PHOTOELECTRIC DETECTOR
AX-100PLUS, AX-200PLUS, AX-100ALPHA, AX-200ALPHA

Please read instructions completely before beginning installation.

Photoelectric detectors detect intruders when both the upper and lower invisible infrared beams are simultaneously broken. Maximum detection range between Transmitter and Receiver is 100ft. (30m) for AX-100PLUS / 100ALPHA and 200ft. (60m) for AX-200PLUS / 200ALPHA.

FEATURES
1. LED indicator for fine beam alignment level: Accurate and reliable alignment is easily achieved by using LED indicators located on the Receiver.
   - AX-100/200PLUS: Alarm indicator is located on the front of the inner housing and in the view finder.
   - AX-100/200ALPHA: Course Alignment LED and Alarm indicator are on the front of the inner housing and only Course Alignment LED is in the view finder.
2. Fine angle adjustment for alignment
3. Selectable beam frequencies: With just a turn of the dials, optical alignment is adjusted vertically and horizontally.
4. Form C relay
5. Anti-Frost structure with visor
6. Beam interruption time adjustment
7. Alignment level monitor jack
8. Optional Accessories: Crosstalk is eliminated with 4 channel selectable, beam frequencies. Used when stacking beams or for long range applications. (for AX-100/200ALPHA)
   - Form C relay for more applications.
   - Visor structure prevents fog and condensation from blocking the beams.
   - This function allows you to select the suitable beam interruption time for any environment.
9. UL Listed: Heating unit (HU-2), back cover (BC-2)

1. PARTS IDENTIFICATION

2. INSTALLATION HINTS

1. Mount unit only on a solid surface.
2. Do not install the unit where falling leaves or seasonal growth of branches will block the beam.
3. Prevent direct sunlight from entering into internal optics.
4. The mounting pole should have a solid footing with little movement at the top of the pole.
5. Avoid aerial wiring.
6. For indoor applications wiring is similar to the installation of a telephone or intercom.
   - For outdoor wiring, apply wire conduit as far as possible. Some sites will require shielded cables or underground wiring work.
3. INSTALLATION METHOD

a. General

1. Detection range and installation height

Maximum distances between Receiver and Transmitter are listed below:
- AX-160PLUS, AX-160ALPHA = 100m (328ft) Max
- AX-200PLUS, AX-200ALPHA = 200m (656ft) Max

2. Alignment angle

   Horizontally
   Vertically

   180° (±90°)
   10° (±5°)

3. Pole mounting
   - Pole size should be as follows: 1 1/16" = 1 7/8" (±43 ± 48 mm)(Standard U.S. 1 1/4" or 1 1/2" pipe)
   - The length of the wiring cable out of the pole should be within 20 inches (60cm).

b. Installation Method

1. Cover Lock Screw
   - Loosen the cover lock screw and remove the front cover. And loosen the unit base mounting screw and remove mounting plate by sliding it down against the unit base.

2. Wall mounting
   - Pull out the wire through the wiring hole on the mounting plate and attach the plate to the wall with the screw.

3. Pole mounting
   - Place U-shape brackets at the top of the pole. And pull out the wire through the wiring hole of the mounting plate, attach the mounting plate to the U-shape bracket with screw.

4. Two unit installation (back to back)
   - Fix two U-shape brackets in layers on a pole, two units can be installed back to back on a pole all the same height.

5. After checking optical alignment and operation check (See Sec.5 OPTICAL ALIGNMENT), replace the cover, and fasten the cover lock screw tightly.

4. TERMINAL AND WIRING

Receiver

<table>
<thead>
<tr>
<th>ALARM OUTPUT</th>
<th>POWER INPUT 10.5~28VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form C</td>
<td>(28VDC 0.2A max)</td>
</tr>
<tr>
<td>TAMPER</td>
<td></td>
</tr>
</tbody>
</table>

Transmitter

<table>
<thead>
<tr>
<th>POWER INPUT 10.5~28VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM N.C. N.O. SP TAMPER</td>
</tr>
</tbody>
</table>

Wiring Distance

- When using two or more units on one wire, the maximum length is determined by dividing the maximum wire length listed below by the number of units (one unit = to either one transmitter or one receiver) used.
- Power wires should not exceed the following lengths:

<table>
<thead>
<tr>
<th>WIRE SIZE</th>
<th>12VDC</th>
<th>24VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWG22(0.33mm²)</td>
<td>1600(500m)</td>
<td>8100(2500m)</td>
</tr>
<tr>
<td>AWG20(0.52mm²)</td>
<td>2690(800m)</td>
<td>13600(4000m)</td>
</tr>
<tr>
<td>AWG18(0.83mm²)</td>
<td>4000(1200m)</td>
<td>19560(6000m)</td>
</tr>
<tr>
<td>AWG16(1.31mm²)</td>
<td>6500(2000m)</td>
<td>32500(10000m)</td>
</tr>
</tbody>
</table>

UL requires AX-100/200PLUS & AX-100/200ALPHA to be connected to a UL listed power supply capable of providing a nominal input of 12VDC, 10.5~28VDC, 48mA and battery standby time of 4 hours.
5. OPTICAL ALIGNMENT

The reliability of PHOTODETECTIVE DETECTOR depends on the optical alignment level. Using the following method, be sure to obtain the maximum voltage from the monitor jack using a volt-meter.

**Step 1**

**Beam Frequencies Selection**

Select the beam frequencies switch (AX-100/200ALPHA only)

[Diagram showing beam frequencies selection]

See Sec.6 Selectable Beam Frequencies

**Step 2**

**Horizontal & Vertical Adjustment**

- **HORIZONTAL ADJUSTMENT**
  - Course adjustment
  - Fine horizontal adjustment

- **VERTICAL ADJUSTMENT**
  - Fine vertical adjustment

Looking into view finder of the Transmitter, adjust the lens horizontally and vertically, so that the Receiver can be seen in the center of the sight.

Aim lens of Transmitter and Receiver at each other by gripping the lens bracket and turning left or right.

Looking into view finder, turn horizontal alignment dial to make adjustment.

Looking into view finder, turn vertical alignment dial with fingers or screw driver.

Turning vertical alignment right moves the Lens upward, and left downward.

**Step 3**

**AX-100PLUS**

Checking by Alarm Indicator LED

[Diagram showing LED indicator]

**AX-200ALPHA**

Checking by Course Alignment LED

[Diagram showing LED indicator]

Look into the view finder of the Receiver and make fine adjustments horizontally and vertically. At this time, the Transmitter should be kept in center of the sight and the Course Alignment LED should be turned off.

Please don’t forget to obtain the maximum voltage from the monitor jack, using a voltage meter, to achieve the most stable beam.

(Step 4)

LED AT THE FRONT BODY | LED INSIDE THE VIEW FINDER | ALARM INDICATOR | LED STATUS
--- | --- | --- | ---
Alarm Indicator | Alarm Indicator | LED ON: Beam energy is not reaching from Transmitter to Receiver. | LED OFF: The Transmitter’s beam energy is reaching the Receiver.

*Before going to Step 4, confirm that LED is OFF.*

By checking Course Alignment LED at the front body or inside the view finder, a course alignment is achieved.

Please don’t forget to obtain the maximum voltage from the monitor jack, using a voltage meter, to achieve the most stable beam.

(Step 4)

LED AT THE FRONT BODY | LED INSIDE THE VIEW FINDER | ALARM INDICATOR | LED STATUS
--- | --- | --- | ---
Course Alignment LED | Course Alignment LED | LED ON: Beam energy is not reaching from Transmitter to Receiver. | LED OFF: The Transmitter’s beam energy is reaching the Receiver.

Alignment Level: | LED indicator: | (See Alignment Level Chart in Step 4)
--- | --- | ---
No Alignment | ON | ON & OFF
Poor | OFF | OFF
Good | (See Alignment Level Chart in Step 4)
Excellent | (See Alignment Level Chart in Step 4)

*Step 4 must be completed in order to achieve a stable beam alignment.*

*Before going to Step 4, confirm that LED is OFF.*

**Step 4**

Checking From The Monitor Jack

After the adjustments are made by observing the LED indicators, check the voltage from the monitor jack using a voltage meter to obtain the most stable beam.

The alignment level of the beams can be confirmed by comparing the voltage readings to the following chart. Be sure to obtain greater than an excellent monitor jack output, 2.5V.

**Alignment Level**

| MONITOR JACK OUTPUT |
|---|---|---|---|---|
| Poor | Fair | Good | Excellent |
| 0V < 1V | 1.5V < 2V | 2.5V < 3V |

Optical Alignment for Indoor Use

Obtain maximum voltage from the monitor jack, at least more than 1.5V

**Confirmation of Action**

1. Check that the alarm indicator light is OFF.
2. If the alarm indicator light is ON even though the beams are not blocked, re-adjust the optical alignment and check wiring (See Sec.5).
3. After alignment is achieved and unit works properly, conduct a walk test from at least at following three points.
   - In front of the Transmitter
   - In front of the Receiver
   - At the middle point between Receiver and Transmitter
6. SELECTABLE BEAM FREQUENCIES (AX-100 / 200ALPHA only)

The selectable beam frequencies can be used to avoid unwanted crosstalk that can occur when using multiple photobeams for long distance or beam stacking applications.
- To select between 4 separate beam frequencies, use the switch provided.
- Make sure the receiver and transmitter that are facing each other are set to the same code.

IMPORTANT Always switch the frequencies TWO channels apart when stacking units on top of one another (See following example). The upper unit is set on channel 1 while the lower is on channel 3, channels 2 and 4 could have also been used.

![Beam Frequency Switch Diagram](image)

7. BEAM INTERRUPTION TIME ADJUSTMENT

The beam interruption time adjustment is on Receiver unit. This function allows you to match the units sensitivity to its surroundings. Slower settings reduce sensitivity.

![Beam Interruption Time Adjustment Diagram](image)

**CAUTION:**
- Speeds shown above are the maximum detectable speeds for each setting. Faster speeds will not be detected. Where birds, newspapers or flying debris can occasionally interrupt the beams, adjust setting to a slower speed (longer interruption period.)
- Beam interruption times exceeding 70 msec do not comply with the requirements in UL639, Intrusion Detection Units.

8. SPECIFICATIONS

<table>
<thead>
<tr>
<th>Model</th>
<th>AX-100PLUS</th>
<th>AX-200PLUS</th>
<th>AX-100ALPHA</th>
<th>AX-200ALPHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection Method</td>
<td>Infrared Photoelectric</td>
<td>Infrared Photoelectric</td>
<td>Infrared Photoelectric</td>
<td>Infrared Photoelectric</td>
</tr>
<tr>
<td>Range</td>
<td>Outdoor: 100ft(30m)</td>
<td>200ft(60m)</td>
<td>100ft(30m)</td>
<td>200ft(60m)</td>
</tr>
<tr>
<td></td>
<td>Indoor: 200ft(60m)</td>
<td>400ft(120m)</td>
<td>200ft(60m)</td>
<td>400ft(120m)</td>
</tr>
<tr>
<td>Maximum Arrival Distance</td>
<td>1000ft</td>
<td>2000ft</td>
<td>1000ft</td>
<td>2000ft</td>
</tr>
<tr>
<td></td>
<td>(300m)</td>
<td>(600m)</td>
<td>(300m)</td>
<td>(600m)</td>
</tr>
<tr>
<td>Beam Characteristics</td>
<td>Pulsed Infrared</td>
<td>4 channel (Automatic Synchronization)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selectable Beam Frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interruption Period</td>
<td>50~500msec(Selectible)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Input</td>
<td>10.5~28VDC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Draw (transmitter + receiver)</td>
<td>Normal operation 46mA max</td>
<td>Normal operation 40mA</td>
<td>During optical alignment 46mA max</td>
<td></td>
</tr>
<tr>
<td>Alarm Period</td>
<td>2sec(±1) nominal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alarm Output</td>
<td>Form C Relay (28VDC 0.2A max)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tamper Switch</td>
<td>N.C. opens when cover is removed (RECEIVER only)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-13°F ~ 131°F (5°C ~ 55°C)</td>
<td>-30°F ~ 131°F (-35°C ~ 55°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment Humidity</td>
<td>95% max</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alignment Angle</td>
<td>±5 Vertical, ±90 Horizontal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td>Wall or Pole</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>36.7oz(1040g) (both Transmitter and Receiver)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Specifications and design are subject to change without prior notice.
1. "No Action" on the transmitter or receiver after power has been applied.

- Check to see that power cables are properly connected and polarity is correct.
  OK
- Check to see that input power is within the product's requirements.
  OK
- Call Technical Support.

NG
- Correct terminal connection and/or polarity.
- Does the power supply output more than 12VDC?
  YES
- Remove the power wires from Power supply's output terminals. Measure the voltage. Does the power now satisfy the requirement?
  NO
- Power cables may be too long for the gauge being used. This will cause the voltage to drop. Use heavier cable or use additional power supplies closer to the farthest units. If you are unsure of the proper wire gauge, call Technical Support.
- The power line is short circuited or grounded. Repair as required.
- The power supply may be malfunctioning. Repair is required, or call power supply manufacturer.

AX-100/200PLUS: 10.5-28VDC
AX-100/200ALPHA: 10.5-28VDC

2. "No Action" on alarm zone even though the beams are completely blocked.

- Alarm indicator LED lights but control panel does not recognize the alarm signal.
  OK
- Remove the alarm circuit wires from the receiver. Check the alarm output relay. Does the relay open when the LED indicator activates?
  NG
- Call Technical Support

NG
- When the receiver's cover is removed and the beams are blocked, the Alarm Indicator LED does not light.
- If the beam is interrupted at a location far from the receiver, no alarm signal is generated, but when the beam is interrupted at a location near the receiver, an alarm signal is generated.
- The receiver may be affected by other beam transmitters, or the beams are being reflected off of a shiny surface.
  OK
- Check other items.
- Change the lay out of the beams or call Technical Support for further advice.

AX-100/200PLUS

YES
- Are there any other outdoor beams near the installation site?
  NO
- Check other items.
- Which AX is used?
  NO
- AX-100/200ALPHA
  Check other items.
- If AX-100/200ALPHA beams are used at the installation site, select different "Frequency Channels" for the beams causing the interference.
- Adjust vertical and/or horizontal alignment in order to move the IR energy off of the reflective surface. Monitor the beam strength (Monitor Jack) while adjusting beam to insure stable alignment.

AX-100/200PLUS

YES
- Remove power from all other transmitters and conduct walk test.
  NO
- Does the Photoelectric Beam work properly?
  NO
- Check other items.
  YES
- The unit may be affected by electrical noise. May need to use shielded wire and/or metallic conduit pipe. Call Technical Support if you are unsure of the proper shielding techniques.

NG
- When the lens of the receiver are completely covered, an alarm signal is generated.
- The beam interruption time is set too long.
- The intended target does not block both upper and lower beams completely.

NG
- Remove the alarm circuit wire from the receiver, place your volt meter on resistance and measure the alarm output relay. Does the relay open when power is removed?
  YES
- The unit may be affected by electrical noise. May need to use shielded wire and/or metallic conduit pipe. Call Technical Support if you are unsure of the proper shielding techniques.

NG
- Turn the interruption time adjustment dial counter-clockwise one graduation.
  YES
- Does the receiver work when both upper and lower beams are completely blocked? If so, the installation height is not proper. Adjust the installation height.
3. Alarm signal is being generated though beams are not blocked

<table>
<thead>
<tr>
<th>Is the Alarm Indicator LED on the receiver illuminated?</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refer to the following &quot;Monitor Jack Output&quot; value to ensure the beams are properly aligned.</td>
<td>AX-100/200PLUS: 2.5 VDC or more</td>
<td>AX-100/200ALPHA: 2.5 VDC or more</td>
</tr>
<tr>
<td>Remove the alarm circuit wire from the receiver, then check the alarm output relay with volt meter.</td>
<td>OK</td>
<td>NG</td>
</tr>
<tr>
<td>Re-align the beams using a volt meter to ensure proper Monitor Jack Output voltage. Does the value satisfy the beams requirement?</td>
<td>YES</td>
<td>NG</td>
</tr>
<tr>
<td>Does the Unit work properly?</td>
<td>YES</td>
<td>NG</td>
</tr>
<tr>
<td>Double check to see that there are no objects that may be blocking the beams.</td>
<td>OK</td>
<td>NG</td>
</tr>
<tr>
<td>Is the LED indicator on the transmitter on?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Go to page 1, see trouble shooting procedure number 1.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. False activations

<table>
<thead>
<tr>
<th>Check alignment voltage from Monitor Jack</th>
<th>OK</th>
<th>NG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does it satisfy the minimum requirement?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Re-align the beams. Refer to the &quot;Beam Alignment Procedure&quot;.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are the beams mounted on a stable footing with little movement of the mounting structure?</td>
<td>YES</td>
<td>NG</td>
</tr>
<tr>
<td>Change footing, pole or structure to ensure a stable mounting structure.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- There is frost or snow on the unit's cover.
- Very heavy rain occurred at the same time as the activation.
- There are plants, trees or debris that may block the beam during windy conditions.
- The unit may be detecting a large bird.
- The units may be detecting small animals (dog, cat, deer etc.).
- The receiver is facing directly at the rising or setting sun.
- There are reflective objects within 3 feet of beams path. (cars, glass, surfaces with high gloss paints etc.)
- Bad wiring or corroded splices. Check for shorts, opens, grounds and high resistance on the alarm circuit wires.
- The covers are very dirty or dusty.

- Use the HU-2 heater unit.
- Turn the beam's interruption adjustment clockwise one graduation.
- Cut off branches, now grass or secure debris to avoid unnecessary activation. Or move the beams.
- Adjust the interruption time, change the installation height or move the beams in order to avoid perching birds within the beam's path.
- Adjust the interruption time, change the installation height or move the beams in order to avoid small animals crossing the beam's path.
- Move the beams to avoid the rising or setting sun or swap transmitter and receiver locations.
- Call Technical Support for other options.
- Call Technical Support for other options.
- Check for shorts, opens grounds and high resistance values on the alarm circuit wires. If everything looks to be OK, call Technical Support for further testing measures.
- Clean covers both inside and outside using a dry soft cloth or mild soap and water only. Do not use any oil or alcohol based solvents to clean the covers, doing so will cloud or etch the cover and reduce its efficiency.

Important

The majority of false activations can be attributed to poor beam alignment. When aligning outdoor beams accept no less than an "EXCEL" value for the most stable and trouble free system. Refer to the installation manual for acceptable Monitor Jack Voltage Values.

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NOTE

This unit is designed to detect an intruder and activate an alarm control panel. Being only a part of a complete system, we cannot accept responsibility for any damages or other consequences resulting from an intrusion.