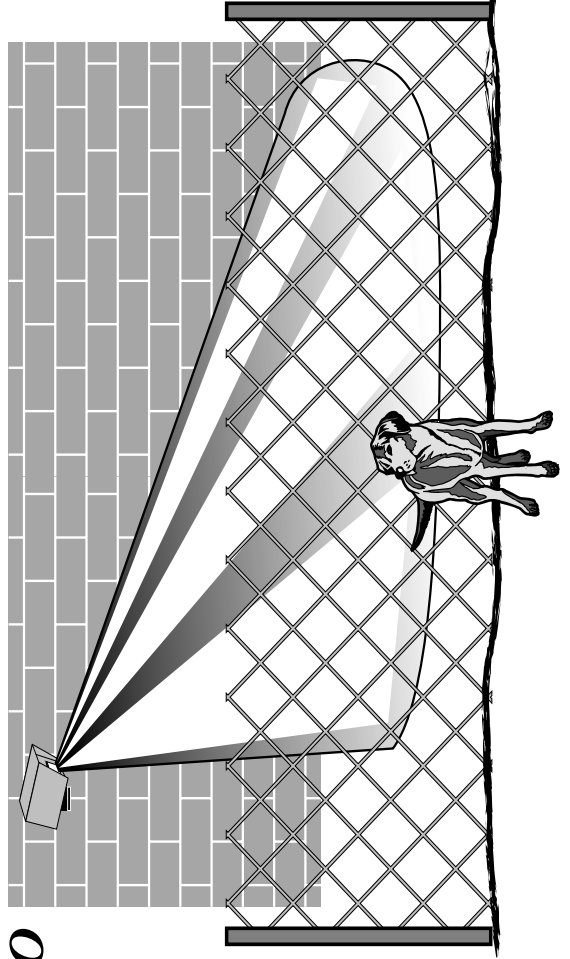**DO** mount the sensor where it has a clear field of view without obstructions.

DO

18

BEWARE OF ANIMAL ENTRY THROUGH GAPS OR HOLES IN THE FENCE

DON'T ignore openings in the fence or gate areas that can serve as easy entry for animals (dogs, cats, raccoons, etc.) into the protected area.
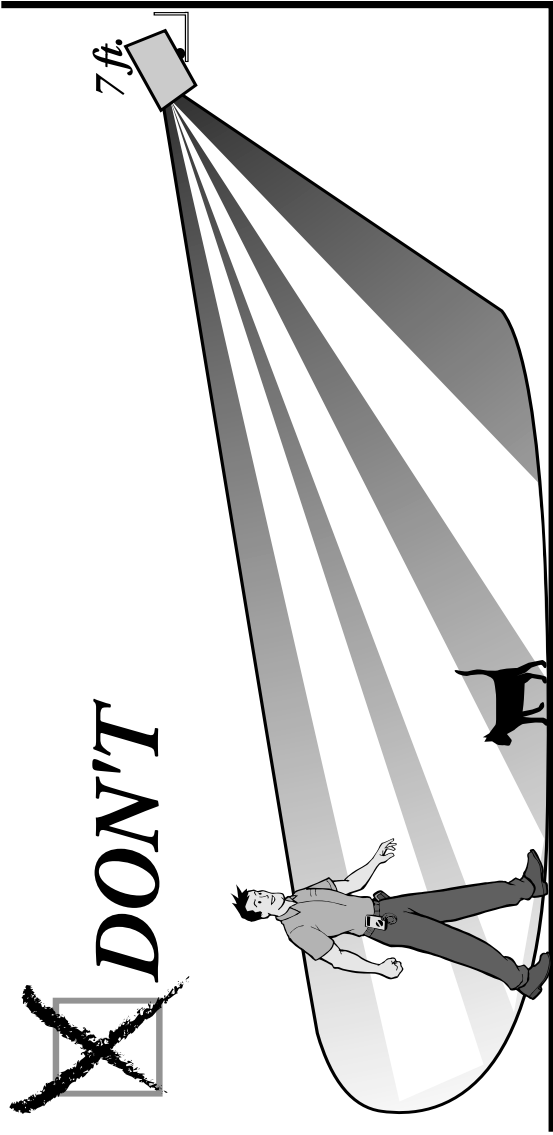
DON'T

19

DO patch holes and secure the fence so animals do not have free access into the protected area. Also, try to eliminate large gaps under gates that enable easy animal entry.

DO
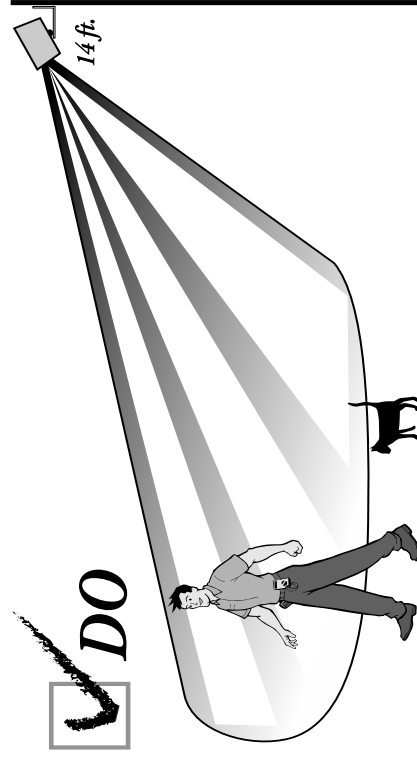

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BEWARE OF ANIMALS IN THE PROTECTED AREA

DON'T mount the sensor too low on the wall if animals will be present. At a low mounting height the protection pattern contacts the ground very close to the sensor where a small animal will appear to be large to the sensor.

✗ DON'T

7 ft.

DO mount fairly high if animals are likely to be present on occasion.
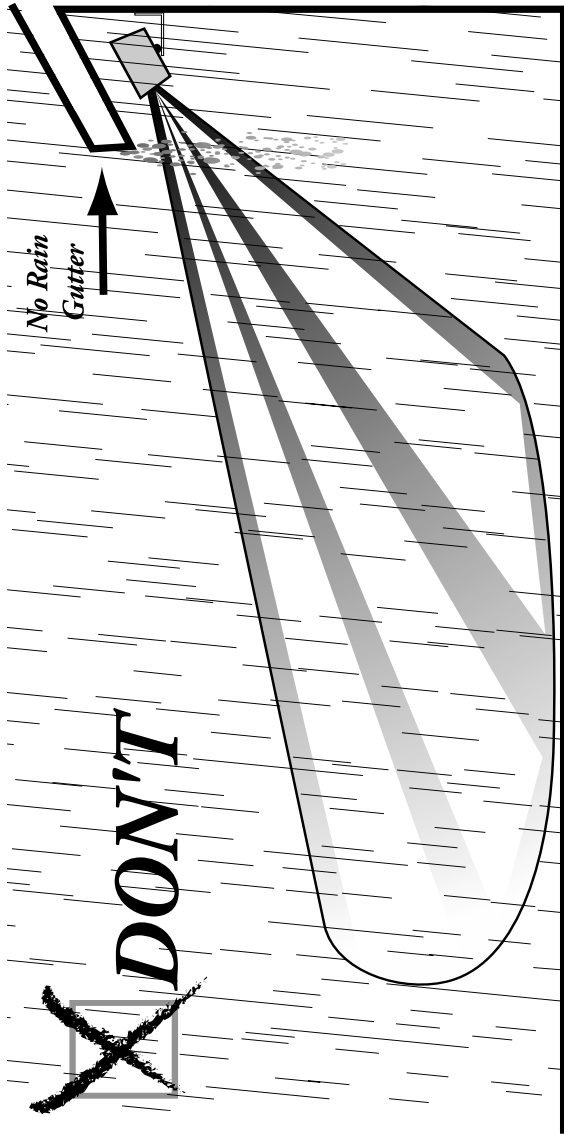
✓ DO

14 ft.

OR

DO use "Pet Alley" Lens Modules (Lens-A-PET, Lens-B-PET, Lens-C-PET) and mount at 4-6 ft. (1.2-1.9m) **Note:** Pet alley lens modules do not have infrared protection zones that contact the ground.

✓ DO

With Pet Alley Lens

5 ft.

No Rain Gutter

DON'T

USE CAUTION WHEN MOUNTING UNDER THE EAVES OF A ROOF

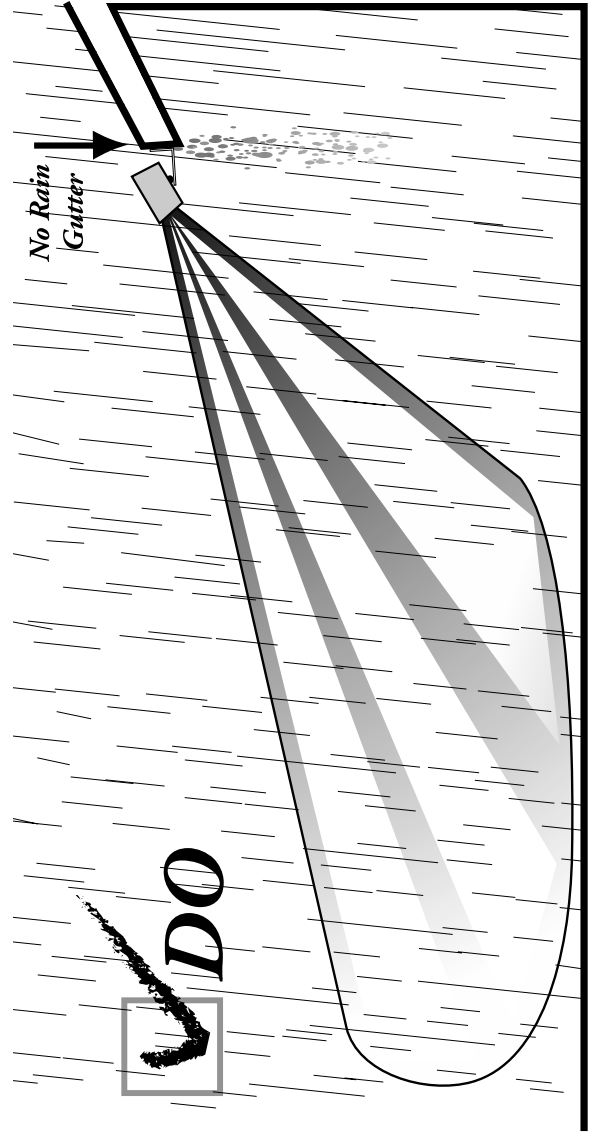**DON'T** mount the sensor under the eaves (overhang) of a non-guttered roof. During heavy rains the runoff directly in front of the sensor's face can create nuisance alarms.

23

No Rain Gutter

DO

DO mount the sensor where the sensor's weather shroud can route the rain away from the sensor's face or **DO** mount the sensor under the roof eaves **only** if the roof has a rain gutter.
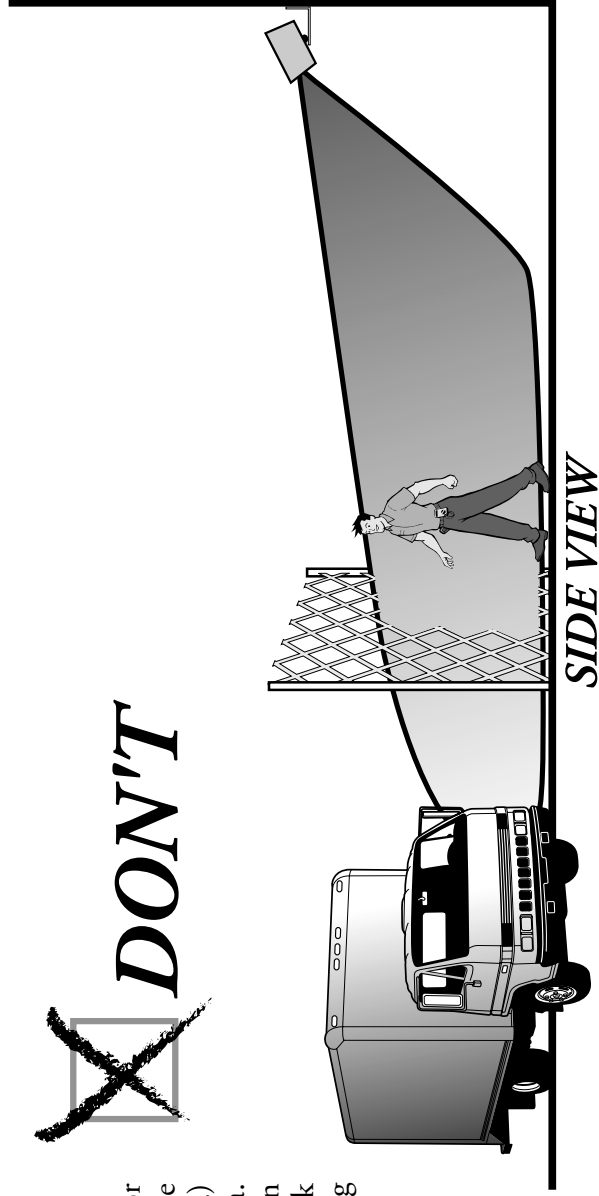
24

BEWARE OF LARGE OBJECTS OUTSIDE OF THE PROTECTED AREA

DON'T point the sensor so that it may detect a large object (car, bus, truck, train, etc.) outside of the protected area. Remember that the sensor can detect a large object like a truck or bus at distances approaching 500 ft. (152.4m).

DON'T

SIDE VIEW

DO aim the sensor downward so that the protection pattern coverage terminates into the ground within the protected area. Carefully test by driving a vehicle **(under 10 mph / 16 kph)** around the perimeter to ensure the protection pattern is contained within the protected area.

DO

SIDE VIEW

INSTALLATION CHECK LIST

☐ Is each sensor individually zoned? More than one sensor on an alarm zone should not be considered or tolerated! More than one sensor on one zone makes it virtually impossible to troubleshoot intermittent problems. Please advise your installation supervisor of PROTECH's position on this very important matter before proceeding with the installation.

☐ Is the Green **Voltage OK LED** on? The **Voltage OK LED** verifies that proper input voltage is provided at the sensor. It is best to view the **Voltage OK LED** with the AC power disconnected and the sensor powered by standby battery only. This would be worst case condition and deliver lowest voltage to sensor.

☐ Did you realize the **SENSITIVITY CONTROL** rotary switch is the most critical field setting for false-alarm-free performance? PROTECH recommends a field setting of 1, 2, 3, 4, or 5 in commercial applications. A field setting of "1" will provide the greatest false alarm rejection performance.

☐ Did you realize the **RANGE CONTROL** rotary switch adjusts the overall size of the sensor's detection area? Generally, to attain the maximum specified range of the sensor it will be necessary to set the **RANGE CONTROL** rotary switch near the maximum range settings of 80, 90, or 100 percent of maximum.

☐ Did you angle the sensor downward to terminate the protection pattern into ground? Did you test the perimeter with a vehicle to ensure the sensor is not seeing a large object (bus, truck, train, etc.) outside the protected area?

☐ Did you consider a higher mounting height so that a small animal (cat, rat, rabbit, bird, etc.) on the ground is too small to detect? Or have you considered using "Pet Alley" Lens Modules? Please refer to the specifications on page 3.

TROUBLESHOOTING

The sensor does not work; the LED's do not come on.
1. Check input voltage at terminals 2 (-) and 3 (+) or view the **Voltage OK LED** on PC board to verify that it is on. You must deliver 8.5 to 20 VDC at the input terminals.
2. Check to see if the LED switch is in the "ON" position.

The sensor Alarm LED is on constantly and does not reset.
1. If input voltage is OK, return sensor to manufacturer.

You cannot attain the maximum specified range of the sensor.
1. Refer to "Helpful Hint for Walk-Testing" in the WALK TESTING section of this booklet.
2. If the passive infrared portion does not detect as specified, check sensor alignment, as the proper aiming angle is very critical.
3. If the microwave portion does not detect as specified, check Range and Sensitivity Control.
4. Check to see if you have the proper Lens Module.
5. Are large objects blocking the protection pattern? If the sensor only sees 1/2 of an intruder, it is likely only 1/2 the expected range will be attained.

You are experiencing false alarms.
1. Check input voltage as described in item 1. It is best to check voltage with primary power disconnected from the main power source and the sensor operating on standby battery only. This should be the worst case or lowest voltage situation.
2. Check Sensitivity Control. PROTECH recom-mends a setting of 1, 2, 3, 4, or 5 for commercial/industrial applications.
3. Is the sensor angled downward to terminate the protection pattern into the ground? Did you drive a vehicle along the perimeter to ensure the sensor is not seeing a large object (bus, truck, train, etc.) outside the protected area? Remember that the sensor will see a man at 100 ft. (30.5m) but may see a bus at 500 ft. (152.4m) PROTECH highly recommends that the XL-SOUNDER be utilized for walk-testing.
4. Did you consider mounting the sensor higher so that a small animal (cat, rat, rabbit, bird, etc.) on the ground is too small to detect. Or have you considered using "Pet Alley" Lens Modules and mounting lower (4-6 ft.)?

Note: If all of the above has been checked out and the problem persists, please contact PROTECH Technical Support.

Changing The Lens Module

1.

2.

3.