Installation Instructions
DS416 Single Beam Photoelectric Intrusion Detection Systems

1.0 Specifications

- **Range:** Outdoors: 30 ft. (10 m)
- **Voltage:** 10 to 26 VDC; 8 to 18.5 VAC.
- **Current**: Transmitter Receiver
  (@ 12VDC) 7 mA max. 25 mA max.
- **Standby:** Intended for connection to DC power supplies capable of supplying power if primary power fails.
- **Relay:** Form "C," alarm-activated contacts rated at 0.5 A max. @ 120 VAC; 1 A max.@ 24 VDC (resistive load).
- **Tamper:** Normally Closed with cover in place; rated 0.5 A @ 30 V.
- **Response Time:** 100 milliseconds minimum.
- **Pointability:** The optical module can be adjusted ±90° horizontally or ±5° vertically.
- **Beam:** Pulsed Infrared; 950 nm, 1 kHz.
- **Temperature:** -4°F to +122°F (-20°C to +50°C).
- **Dimensions:** 5.5 in. x 3.4 in. x 4.2 in. (HxWxD)
  139.5 mm x 86 mm x 106.5 mm

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 on the bottom of the cover.
- Remove the Transmitter unit from the Metal Mounting Bracket by loosening the retaining screw (see Figure A).

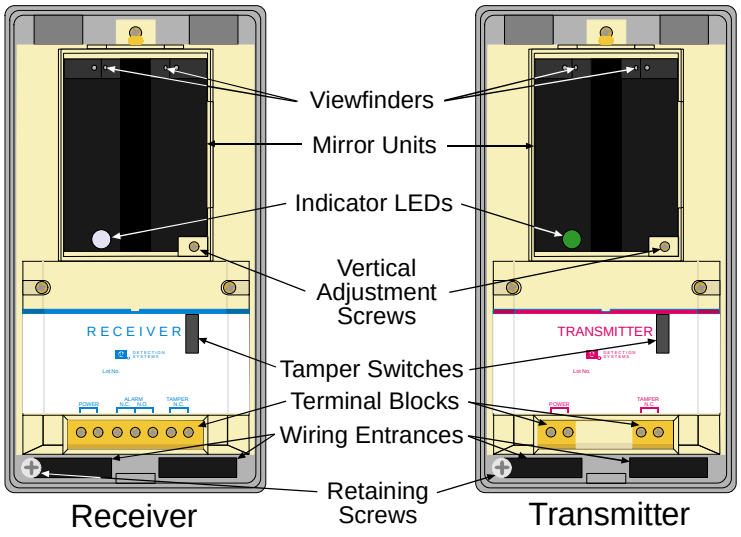

Figure A - Location of the system's major items.

- Place the Metal Mounting Bracket onto the mounting surface. Firmly attach it to the surface using the two self-tapping mounting screws supplied (see Figure B).

Figure B - Surface Mounting

NOTE: Be sure all wiring is unpowered before routing.

- Route wiring (for wire size see Section 4.0) through the Transmitter's wire entrance (see Figure A), leaving enough to properly wire the transmitter.
- Mount the Transmitter to the Metal Mounting Bracket. Firmly tighten the retaining screw.
- 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.

- Use optional MB series poles or equivalent. Poles should have diameters between 1.7 and 2.4 inches (43 and 60 mm).

- 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 mounting screw on the bottom of the cover.

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- Remove the Transmitter unit from the Metal Mounting Bracket by loosening the retaining screw (see Figure A).
- Assemble the Metal Mounting Bracket to the Pole Mounting Plate with the short machine screws provided (see Figure C).

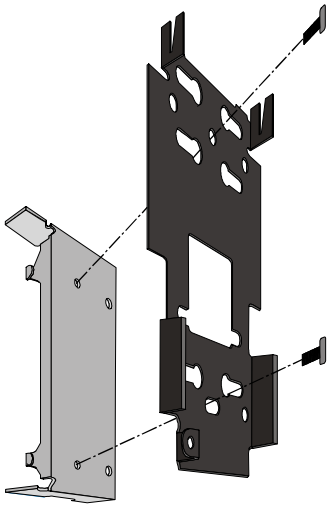

Figure C - Assembling the Mounting Plates

- Trim the Mounting Straps to the appropriate length (see Figure D).

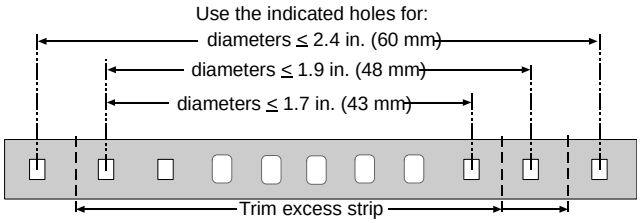

Figure D - Preparing Mounting Straps

- Bend the Mounting Straps around the pole, hook one end of them over the hooks on the Mounting Plate Assembly and the other ends over the Mounting Hooks (see Figure E). Firmly attach the Mounting Plate Assembly to the pole (see Figure E) with the Mounting Straps, Mounting Hooks, and long machine screws supplied. Make sure they are line-of-sight aimed so the transmitter and receiver will be aligned.

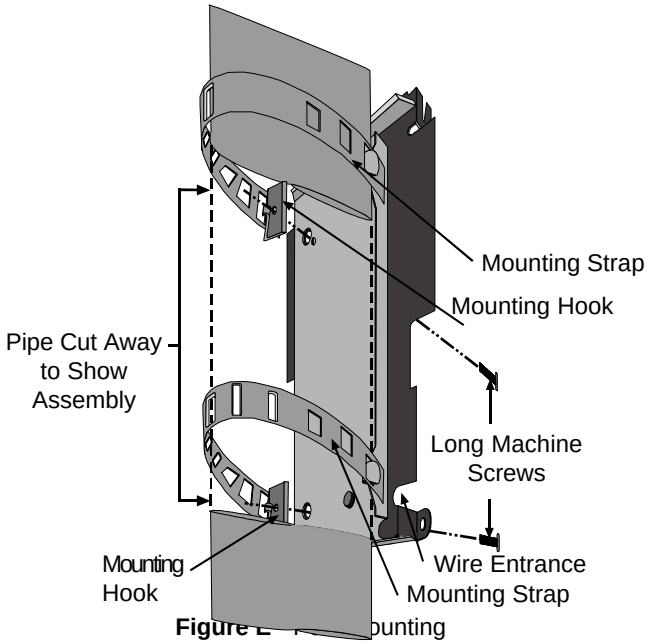

Figure E - Mounting

NOTE: Be sure all wiring is unpowered before routing.

- Route wiring (for wire size see Section 4.0) through the Mounting Plate Assembly wire entrance (see Figure E), leaving enough to properly wire the Transmitter.
- Route the wiring through the Transmitter's wire entrance.
- Slide the Transmitter onto the hooks at thetop of the Mounting Plate Assembly. Tighten the Retaining Screw (see Figure A).
- 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

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

- Use the following chart (Figure F) 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.

DS416 Wiring Chart

SIZE	12 VDC	24 VDC
20 AWG(1.0 mm)	1,000 ft. (300 m)	5,000 ft. (1500 m)
18 AWG(1.2 mm)	1,600 ft. (480 m)	8,000 ft. (2400 m)
16 AWG(1.5 mm)	2,600 ft. (790m)	13,000 ft. (3900 m)
14 AWG(1.8 mm)	4,000 ft. (1200 m)	20,000 ft. (6000 m)

Figure F - Wire chart

- Wire the receiver and transmitter terminal strips (see Figures G and H).

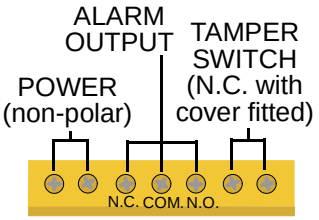

Figure G - Receiver wiring

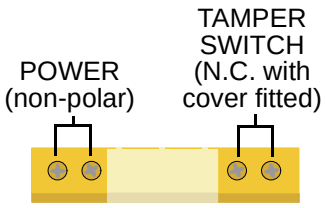

Figure H - Transmitter wiring

5.0 Set-up and Alignment

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

- Look through one of the Transmitter's Viewfinders located on either side of the Mirror Units (see Figure A).
- Rotate the optical module until the image of the other unit is centered in the mirror (see Figure J). If initially aimed too high or low, adjust the Vertical Fine Tuning Screw (see Figure A) until the unit is centered.

NOTE: Alignment may be made easier with the use of an alignment light (see Section 7.0).

- Repeat this complete alignment sequence for the receiver's optical module.

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

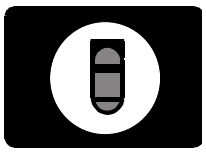

Figure J - Image Correctly Centered in Viewfinder

- Apply power to the units.
- Check the transmitter. The Indicator LED (see Figure A) should be on (green). If the lamp is not on, the unit is not receiving power.

- When properly aligned the Receiver's Indicator LED should be lit (green). If the Indicator LED is not on or lit red, either the Receiver is not properly wired to the power source, the units are not properly aligned, or the mirrors are dirty. Inspect the wiring, clean the mirrors, and realign the system as needed.

NOTE: The mirror units may be cleaned with a soft, clean, damp cloth.

- Once the system is properly aligned, replace the covers, tighten the Cover Mounting Screws (on the bottoms of the covers), and slide the hoods down onto the tops of the units until they snap into place.

6.0 Final Check

NOTE: The following test should be performed at least once per year to assure proper performance and operation. Furthermore, the system mounting (including alignment), wiring, and condition of all components should be inspected periodically.

- Once the system has been aligned and all components are reassembled, walk through the beam path at several locations and from varying directions (see Figure K). Be sure the system alarms as desired.
- The system should alarm during each crossing of the beam. If not, re-check alignment.

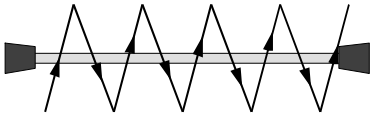

Figure K - Walk testing the system

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

- Secure the covers by tightening each cover mounting screw and replace the hoods.

7.0 Other Information

7.1 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.

7.2 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.

8.0 Application Tips

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

8.1 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 L 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.

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

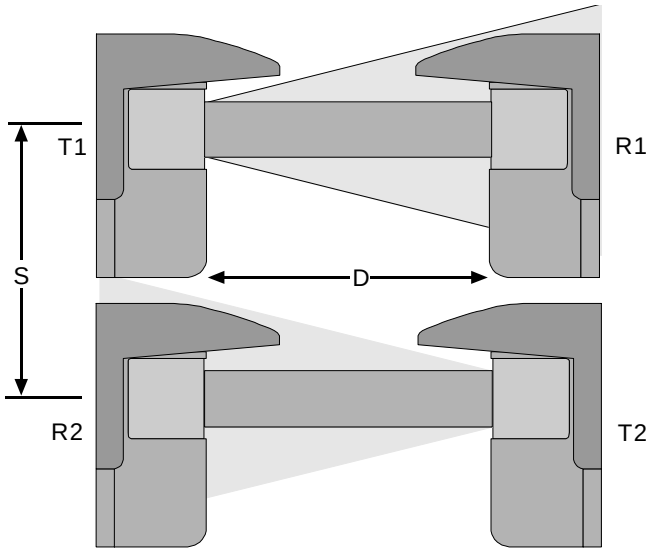

Figure L - Beam stack method

Therefore, if the distance between a transmitter and receiver is 30 ft. (9 m), the maximum spacing between receivers would be 30 ft. (9 m) ÷ 20, or 1.5 ft. (0.45 m) which equals 18 inches (45 cm).

$$S = D/20 \quad S = 30(9)/20 \quad S = 1.5(0.45)$$

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 M).

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

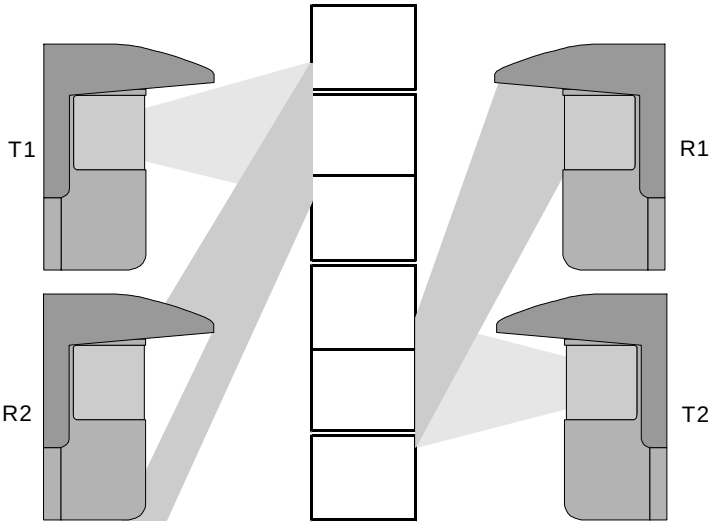

Figure M - Near field reflection

in Figure N. Note that the beam from each transmitter is covering two receivers. (T1 covers R1 and R3, T2 covers R2 and R4). To acheive this the receivers must be spaced closer together than the "S" distance calculated with the above equation.

8.2 Perimeter Protection

When protecting the interior of an installation, a good technique is to

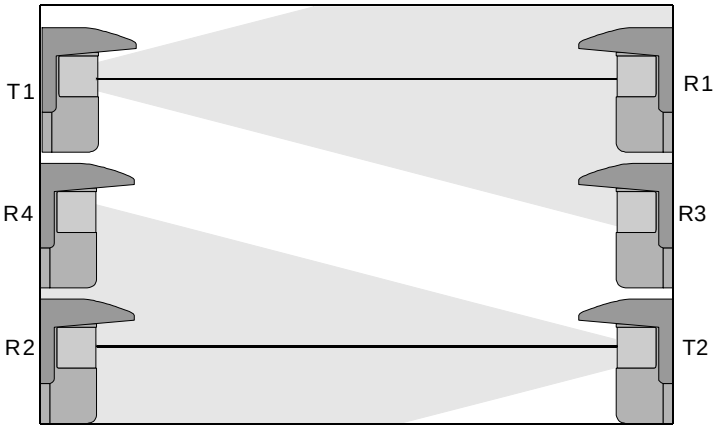

Figure N - Multi-system stack

mount the units at 90° angles around the coverage area (see Figure P).

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.

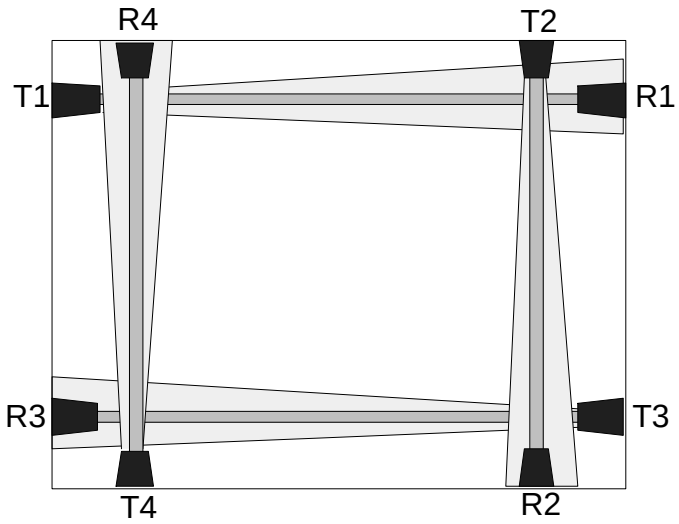

Figure P - Perimeter protection

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 Q).

If a receiver is being set-up by the wrong transmitter, the signals can

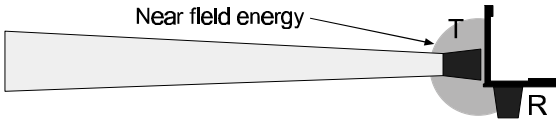

Figure Q - Close proximity field problem

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.

