

# Installation Instructions

## DS422i and DS426i Dual Beam Photoelectric Intrusion Detection Systems

### 1.0 Specifications

- Range:**

	Indoors	Outdoors
DS422i	300 ft. (90 m)	100 ft. (30 m)
DS426i	600 ft. (180 m)	200 ft. (60 m)
- Dimensions (HxWxD):** 6.75 in. x 3.25 in. x 3.5 in.  
171 mm x 82 mm x 87 mm
- Voltage:** 12 to 28 VDC. Non-Polarized.
- Current:**

	Transmitter	Receiver
DS422i	15 mA	25 mA
DS426i	30 mA	25 mA
- Standby:** Intended for connection to DC power supplies capable of supplying power if primary power fails.
- Relay:** Alarm activated Form "C" with dry contacts rated at 0.5 amps max. @ 30 VAC and DC.
- Tamper:** Normally Closed with cover in place.
- Pointability:** The optical module can be adjusted  $\pm 90^\circ$  horizontally or  $\pm 24^\circ$  vertically.
- Temperature:**  $-13^\circ\text{F}$  to  $+130^\circ\text{F}$  ( $-25^\circ\text{C}$  to  $+55^\circ\text{C}$ ).
- Trigger Response Time:** 50 to 700 milliseconds, selectable.

### 2.0 Installation Considerations

- Stay within the listed maximum range.
- Install the system with a clear line-of-sight between the transmitter and receiver. If installed outdoors, make sure trees, weeds, plants, etc. will not interfere with the beams.
- Use care when installing near reflective surfaces (i.e. glossy walls or floors). Care should be taken during alignment to ensure beams are line-of-sight aimed and are not reflecting off surfaces.
- Do **not** install the units where they may be immersed in water or subject to corrosive liquids or sprays.
- Do **not** install the receivers where they will be facing an intense source of light (e.g. a rising or setting sun). If the sun can not be avoided, mount the receiver slightly higher than the transmitter. Aim the receiver down at the transmitter.
- Do **not** install the receivers where sunlight could be reflected directly into the receiver optics.
- Do **not** install either unit on movable surfaces or surfaces subject to strong vibrations.

### 3.0 Mounting

#### 3.1 Surface Mounting

**NOTE:** The recommended mounting height is 3 feet (1 m). However, mounting height will change depending on the anticipated intruder catch area.

- Choose the appropriate mounting locations. They should be rigid and provide a clear line-of-sight between the transmitter and receiver.
- Remove the transmitter's cover by loosening the cover mounting screw (see Figure A).

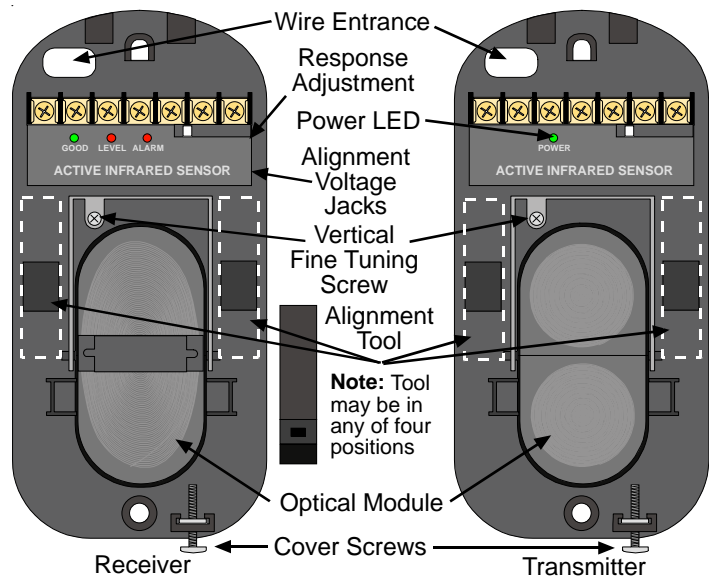


Figure A - Location of the system's major items.

- Place the provided template onto the mounting surface and mark the holes for its two mounting screws (supplied).
- NOTE:** Be sure all wiring is unpowered before routing.
- Route wiring (for wire size see Section 4.0) through the transmitter's wire entrance, leaving enough to properly wire the transmitter.
- Mount the transmitter to the mounting surface. Firmly tighten the screws.
- Repeat this complete mounting procedure for the receiver. Be sure to mount the receiver in direct line-of-sight with the transmitter.

#### 3.2 Pole Mounting

**NOTE:** The recommended mounting height is 3 feet (1 m). However, mounting height will change depending on the anticipated intruder catch area.

**NOTE:** Use optional MB series poles or equivalent.

- Choose the appropriate mounting location. Install the poles with a clear line-of-sight between the transmitter and receiver.
- Remove the transmitter's cover by loosening the Cover Screw (see Figure A).
- Firmly attach a mounting plate and U-clamp to the pole (see Figure B) with the screws supplied. Make sure they are line-of-sight aimed so the transmitter and receiver will be aligned.

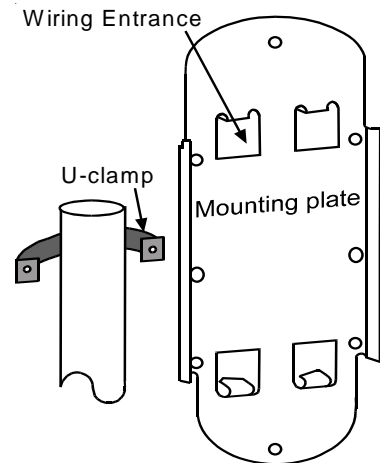


Figure B - Pole assembly



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**NOTE:** Be sure all wiring is unpowered before routing.

- Route wiring (for wire size see Section 4.0) through the mounting plate wire entrance (see Figure B), leaving enough to properly wire the transmitter.
- Route the wiring through the transmitter's wire entrance.
- Slide the transmitter onto the mounting plate. Tighten with the mounting plate-to-unit screws.
- Repeat this complete mounting procedure for the receiver. Be sure to mount the receiver in direct-line-of-sight with the transmitter.

#### 4.0 Wiring



Only apply power after all connections have been made and inspected.

- Use the following chart (Figure C) to determine the minimum gauge wire needed per length of wire run between the power source and the last unit on the run. The chart is based on one system (one transmitter and one receiver) connected to the same wire run from the power source.

If more than one system is added to the run, the maximum length per gauge decreases and is determined by dividing the length found in the chart by the number of systems on the run.

DS422i Wiring Chart		
SIZE	12 VDC	24 VDC
24 AWG(0.6mm)	920 ft. (280m)	790 ft. (240m)
22 AWG(0.8mm)	1,640 ft. (500m)	1,440 ft. (440m)
20 AWG(1.0mm)	2,560 ft. (780m)	2,300 ft. (700m)
18 AWG(1.2mm)	3,675 ft. (1120m)	3,280 ft. (1000m)

DS426i Wiring Chart		
SIZE	12 VDC	24 VDC
24 AWG(0.6mm)	820 ft. (250m)	690 ft. (210m)
22 AWG(0.8mm)	1,410 ft. (430m)	1,250 ft. (380m)
20 AWG(1.0mm)	2,230 ft. (680m)	2,000 ft. (610m)
18 AWG(1.2mm)	3,215 ft. (980m)	2,850 ft. (870m)

Figure C - Wire chart

- Wire the receiver and transmitter terminal strips (see Figures D and E).

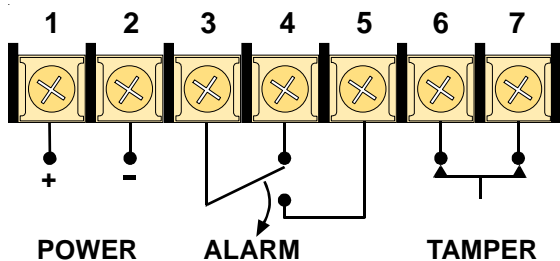


Figure D - Receiver Wiring

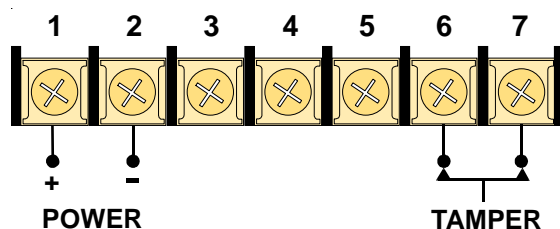


Figure E - Transmitter Wiring

#### 5.0 Setup and Alignment

**NOTE:** Precise, correct alignment is a critical process for these systems to operate effectively.

- Apply power to the units.
- Check the transmitter. The Power LED (see Figure A) should be on. If the lamp is not on, the unit is not receiving power.
- Locate the Alignment Tool (see Figure A) on either the Transmitter or Receiver.
- Slide the Alignment tool up and out of its holder (see Figure F) and slide it onto the Alignment Mount on whichever side of the Transmitter is most convenient for sighting through the viewfinder.

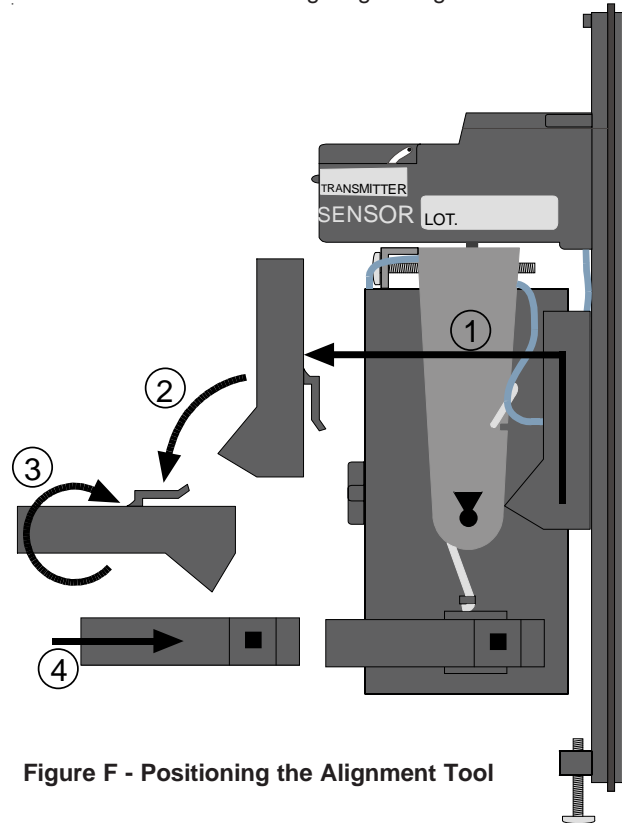


Figure F - Positioning the Alignment Tool

- From the side of the unit, look into the viewing port at the mirror. The view in the mirror is what is in line-of-sight of the optical module.

**NOTE:** Alignment may be made easier with the use of an alignment light (see Section 8.0).

- Rotate the optical module until the image of the other unit is centered in the mirror (see Figure G). If initially aimed too high or low, adjust the Vertical Fine Tuning screw (see Figure A) until the unit is centered.



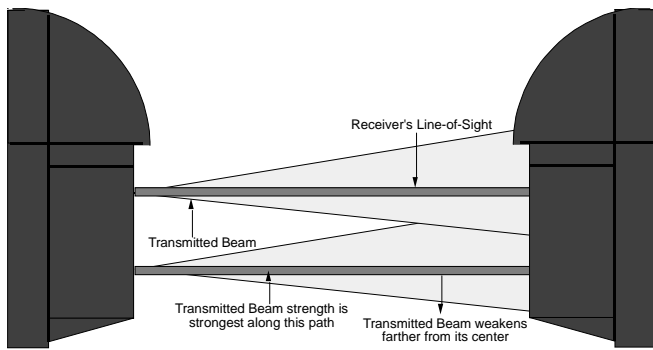
Figure G - Image in mirror

- Repeat this complete alignment sequence for the receiver's optical module.
- When properly aligned the Receiver's green GOOD LED should be lit.

#### 6.0 Fine-tune Alignment

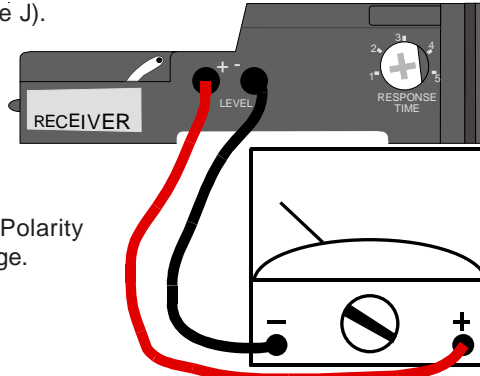
Meter readings are very important in providing maximum trip-safety margins (see Figure H). A 20,000 Ohm/volt (or greater) DC VOM is recommended.

When fine-tuning the transmitter and receiver, maximum meter readings occur at the transmitted beam's center, which is also the receiver's line-of-sight. A reduction in the system's effectiveness will occur if the units are not properly aligned and fine-tuned.



**Figure H - Beam Strength Area**

- Set the meter to read 3 to 5 VDC.
- Fine peak the transmitter. Connect the meter to the receiver's test terminals (see Figure J).



**Figure J - Meter connection**

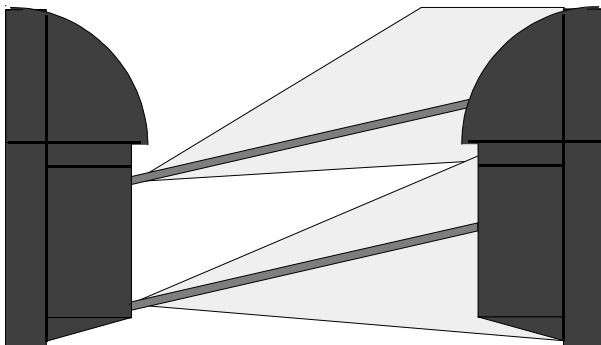
- Rotate the transmitter's optical module very slightly to the right and left until a maximum meter reading has been achieved. If you cannot obtain a reading greater than 2.3 VDC, the Transmitter and Receiver must be realigned using the procedure in section 5.0.

**NOTE:** To aid in fine-tuning the system, the red LEVEL LED gets brighter as the units get fine-tuned and the green GOOD LED will be on when the meter readings reach a peak.

- Adjust the transmitter's Vertical Fine Tuning screw slightly until maximum meter readings have again been achieved.
- With the transmitter's optical module fine-tuned, repeat this exact process with the receiver.

## 7.0 Final Check

- Completely block the upper beam on the transmitter. Neither the ALARM LED nor the LEVEL LED should come on. If either does come on, the beams are incorrectly aligned (see Figure K) and should be re-aligned.

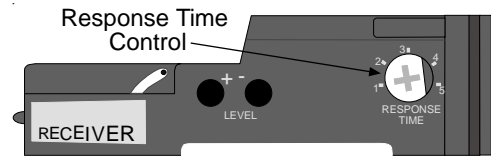


**Figure K - Mis-aligned beams**

- Completely block the lower beam of the transmitter. Again, neither the ALARM LED nor the LEVEL LED should come on.
- If necessary, re-align and fine-tune each unit.

## 7.1 Alarm response time

The system's sensitivity to alarms is manually adjusted by the RESPONSE TIME Control on the receiver (see Figure L1 and Table L2).



**Figure L1 - Response Time Control**

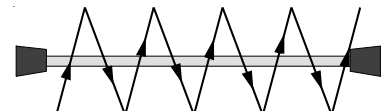
SETTING	RESPONSE TIME (ms)	RESPONSE SPEED	CATCH EXAMPLE
1	50±25%	23 ft./s (7 m/s)	running
2	210±25%	4 ft./s (1.2 m/s)	jogging
3	380±25%	2.3 ft./s (0.7 m/s)	quick walk
4	540±25%	1.6 ft./s (0.5 m/s)	walking
5	700±25%	1 ft./s (0.3 m/s)	slow walk

**Table L2 - Response Settings**

A setting near 1 will alarm if a person runs through the beam while a setting near 5 will alarm for objects moving very slowly through the beam. The setting should be adjusted lower where birds, debris, etc., may interrupt the beam path. Be careful not to adjust the setting too low, or it will not trigger an alarm.

**NOTE:** In order to comply with the requirements in UL 639, Intrusion Detection Units, an object passing through the beams at a speed of 8.8 feet per second (2.7 m/s) must trigger an alarm.

- Walk through the beams after the desired setting has been chosen. Be sure the system alarms at the desired pace.
- Walk through the beams in several locations between the units (see Figure M).
- The system should alarm during each crossing of the beam. If not, re-check alignment or trigger response time.
- Replace the covers.



**Figure M - Walk testing the system**

**NOTE:** If a tamper circuit has been installed, it should be tested now by lifting up the appropriate covers.

- Secure the covers by tightening each cover mounting screw.

## 8.0 Other Information

### 8.1 Alignment Lights

Alignment may be made easier by using a flashing high intensity light placed in front of the units. This makes a very distinct target when looking at the other unit through the viewing port. A recommended light source is model AL402.

### 8.2 Maintenance

At least once a year the front covers should be cleaned. Use a clean cloth and a common window cleaner.

On a daily basis, the end user should walk through the beams before arming. This will verify operation.

## 9.0 Application Tips

When using photoelectric detectors for motion detection, there are a few installation techniques that will make the system more versatile.

### 9.1 Beam Stacking

Beam stacking gives a wall of protection by stacking several units at different heights and providing an alarm activation on the blockage of only one pair of beams (see Figure N for the correct set-up technique). Note that the system is installed with alternating transmitters and receivers at each end. This eliminates the possibility of a receiver being covered by more than one transmitter.

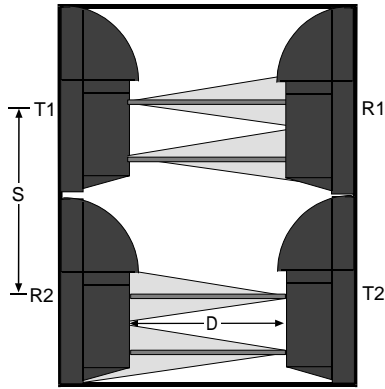


Figure N - Beam stack method

The maximum spacing between receivers (S) can be calculated by dividing the distance between the transmitter and its receivers (D) by 20.

Therefore, if the distance between a transmitter and receiver is 100 ft. (30 m), the maximum spacing between receivers would be 100 ft. (30 m) ÷ 20, or 5 ft. (1.5 m)

$$S = D/20 \quad S = 100 \text{ ft. (30 m)}/20 \quad S = 5 \text{ ft. (1.5 m)}$$

A potential problem when installing systems in a beam stack is "Near Field Reflection." Near field reflection is caused when a reflective object is placed in the line-of-sight of the detectors and causes the transmitted signal to be reflected to the wrong receiver (see Figure P).

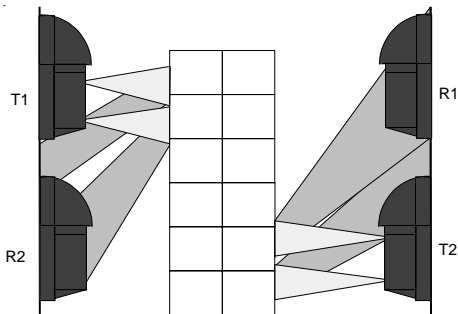


Figure P - Near field reflection

It may be desirable to have more than two sets of beams to create taller stacks. This can be accomplished by adding receivers as shown in Figure Q). Note that the beam from each transmitter is covering two receivers.

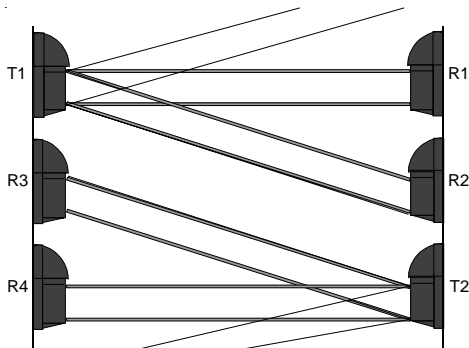


Figure Q - Multi-system stack

## 9.2 Perimeter Protection

When protecting the interior of an installation, a good technique is to mount the units at 90° angles around the coverage area (see Figure R).

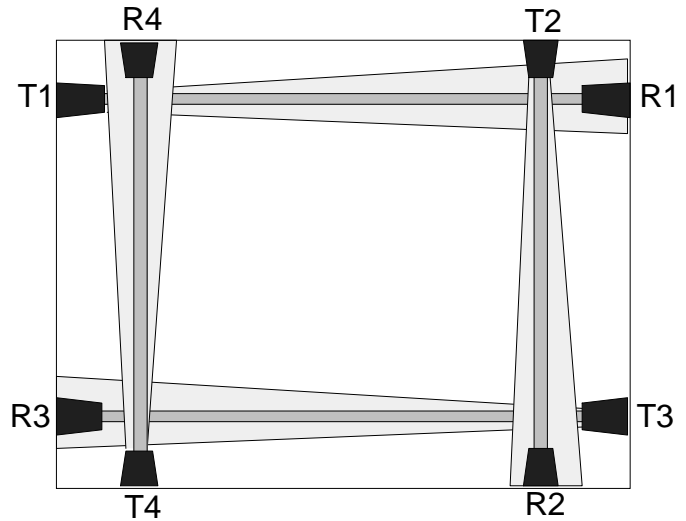


Figure R - Perimeter protection

Note that the beams are mounted so they cross each other. This way, an intruder can not enter the area by walking between the units.

When installing multiple transmitters and receivers, test with all the receivers powered-up, but with only one transmitter powered-up at a time. A transmitter should set up only its receiver.

Receivers physically too close to a different system's transmitters may be set up even if the transmitter is not pointed at them (see Figure T).

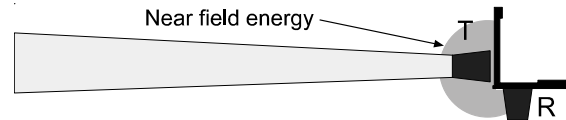


Figure T - Close proximity field problem

If a receiver is being set up by the wrong transmitter, the signals can usually be eliminated by masking the sides of the transmitter and receiver. Use electrician's tape or duct tape inside each enclosure's window.

When installing these systems, remember that the infrared signal may reflect off objects (e.g. glossy walls or floors) in the coverage area and still set up the receiver.

A thorough walk test performed at several different points within the coverage area will catch this problem. Re-aligning the units should solve this problem.

**The only way to insure proper continual protection is to perform regular walk tests of the desired coverage area.**

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