No. 59-1365-4 0902-05

INSTALLATION MANUAL

PHOTOELECTRIC DETECTOR

AX-250PLUS, AX-500PLUS
AX-350TF, AX-650TF

< STANDARD >

< 4 SELECTABLE BEAM FREQUENCIES >

Please read intsructions 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 for the AX-250PLUS is 250ft. (75m), the AX-500PLUS is 500ft. (150m) and for the AX-350TF is 350ft. (100m), the AX-650TF is 650ft. (200m)

FEATURES

- Beam interruption time adjustment : This function allows you to select the suitable beam interruption time for any environment.
- Anti-Frost Structure : Prevents fog and condensation from blocking the beams.
- Alignment level monitor jack : Can easily obtain maximum optical alignment by checking the voltage from this jack.
- Form C relay : Form C relay for more applications.
- Tamper : N.C., Opens when cover is removed.
- Option : Heating unit (HU-1), Back cover (BC-1) AX-Beam Tower (AX-BT)
- UL Listed : For UL Listed applications, the heating unit (HU-1) shall not be installed with the models AX-350TF and AX-650TF.

AX-350TF, AX-650TF ONLY

- LED indicator for fine beam alignment level : The optical alignment level can be checked at the Reciver.
- Selectable beam frequencies : Crosstalk is eliminated with 4, channel selectable, beam frequencies. Used when stacking beams or for long range applications.
- Re-Transmit Circuit : The advantage of this method is the elimination of wiring, from a detector or switch, back to the control panel.
- D.Q.Circuit (Environmental Disqualification) : The environmental compensation circuit is designed to eliminate false alarms caused by snow, fog, heavy rain, ice and misalignment.
- Alarm Memory

For Safe Use of the Product

- Read this instruction manual carefully prior to installation.
- After reading, store this manual carefully in an easily accessible place for reference.
- This manual uses the following warning indications for correct use of the product and harm to you or other people and damage to your assets, which are described below. Be sure to understand the description before reading the rest of this manual.

⚠ **WARNING**	Failure to follow the instructions provided with this indication and improper handling may cause death or serious injury.
⚠ **CAUTION**	Failure to follow the instructions provided with this indication and improper handling may cause injury and / or property damage.

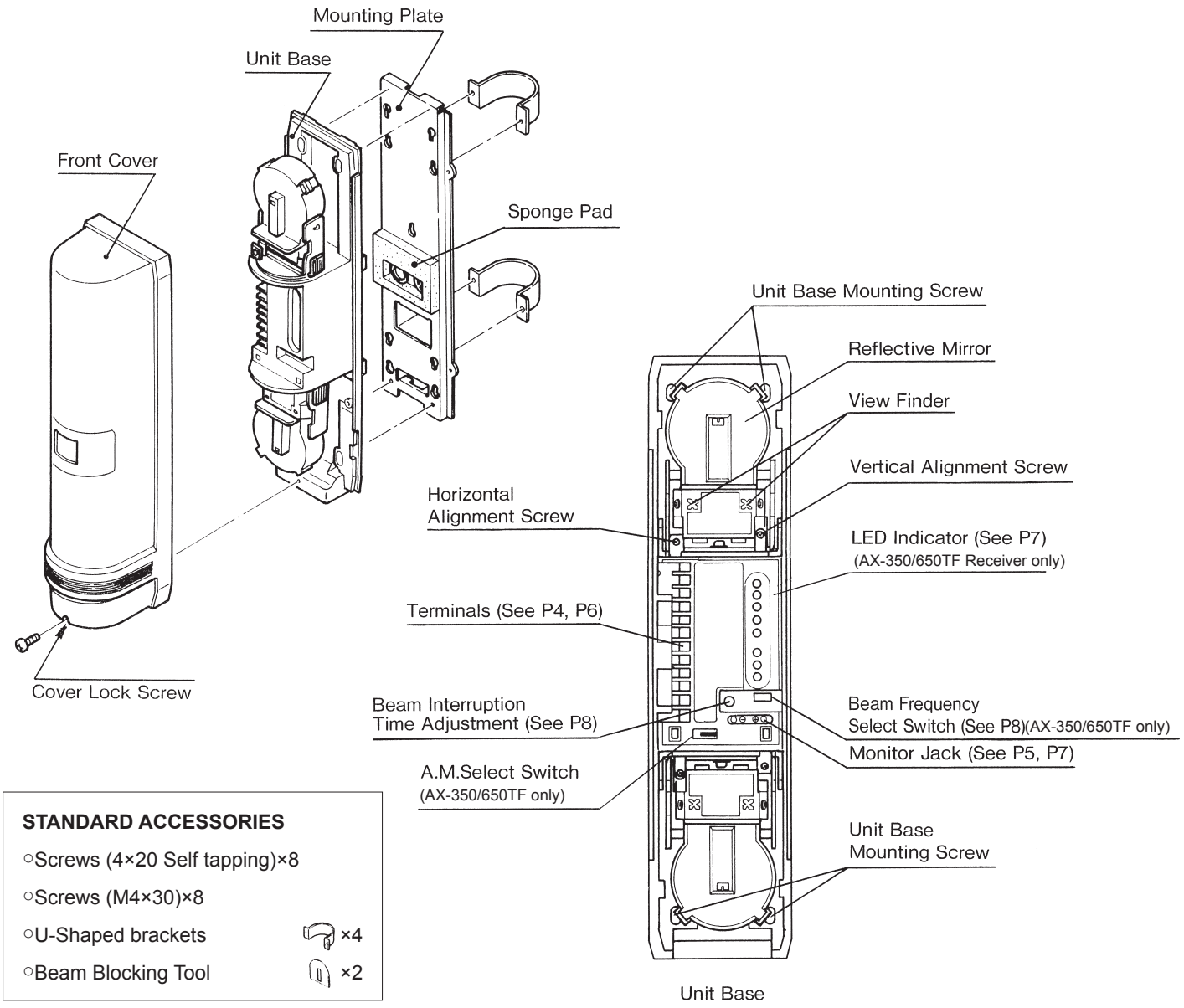
This symbol indicates prohibition. The specific prohibited action is provided in and/or around the figuer.

This symbol requires an action or gives an instruction.

⚠ **WARNING**	Do not use the product for purposes other than the detection of moving objects such as people and vehicles. Do not use the product to activate a shutter, etc., which may cause an accident.
	Do not touch the unit base or power terminals of the product with a wet hand (do not touch when the product is wet with rain, etc.). It may cause electric shock.
	Never attempt to disassemble or repair the product. It may cause fire or damage to the devices.
	Do not exceed the voltage or current rating specified for any of the terminals during installation, doing so may cause fire or damage to the devices.
⚠ **CAUTION**	Do not pour water over the product with a bucket, hose, etc. The water may enter, which may cause damage to the devices.
	Clean and check the product periodically for safe use. If any problem is found, do not attempt to use the product as it is and have the product repaired by a professional engineer or electrician.

CONTENTS

1. PARTS IDENTIFICATION

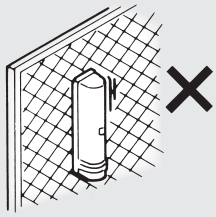


STANDARD ACCESSORIES

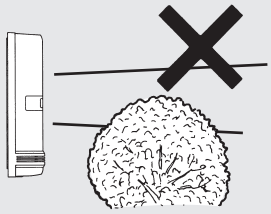
- ○Screws (4×20 Self tapping)×8
- ○Screws (M4×30)×8
- ○U-Shaped brackets ×4
- ○Beam Blocking Tool ×2

2. PRECAUTIONS

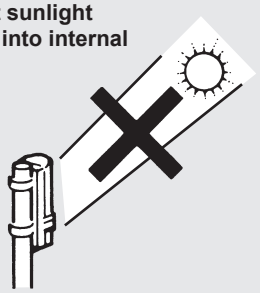
1. Mount unit only on a solid surface.



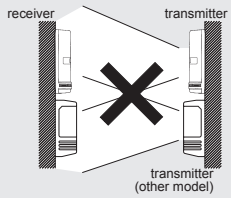
2. Do not install the unit where objects moved by the wind such as plants and laundry, which may block the beam.



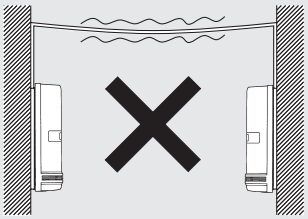
3. Prevent direct sunlight from entering into internal receiver.



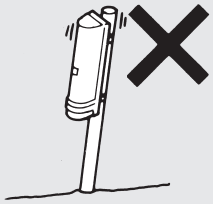
4. A different type of beam should not reach the receiver.



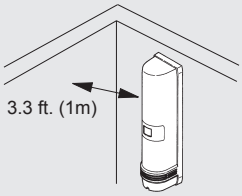
5. Avoid aerial wiring.



6. Do not install the unit on unsteady surfaces.



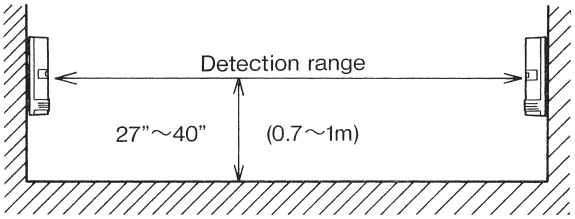
7. Mount the units more than 1m away from the wall or fence.



3. INSTALLATION METHOD

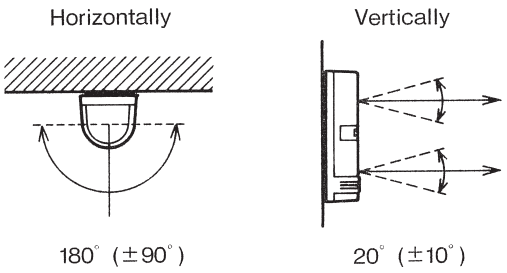
a. General

1 **Detection range and installation height.**



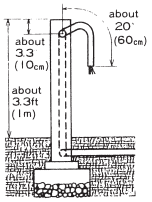
Maximum distances between Receiver and Transmitter are listed below.
AX-250PLUS = 250ft (75m) Max
AX-500PLUS = 500ft (150m) Max
AX-350TF = 350ft (100m) Max
AX-650TF = 650ft (200m) Max
and the installation height should be at 27"~40". (0.7~1m)

2 **Alignment angle**



3 **Pole mounting**

* Pole size should be as follews: 1 3/8"~1 7/8" O.D (Φ34~Φ48mm) (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).

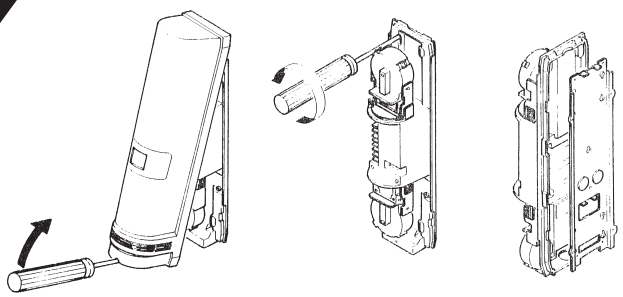


MEASURE OF POLE

* Face transmitter and receiver towards each other when pole mounting.

b. Installation Method

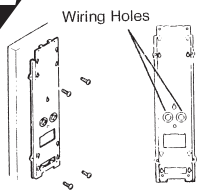
1



Lossen 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.

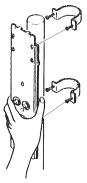
2

well mounting



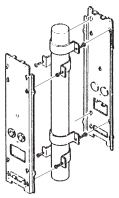
Pull out the wire through the wiring hole on the mounting plate and attach the plate to the well with the screw.

Pole mounting



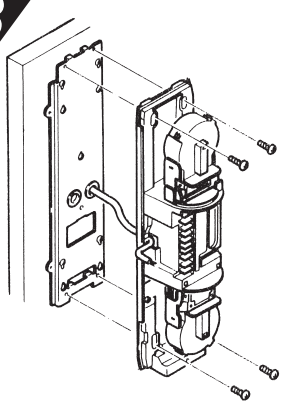
Place U-Shape brackets at the top of the pole. And pull out the wire through the wiring hole og the Mounting plate, attach the mouting plate to the U-Shape bracket with screw.

Two unit installation (back to back)

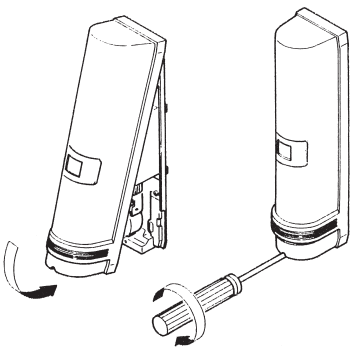


Fix two U-shape brackets in layers on a pole, two units can be installed back to back on a pole at the same height.

3



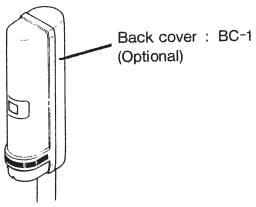
* Connect wire to the terminals (See Sec. 4-1, 5-1 "Terminal").



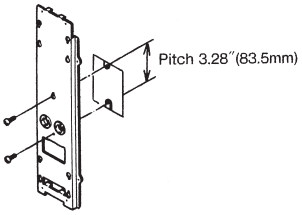
* After checking optical alignment and operation check (See Sec. 4 -3, 5-3 OPTICAL ALIGNMENT), replace the cover, and fasten the lock screw tightly.

NOTE

●Pole Mount Back Cover

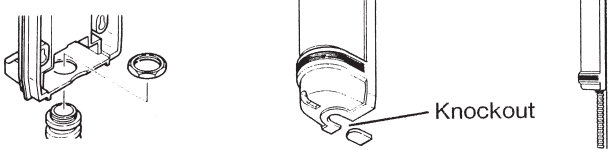


●Electric Box Mounting



For connections to single gang electric boxes, follow intructions for wall mounting.

●Conduit Installtion



Conduit can be installed directly into the bottom of the unit by removihg the knockout on the bottom of the cover.

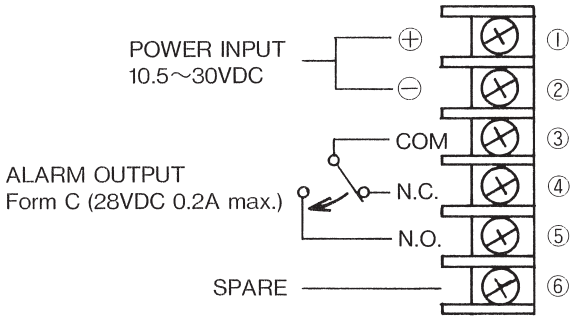
⚠ WARNING

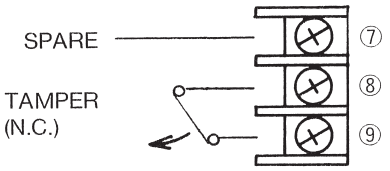
1. Maximum torque requires to tighten the conduit shall not exceed 150 lb-in.
2. The conduit shall be bended before installing into the detector unit.
3. Excessive pulling of the conduit downward may cause slight cracking to the plastic conduit fitting.

4. AX-250/500PLUS

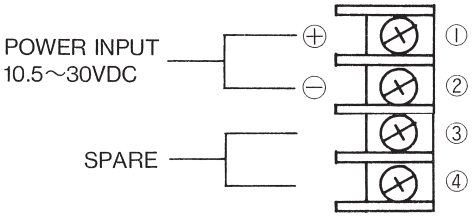
4-1. TERMINAL

Receiver





Transmitter



Wiring Distance

○When using two or more units on one wire, the maximum length is obtained by dividing the wire length listed below by the number of units used.
○Power wires should not exceed the following length.

MODEL	AX-250/500PLUS	
WIRE SIZE	12V DC	24V DC
AWG22 (0.33mm^2)	1300' (400m)	7500' (2300m)
AWG20 (0.52mm^2)	2000' (600m)	12000' (3600m)
AWG18 (0.83mm^2)	3300' (1000m)	19000' (5800m)
AWG16 (1.31mm^2)	5000' (1500m)	30000' (9200m)

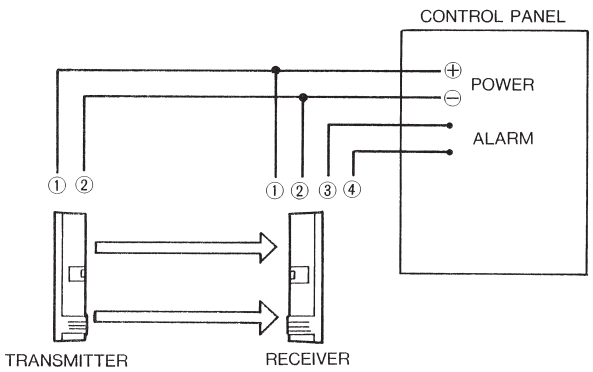
WARNING

Do not exceed the voltage or current rating specified for any of the terminals during installation, doing so might cause fire or damage to the devices.

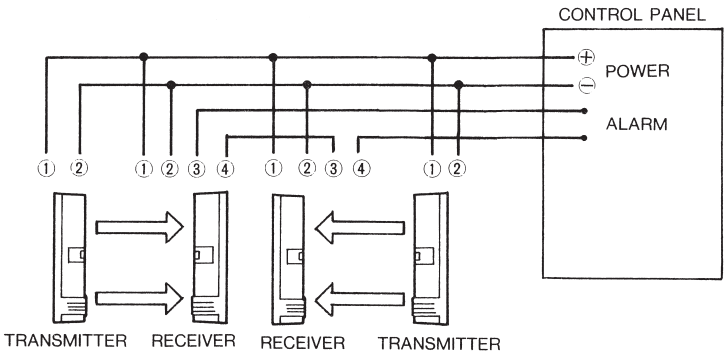
UL requires AX-250PLUS/500PLUS to be connected to a UL listed power supply capable of providing a norminal input of 12VDC, (10.5~30VDC) 50mA and battery standby time of 4 hours.

4-2. WIRING

1 Set



2 Set in the line

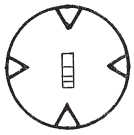


4-3. OPTICAL ALIGNMENT

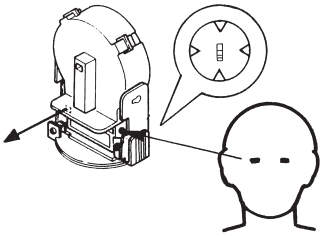
When using two or more units on wire, the maximum length is obtained by dividing the maximum wire length listed below of units used.
Power wires should not exceed the following lengths.

STEP1

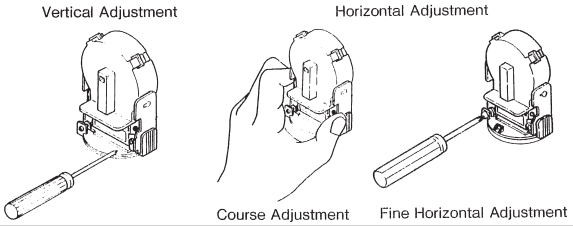
Rough alignment by view finder



Looking through the view finder, locate the other detector in the center of the sights by adjusting vertically and horizontally.

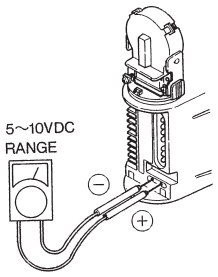


Looking through the view finder, locate the other detector in the center of the sights by adjusting vertically and horizontally.



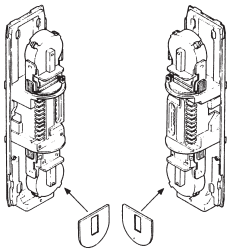
STEP2

Upper Mirror Fine Adjustment

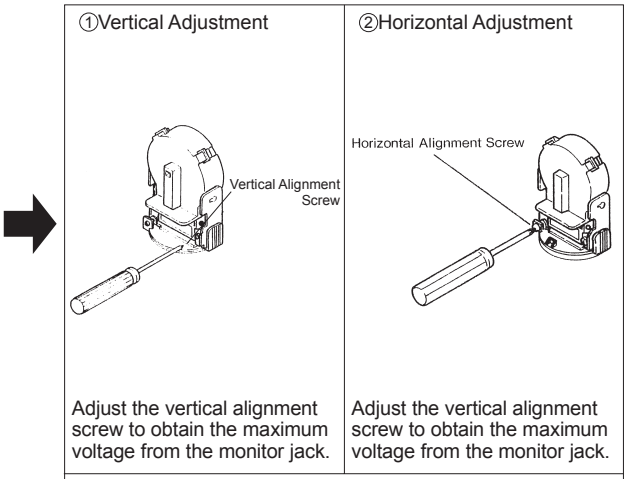


Connect the volt-meter to monitor jack input on Receiver's (+) and (-), then fine tune optical alignment.

Adjust the optical alignment for Transmitter and Receiver one at a time.



Put the attached "Beam Blocking Tool" on the lower mirror of both the transmitter and the Receiver.

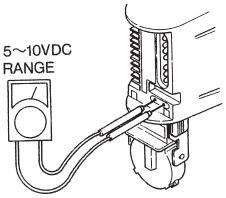


Adjust the vertical alignment screw to obtain the maximum voltage from the monitor jack.

Adjust the vertical alignment screw to obtain the maximum voltage from the monitor jack.

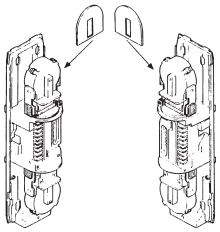
STEP3

Lower Mirror Fine Adjustment



Check the voltage using the monitor jack and make any fine adjustments the lower mirror.

Secondly, adjust the lower morrors.



After the final adjustment are made on the upper mirrors carefully without moving morror remove "Beam Blocking Tool" from the lower mirrors and place them on the upper mirrors of both the Transmitter and Receiver.

Be carefull when removing the "Beam Blocking Tool" from the mirror-Don't move mirrors.

After the vertical and horizontal adjustment are made, recheck the voltage from monitor jack is over 5.0V. If not, adjust the optical alignment again.

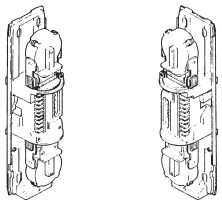
SENSITIVITY CHART

ALIGNMENT LEVEL	Realign	Fair	GOOD	EXCELLENT
MONITOR JACK OUTPUT	0V ◺ 2.0V ◺ 3.5V ◺ 5.0V			

optical Alignment for Indoor Use
obtain maximum voltage from the monitor jack, at least **more than 2.2V**

STEP4

Final checking after removing the "Beam Blocking Tool" from the mirror.



Carefully remove the "Beam Blocking Tool" from the upper mirror of both Transmitter and Receiver also check the voltage from the monitor jack again.

Then check again that the voltage from monitor jack is more than about 5.0V. if not, adjust the optical alignment again.

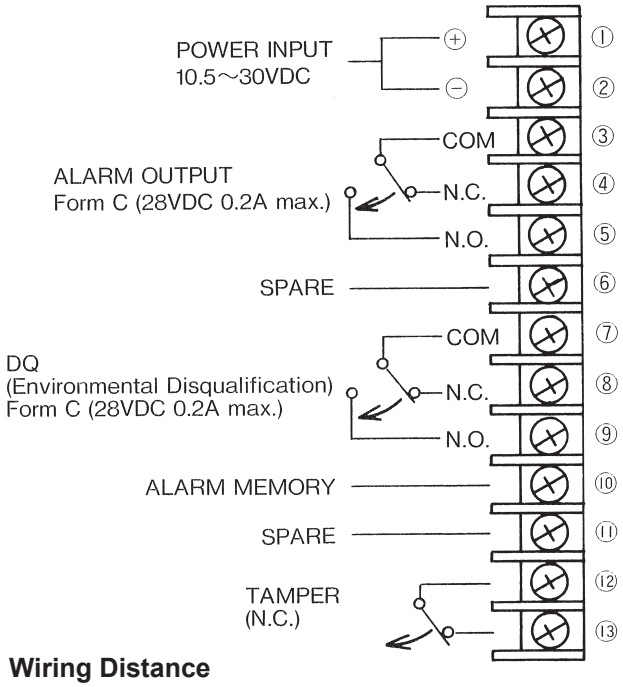
Confirmation of Action

❶ Check that the operation indicator ("ALARM CONDITION" LED) light is OFF.
❷ If the indicator light is ON even though the beams are not blocked, re-adjust the optical alignment and check wiring. (See sec. 4-3)
❸ After alignment is achieved and the units work properly, conduct a walk test at a minimum of three points.
- **In front of the Transmitter.**
- **In front of the Receiver.**
- **At the middle point between Transmitter and Receiver.**

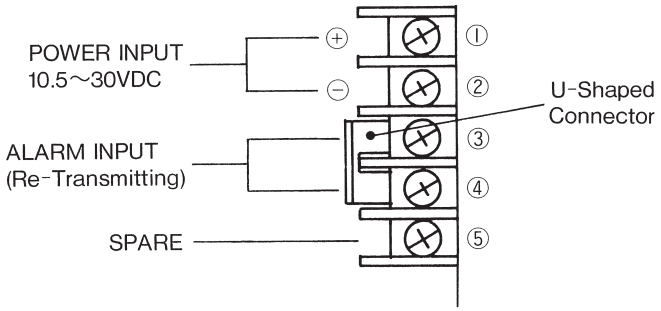
5. AX-350/650TF

5-1. TERMINAL

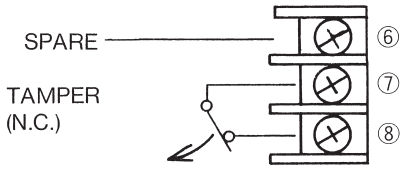
Receiver



Transmitter



CAUTION : Make sure to connect the jumper (U-shaped connector), when not using the retransimitting circuit. If the jumper is not connected, the Transmitter will not transmit beam (Alarm condition).



Wiring Distance

○When using two or more units on one wire, the maximum length is obtained by dividing the wire length listed below by the number of units used.
○Power wires should not exceed the following length.

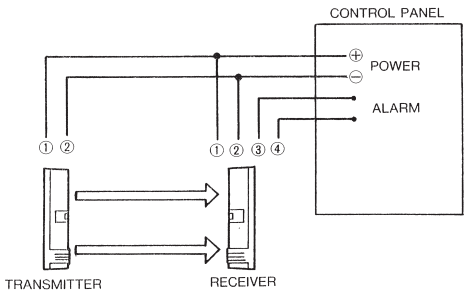
MODEL	AX-350/650TF	
WIRE SIZE	12V DC	24V DC
AWG22 (0.33mm^2)	980' (300m)	4700' (1400m)
AWG20 (0.52mm^2)	1500' (470m)	7400' (2250m)
AWG18 (0.83mm^2)	2450' (750m)	11800' (3600m)
AWG16 (1.31mm^2)	3900' (1150m)	18700' (5700m)

WARNING Do not exceed the voltage or current rating specified for any of the terminals during installation, doing so might cause fire or damage to the devices.

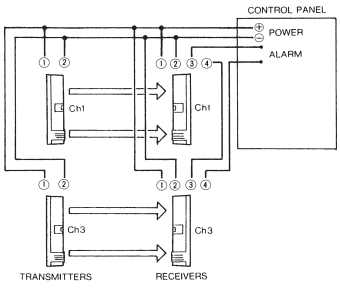
UL requires AX-350TF/AX-650TF to be connected to a UL listed power supply capable of providing a norminal input of 12VDC, (10.5~30VDC) 75mA and battery standby time of 4 hours.

5-2. WIRING

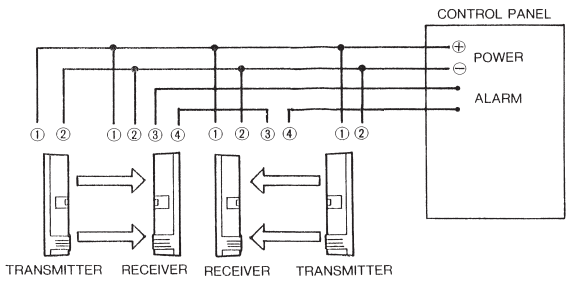
1 Set



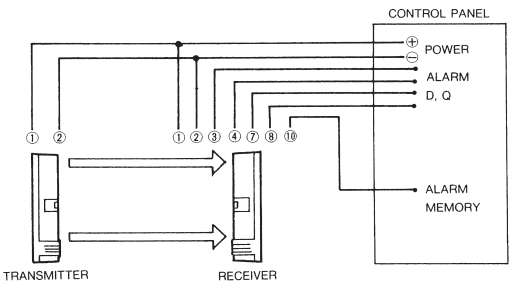
2 Sets Stacking



2 Set in the line



DQ and ALARM MEMORY



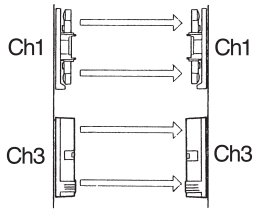
5-3. OPTICAL ALIGNMENT

When using two or more units on wire, the maximum length is obtainted by dividing the maximum wire length listed below of units used.
Power wires should not exceed the following lengths.

STEP1

Beam Frequencies Selection

Select the beam frequencies switch.



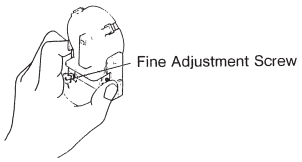
○Match the frequency settings. (See Sec. 7-1 SELECTABLE BEAM FREQUENCIES.)
○When stacking beams or installing more than one set in the same area.

STEP2

Horizontal & Vertical Adjustment

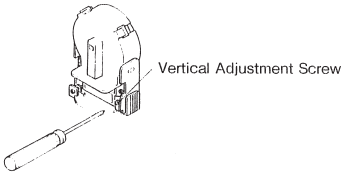
Looking into view finder of the Transmitter, and adjustment the lens holizontally and vertically, so that the Receiver can be seen in the center of the sight.

❶HORIZONTAL ADJUSTMENT



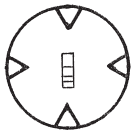
Turn mirror base by hand to obtain the highest alignment level.
Make fine adjustment by turning "Fine Adjustment Screw".

❷VERTICAL ADJUSTMENT



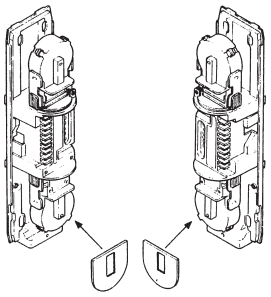
Turn vertical adjustment asrew to get highest level

STEP3



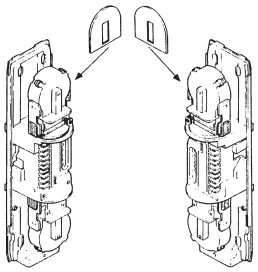
Looking into the view finder of Receiver and make fine adjustments horizontaly and vertically.

❶ADJUST THE UPPER MIRROR



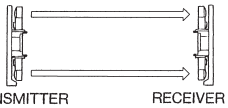
Attach the "Beam Blocking Tool" to the lower mirror on both the transmitter and receiver.
Adjust the upper mirror.
"Excel" reading on the LED indicator is sufficient.

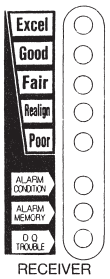
❷ADJUST THE LOWER MIRROR



After the final adjustments are made on the upper mirrors, carefully (do not move mirror) remove the shieldinh tools from the lower mirrors and place them on the upper mirrors of both the transmitter and receiver.
Make the horizontal and vertical adjustments to the lower mirrors.
"Excel" reading on the indicator is sufficient.

LED INDICATION



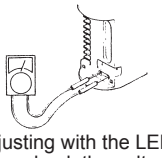


The alignment level indicators have 5 LEDs, each LED represents the level of alignment, ranging from poor to excellent (See illus.)
Each LED will indicate 3 steps of alignemt, slow flicker = okay, fast ficker = better, continuously on = best
Providing 15 graduated stages.

ALARM CONDITION LED
ON: ALARM CONDITION
OFF: RECEIVING BEAM OR POWER IS NOT SUPPLIED.
ALARM MEMORY
DQ

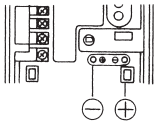
STEP4

Checking From The Monitor Jack

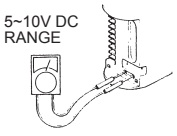


After adjusting with the LED indicators, check the voltage at the monitor jack output using your meter. This will insure proper beam alignment.

Confirm the beam alignment level by setting your volt-meter to the 5~10V DC range, cover either the upper or lower beam and compare the voltage reading with the following chart.



Connect the volt-meter probes (+) to monitor jack (+), and volt-meter probes (-) to monitor jack (-).



Set the volt-meter range to 5~10 VDC.

Check the alignment levels of the upper and lower beams separate from one another and ensure that both reach excellent as stated in the chart.

SENSITIVITY CHART

ALIGNMENT LEVEL	Realign	Fair	GOOD	EXCELLENT
MONITOR JACK OUTPUT	0V ▷ 2.5V ▷ 3.5V ▷ 5.5V ▷			

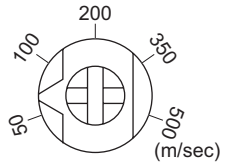
Optical Alignment for Indoor Use
Obtain maximum voltage from the monitor jack, at least **more than 3.4V**

Confirmation of Action

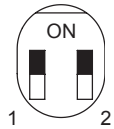
❶ Check that the operation indicator (“ALARM CONDITION” LED) light is OFF.
❷ If the indicator light is ON even thought the beams are not blocked re-adjust the optical alignment and check wiring. (See sec. 5-3)
❸ After alignment is achieved and the units work properly, conduct a walk test at a minimum of three points.
- In front of the Transmitter.
- In front of the Receiver.
- At the middle point between Transmitter and Receiver.

6. BEAM INTERRUPTION TIME ADJUSTMENT

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

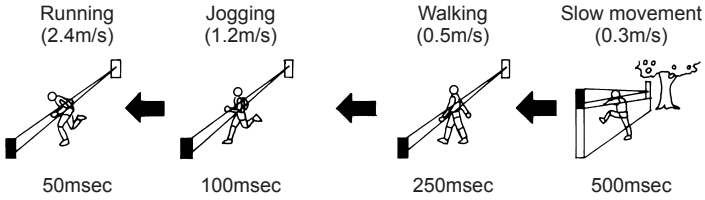


[AX-250/500PLUS]
Adjustment Volume



[AX-350/650TF]
Selection Dip Switch

Interruption time	Switches
50ms	1:OFF, 2:OFF
100ms	1:OFF, 2:ON
250ms	1:ON, 2:OFF
500ms	1:ON, 2:ON



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 beam, 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.

7. AX-350/650TF

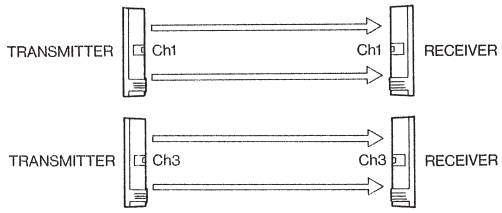
7-1. SELECTABLE BEAM FREQUENCIES

BEAM FREQUENCY SELECT SWITCH

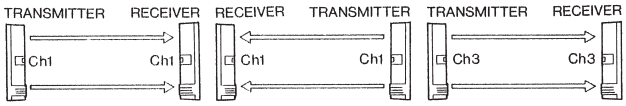
The selectable beam frequencies can be used to avoid unwanted crosstalk that can occur when using multiple photobeams for long distance or beam stacking applications.
- To select between 4 separate beam frequencies, use the switch provided.
- Make sure the receiver and transmitter that are facing each 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, channel 2 and 4 could have also been used.

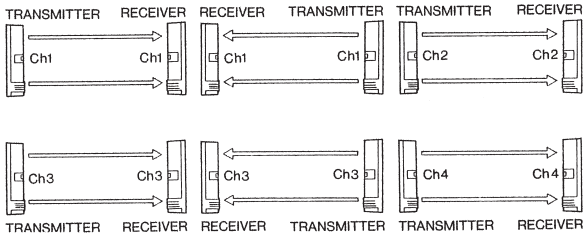
1 2 beam stacking



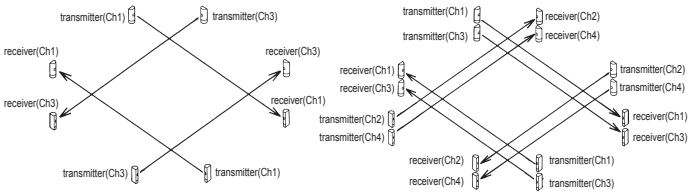
2 Long distance



3 2 beam long distance stacking



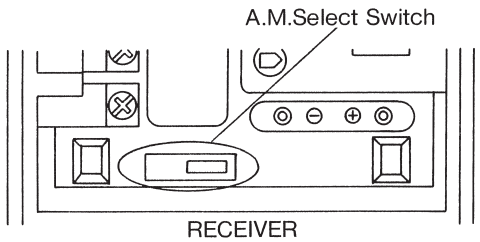
4 Perimeter protection



7-2. ALARM MEMORY

1. Wiring

Connect control voltage signal terminal (System arming status voltage output terminal) of control panel to A.M.terminal.



Model	AX-350TF, AX-650TF	
Type	NEGATIVE	POSITIVE
A.M.Select Switch Position		
System armed	0~1VDC(grounded)	OPEN or + 5~30VDC
System disarmed	OPEN or + 5~30VDC	0~1VDC(grounded)

2. Operation of Alarm Memory

If the units is triggered during an armed period, when the system is disarmed, its LED will remain lit to confirm that it reported the alarm.
- Alarm Memory will not latch while system is disarmed.
- LED operation and alarm output are not affected by alarm memory when system is armed.

3. Reset

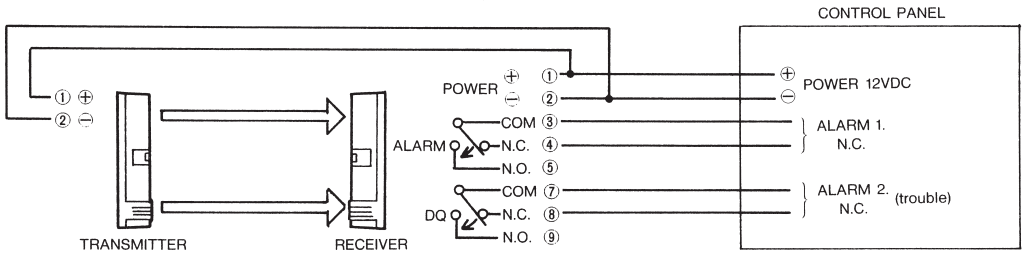
Alarm memory resets automatically when system is re-armed.
- Optical, compatible control panel required.

7-3. DQ CIRCUIT (ENVIRONMENTAL DISQUALIFICATION)

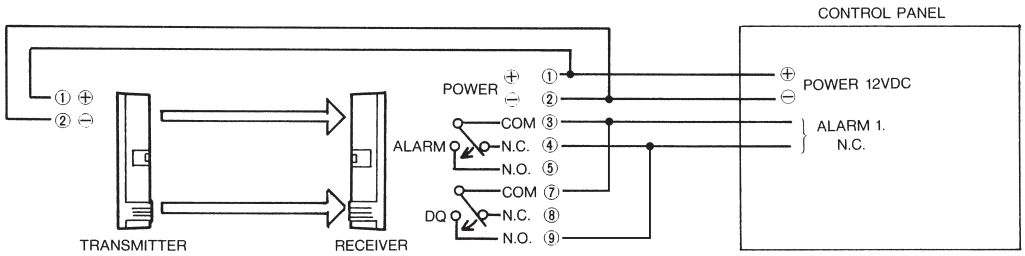
D.Q. will send a trouble signal when the beam strength is below an acceptable level due to heavy fog, rain, snow or other changes in the installation site. The trouble signal output continues as long as the beam strength is below an acceptable level. It will reset when the environmental conditions clear.

〈EXAMPLE〉

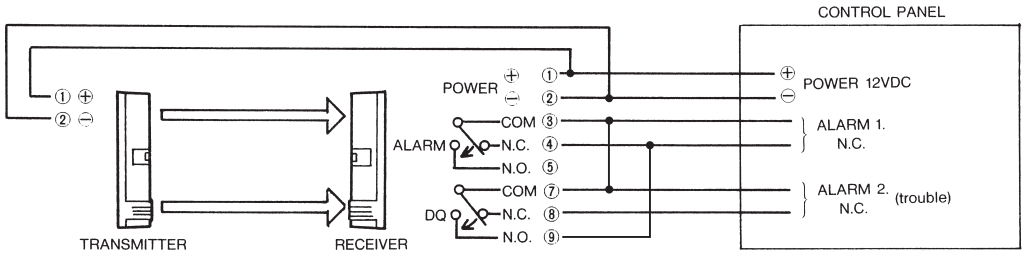
A. Trouble Output + Alarm Output



B. Bypasses Alarm



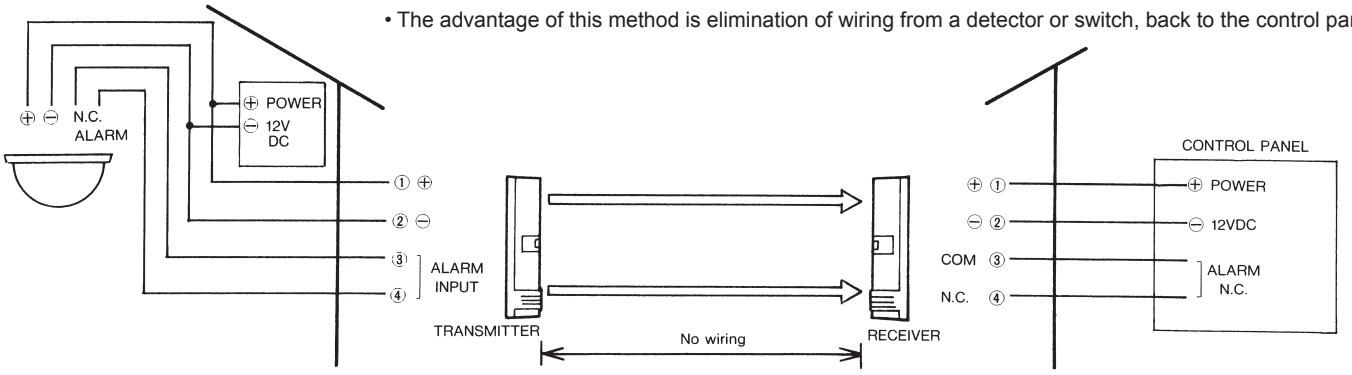
C. Bypasses Alarm + Trouble Output



NOTE : If the control panel's input terminals have the same common, the alarm output, sleep and trouble output can be triggered simultaneously.

7-4. RE-TRANSMITTING CIRCUIT

• The advantage of this method is elimination of wiring from a detector or switch, back to the control panel.



• Remove the jumper (U shaped connector) from the transmitter's alarm input terminals (③ & ④) and connect the N.C. output of the detector or switch.

✻✻✻✻CAUTION✻✻✻✻

◦Make sure you connect the jumper (U shaped connector) when the retransmitting circuit is not in use.

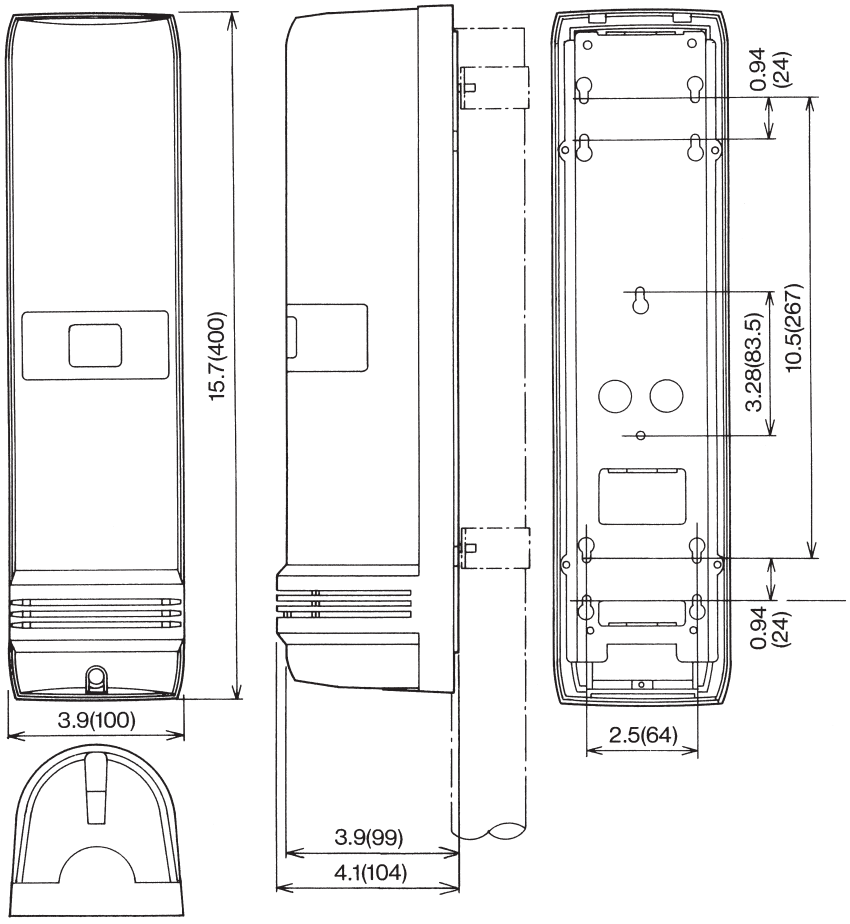
◦Output of the detector or switch must be N.C. (N.O. is not acceptable.)

8. SPECIFICATIONS

MODEL		AX-250PLUS	AX-500PLUS	AX-350TF	AX-650TF
Detection Method		Infrared Photoelectric			
Range	Outdoor	250ft(75m)	500ft(150m)	350ft(100m)	650ft(200m)
	Indoor	500ft(150m)	1000ft(300m)	700ft(200m)	1300ft(400m)
Maximum Arrival Distance		2500ft(750m)	5000ft(1500m)	3500ft(1000m)	6500ft(2000m)
Beam Characteristics		Pulsed Infrared			
Selectable Beam Frequency		———		4 channel	
Interruption Period		50~500 msec (Selectable)		50, 100, 250, 500 msec (4steps)	
Power Input		10.5~30VDC			
Current Draw (transmitter + receiver)		Normal operation 50 mA max T:22mA+R:28mA		Normal operation 60 mA max T:11mA+R:49mA	Normal operation 62 mA max T:13mA+R:49mA
				During optical alignment 78 mA max T:11mA+R:67mA	During optical alignment 80 mA max T:13mA+R:67mA
Alarm Period		2sec(±1) nominal			
Alarm Output		Form C Relay (28VDC 0.2A max)			
Tamper Switch		N.C. opens when cover is removed (RECEIVER only)		N.C. opens when cover is removed	
Operating Temperature		-13°F~131°F (-25°C~+55°C)		-30°F~140°F (-35°C~+60°C)	
Environment Humidity		95% max			
Alignment Angle		±10° Vertical, ±90° Horizontal			
Alarm Memory		———		LED indicates memory status. Selectable Negative & Positive	
Environmental Disqualification Circuit		———		Form C relay operates when beam energy has been gradually reduced to abnormal level.	
Mounting		Wall or Pole			
Weatherproof		IP54			
Weight		95.2 oz (2700g) Transmitter and Receiver		97.0 oz (2750g) Transmitter and Receiver	

∗Specifications and design are subject to change without prior notice.

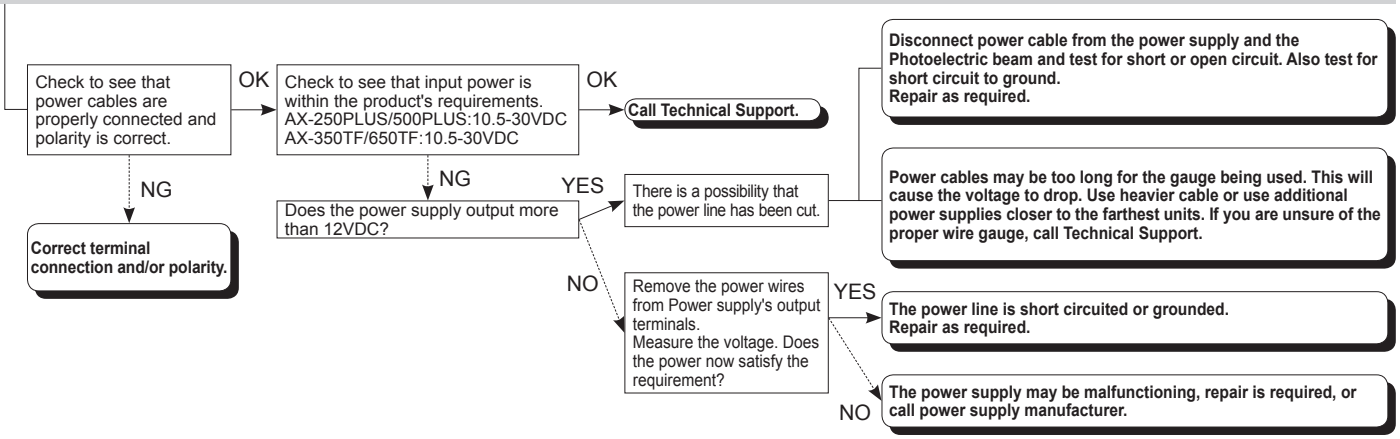
9. DIMENSIONS



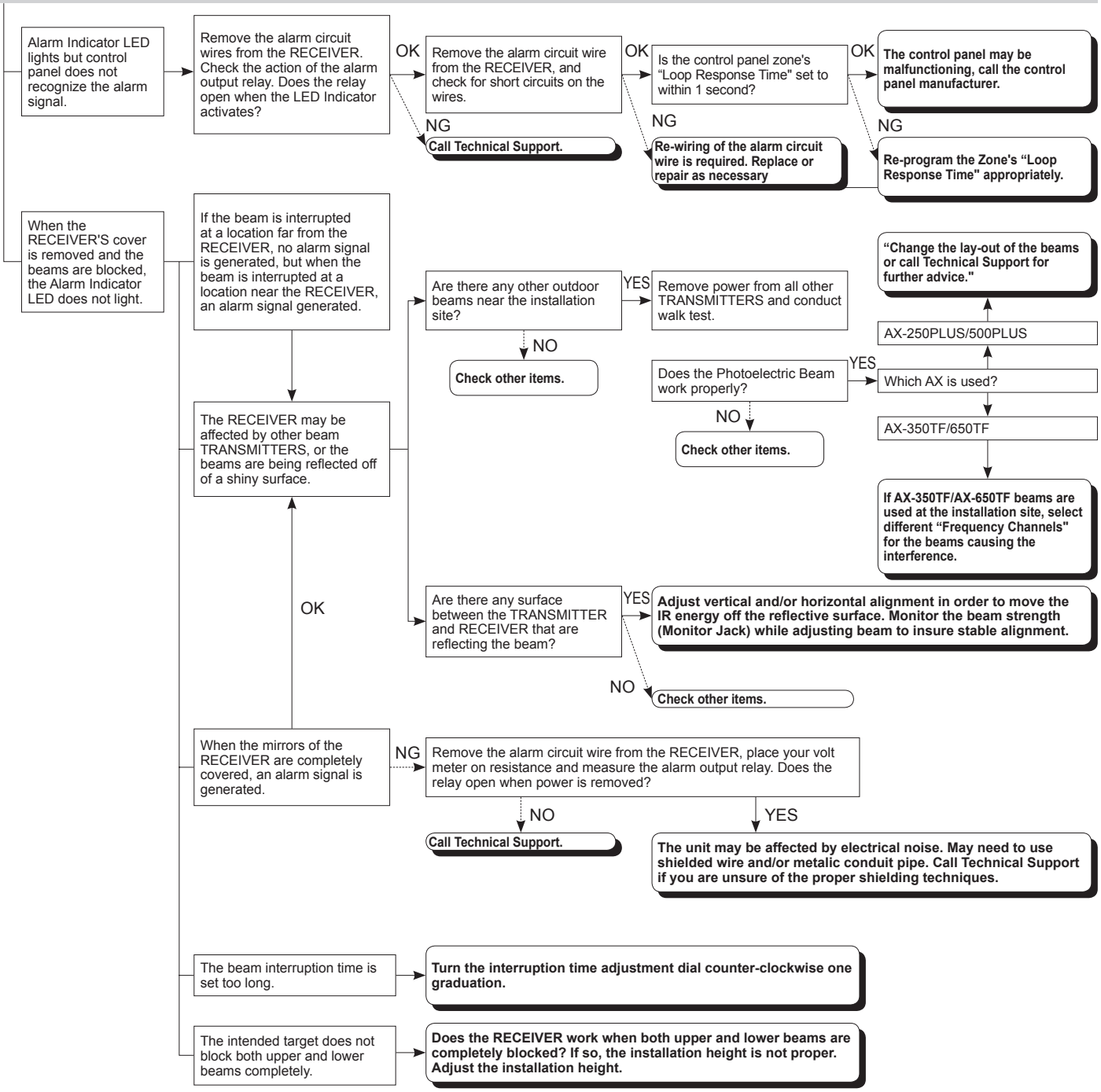
Dimensions : inches(mm)

10. TROUBLE SHOOTING CHECK SHEET for AX-250PLUS/500PLUS/350TF/650TF

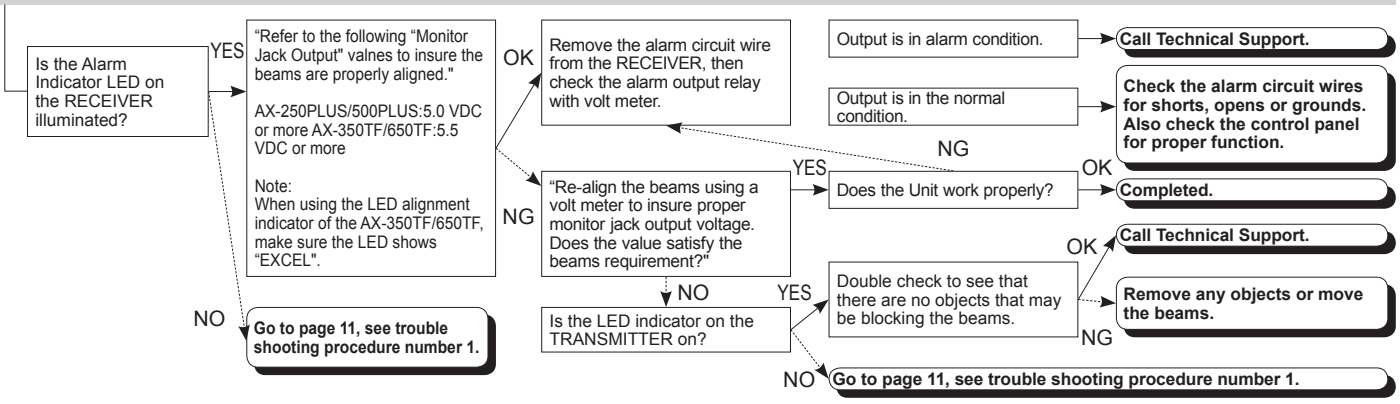
1. "No Action" on the TRANSMITTER or RECEIVER after power has been applied.



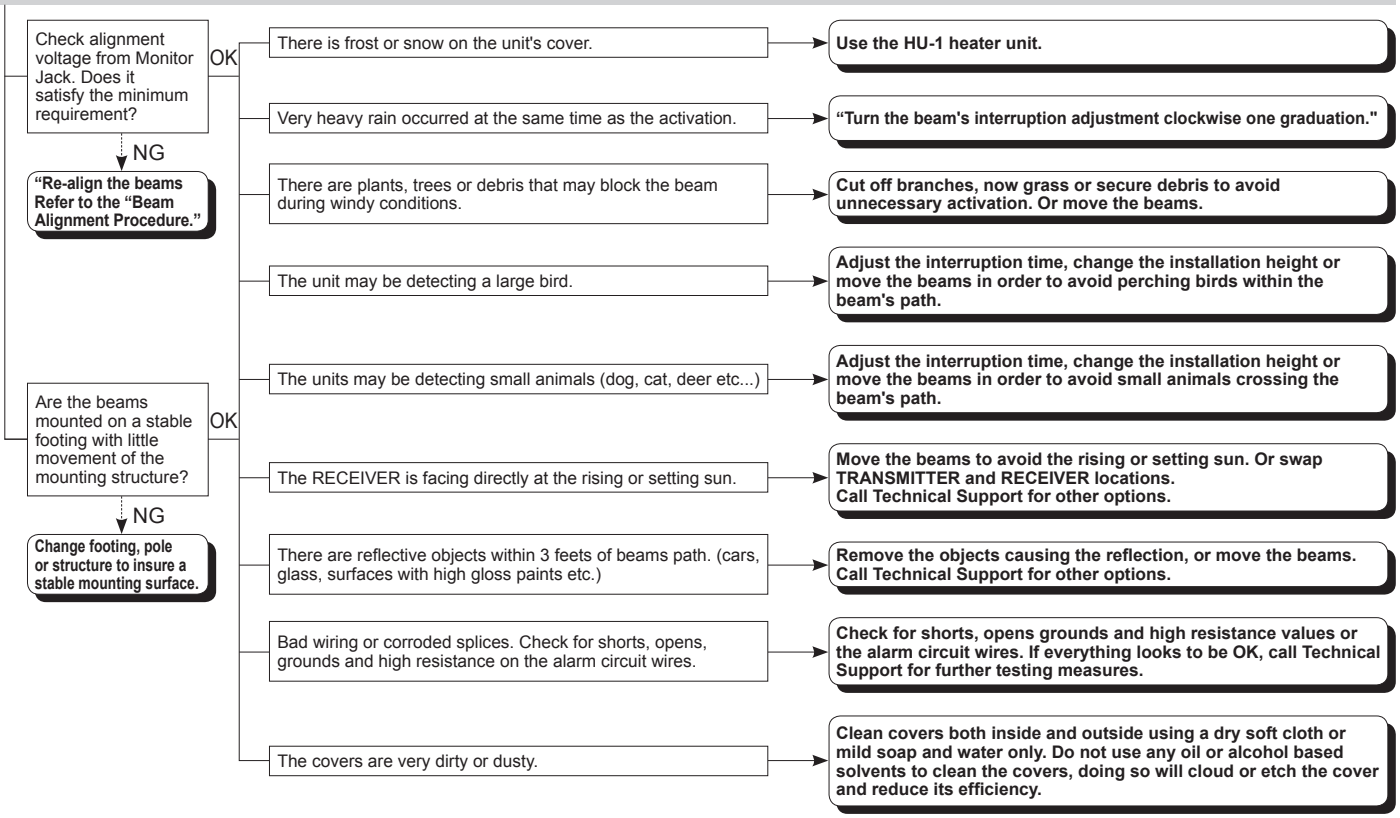
2. "No Action" on alarm zone even though the beams are completely blocked.



3. Alarm signal is being generated though beams are not blocked



4. False activations



Note: Beam Alignment Procedure

When aligning dual or twin beams you must cover both bottom receiver mirror and transmitter mirror with blocking shields, than adjust the top attempting to maximize the Monitor Jack Voltage (see below). When maximum voltage is obtained, place the blocking shields on both upper receiver mirror and transmitter mirror and adjust lower for maximum Monitor Jack Voltage. (Do not align both beams simultaneously.)

AX-250PLUS/500PLUS:5.0VDC or more
AX-350TF/650TF:5.5VDC or more
When using LED INDICATOR of AX-350TF/650TF, align to get at least "EXCEL".

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.

NOTE

These units are 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.
These products conform to the EMC Directive 2004/108/EC.

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