

# PHOTOELECTRIC BEAM DETECTOR

**NR60AQM :200ft./ 60m Range**  
**NR120AQM:400ft./120m Range**  
**NR200AQM:660ft./200m Range**

We appreciate your purchase of ATSUMI PHOTOELECTRIC DETECTORS.  
Please read the following installation instructions carefully for appropriate use of the product.

## INSTALLATION INSTRUCTIONS

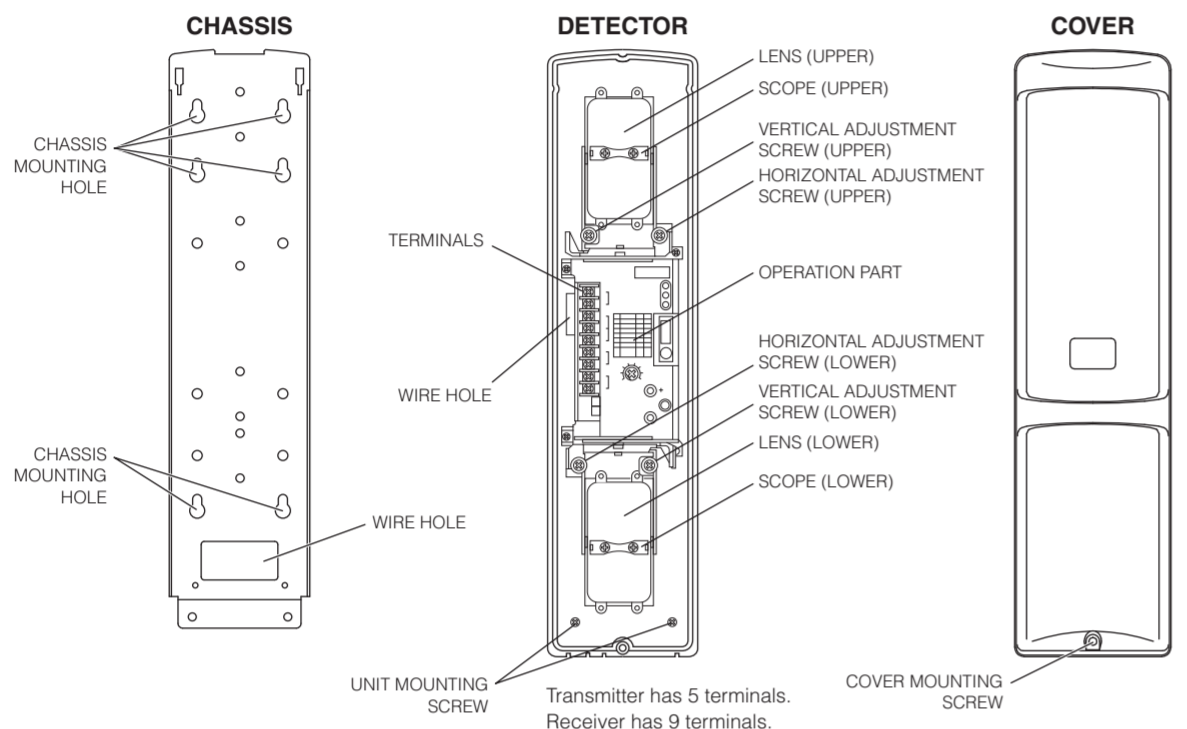
### 1 GENERAL DESCRIPTION

The NR60AQM/120AQM/200AQM are quad photoelectric detectors designed to activate an alarm output upon the detection of intruder through 4 pulsed infrared beams.

For stable operation, the NR60AQM/120AQM/200AQM are equipped with the following features.

- 100 Times Sensitivity Allowance**  
Stable operation is maintained even if 99% of beam energy is lost by rain, fog, frost, etc.
- Quad Beam Detection (AND/OR GATE Selectable)**  
AND GATE : All four beams need to be blocked simultaneously to trigger an alarm, resulting less false alarms caused by birds and other small animals.  
OR GATE : Either of Upper Two Beams or Lower Two Beams need to be blocked, resulting the detection of crawl through on the ground.
- Beam Power Control**  
This function allows selection of the appropriate beam intensity relative to the detection range to minimize the risk of reflection on the nearby walls and cross-taking with other detectors.
- Beam Interruption Time Control**  
This feature can be used to change the beam interruption time to best fit the application.
- Stackable**  
The selectable beams up to 8 kinds can be used and it can allow to stack NRAQM up to 4 units for the high density beam barrier.

### 4 COMPONENTS



### 2 INSTALLATION CONSIDERATIONS

Read the following prior to installing, wiring and regular maintenance.

Symbol	Meaning
<b>WARNING</b>	Indicate that incorrect operation causes significant danger of accident resulting in death or serious injury to the user.
<b>CAUTION</b>	Indicate that incorrect operation causes possibility of injury to the user or damage to the unit.

CAUTION		WARNING
<b>DO NOT INSTALL THE UNIT</b> (1) where trees, plants, or falling leaves will block the beams. (2) where intense source of light, sunlight will be reflected, directly into the receiver optics. A external light incoming within $\pm 3^\circ$ angle of each receiver axis may cause false alarms. (3) where on movable surfaces. (4) where subject to foul water or salt water. (5) where over the max range on each model. (6) where subject to strong electrical noise or RFI. (7) where subject to strong vibration or impact. (8) where subject to corrosive or explosive gas.	<b>AVOID</b> (1) extreme temperature and humidity. (2) magnets or any magnetized material. (3) running power and output wires near high voltage power sources. (4) the beam interference between other units when multiple units are installed as this beam spread angle is 1.4 degree.	Do not perform installation and wiring when it thunders.  Do not supply power until all wiring is completed.  Keep power between 10.5-28 VDC anytime.  Do not disassemble or modify the unit.
<b>IMPORTANT</b> (1) Face upper/lower optical modules on the transmitter and receiver towards each other. (2) Be sure of the beam in alignment optical modules can be adjusted within $\pm 90^\circ$ horizontally and $\pm 10^\circ$ vertically.		

### 3 SUPPLIED PARTS

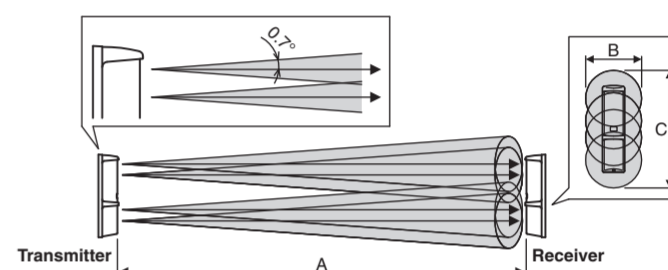
Make sure the following components are included in the package.

PARTS	PCS	PARTS	PCS
Transmitter, Receiver	2	Clamping Screw (short 4x8mm)	8
Installation Instructions	1	Clamping Screw (long 4x25mm)	8
U-clamp	4	Chassis Mounting Screw (5x16mm)	8
Mounting Plate	4	High Density Connection Cables 2P	2

### 5 BEAM SPREAD

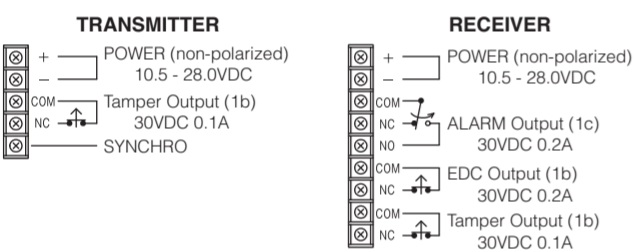
The beam spread angle is  $\pm 0.7^\circ$ . Refer to the right table and the diagrams below to determine the installation conditions.

Distance (A)	Spread (B)	Spread (C)
20m	0.5m	0.8m
40m	1.0m	1.3m
60m	1.5m	1.8m
80m	2.0m	2.2m
100m	2.5m	2.7m
120m	3.0m	3.2m
140m	3.5m	3.7m
160m	4.0m	4.2m
180m	4.5m	4.7m
200m	5.0m	5.2m



### 6 WIRING

#### 6.1 TERMINALS

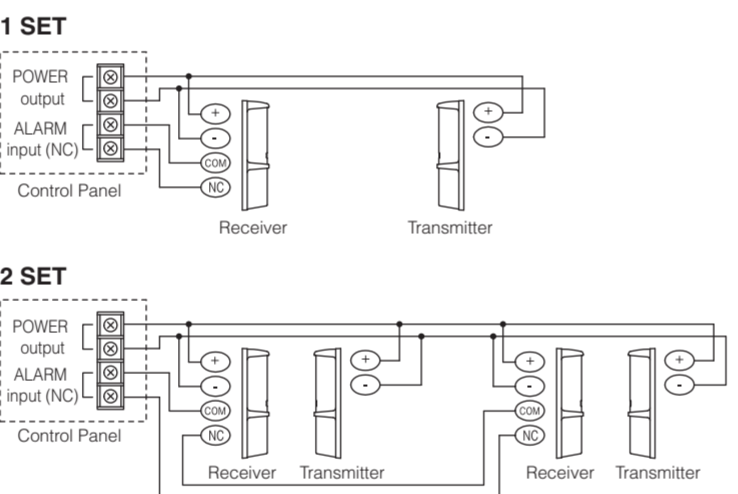


#### 6.2 WIRING LENGTH (MAX ONE WAY LENGTH)

WIRE GAUGE	MAXIMUM DISTANCE (m)					
	NR60AQM		NR120AQM		NR200AQM	
	12VDC	24VDC	12VDC	24VDC	12VDC	24VDC
AWG22	90	820	80	790	80	770
AWG19	170	1,600	170	1,550	160	1,500
AWG17	320	2,930	310	2,830	300	2,740
AWG14	570	5,150	550	4,980	530	4,820

\* This chart is based on 1 set connected to the same wire run from the power source.  
\* When installing 2 or more sets on one wire, the max length is obtained by dividing the max wire length listed above by the number of sets installed.

#### 6.3 EXAMPLES

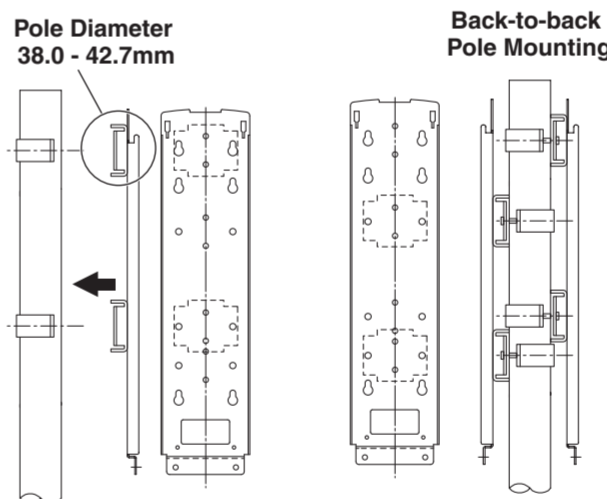
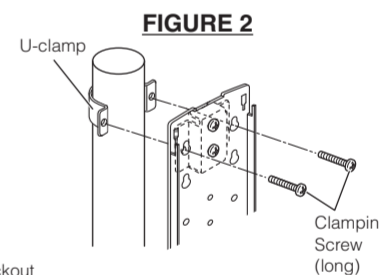
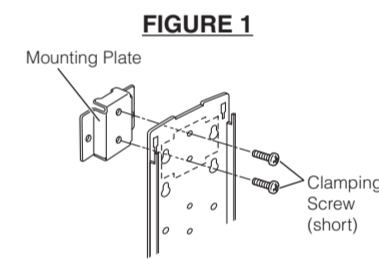


**Note:**  
\* Do not supply power until all wiring is completed.  
\* Power is to be provided by a UL Listed burglar alarm power supply or burglar alarm control panel.  
\* Refer to the National Electrical Code, NFPA70.  
\* This system should be tested at least once a week to ensure proper function.  
\* Don't wire aerial.  
\* Use pipes for outdoor wiring.

### 7 MOUNTING

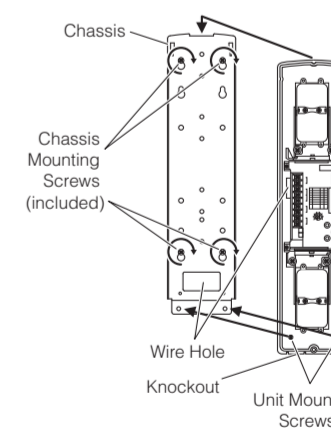
#### 7.1 POLE MOUNTING

- Choose an appropriate mounting location for the system. Install the poles with a clear line-of-sight between the transmitter and the receiver.
- Loosen the transmitter's cover mounting screw and remove the cover.
- Loosen the 2 unit mounting screws and remove the chassis by sliding it down against the unit.
- Attach the mounting plates to the chassis with the clamping screws (short) (see FIGURE 1).
- Firmly attach the chassis to the poles with the U-clamps and the screws (long) (see FIGURE 2).
- Make sure the transmitter is mounted in direct line-of-sight with the receiver.
- Route wiring through the chassis wire hole, leaving enough wire to access the transmitter's terminal strip.
- Route wiring through the transmitter's wire hole.
- Slide the transmitter onto the chassis. Tighten with the unit mounting screws.
- Repeat this mounting process for the receiver. Make sure it is mounted in direct line-of-sight with the transmitter.
- Wire to the terminal strips. (Refer to the 6. WIRING)
- Keep more than 10mm space around the chassis as this detector is bigger than it.
- Use the knockout at the bottom of this detector for the surface wiring.



#### 7.2 WALL MOUNTING

- Loosen the transmitter's cover mounting screw and remove the cover.
- Loosen the 2 unit mounting screws and remove the chassis by sliding it down against the unit.
- Route wiring through the wire hole of the chassis. Leave enough wire to access the transmitter's terminal strip.
- Mount the chassis to the mounting surface with the chassis mounting screws.
- Route wiring through the wire hole of the transmitter. If surface mounting is used, knock-out the thin-wall wire hole at the bottom of the transmitter.
- Reattach the transmitter to the chassis.
- Repeat this mounting procedure for the receiver. Make sure it is mounted in direct line-of-sight with the transmitter.
- Wire to the terminal strips. (Refer to the 6. WIRING)



### 8 FEATURES

#### 8.1 SELECTABLE BEAMS

Crosstalking will occur when using multiple beams for stack beam or long distance application, which can cause no-alarm problems. This NR-AQM series has selectable beams up to 8 kind (2 Groups x 4 Channels) which can be used to avoid crosstalking.

#### 8.2 SELECTABLE AND/OR GATE

The unit has photoelectric intrusion detection system designed to provide an alarm relay activation upon the detection of an intruder moving through four pulsed infrared beams (AND GATE), and also moving through either of the upper two beams or the lower two beams (OR GATE). This AND/OR GATE is selectable with the dip switches for required protection.

#### 8.3 EDC (Environmental Discrimination Circuit)

EDC sends EDC signal when it becomes difficult to maintain stable operation due to environmental disturbance like fog or rain. There are two selective features in utilizing the Bypass switch at the receiver. Hereunder, the condition where it is difficult to maintain stable operation for more than 3 seconds due to unfavorable environmental condition is defined as "Poor Environmental Condition".

##### BYPASS switch ===== OFF

##### 1) In Poor Environmental Condition

EDC LED will turn on and EDC signal will be provided through the normal closed relay output at the receiver. The alarm signal will then be generated by the further loss of the beam energy.

##### 2) When either optical module is blocked for 3 seconds

EDC LED will turn on and EDC signal will be provided. No alarm output will be generated.

##### 3) When both optical modules are blocked for 3 seconds

After the specified interruption time, alarm LED turns on and alarm signal is generated. If beams are blocked for more than 3 seconds, EDC LED will turn on and EDC signal will be provided.

##### BYPASS switch ===== ON

##### 1) In Poor Environmental Condition

EDC LED will turn on and EDC signal will be provided through the normal closed relay output at the receiver. With the further loss of beam energy, the alarm LED turns on but alarm signal is NOT generated (alarm relay is automatically shunted).

##### 2) When either optical module is blocked for 3 seconds

EDC LED will turn on and EDC signal will be provided. If another optical module is blocked, alarm LED turns on but no alarm signal is generated.

##### 3) When both optical modules are blocked for 3 seconds

After the specified interruption time, alarm LED turns on and alarm signal is generated. Even if the beams are blocked for more than 3 seconds, EDC LED will not turn on and EDC signal is not provided.

**Note:** It is extremely important to have the EDC connected to a trouble circuit. It is also important to check the system any time the EDC relay has been activated.

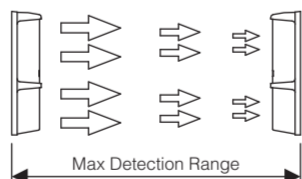
**Note:** EDC feature has not been evaluated by UL.

#### 8.4 BEAM INTERRUPTION TIME

The beam interruption time defines the amount of time an intruder must be in the beam path before an alarm is output. For instance, if the interruption time is set at 100msec, the detector output an alarm only if the beams are blocked for more than 100msec.

#### 8.5 BEAM POWER CONTROL

The beam strength is at optimal level if used at the maximum range. If used for shorter distance, excess beam energy reaches the receiver, resulting in reflection on the nearby walls and cross-talking with other detectors.



**Beam energy decreases as it flies a long distance. For shorter range, more beam energy reaches the receiver.**

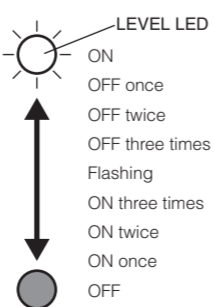
#### 8.6 LEVEL LED

One LED displays the amount of beams received during optical module adjustment.

As more beam energy is received, the illumination time shortens as follows:

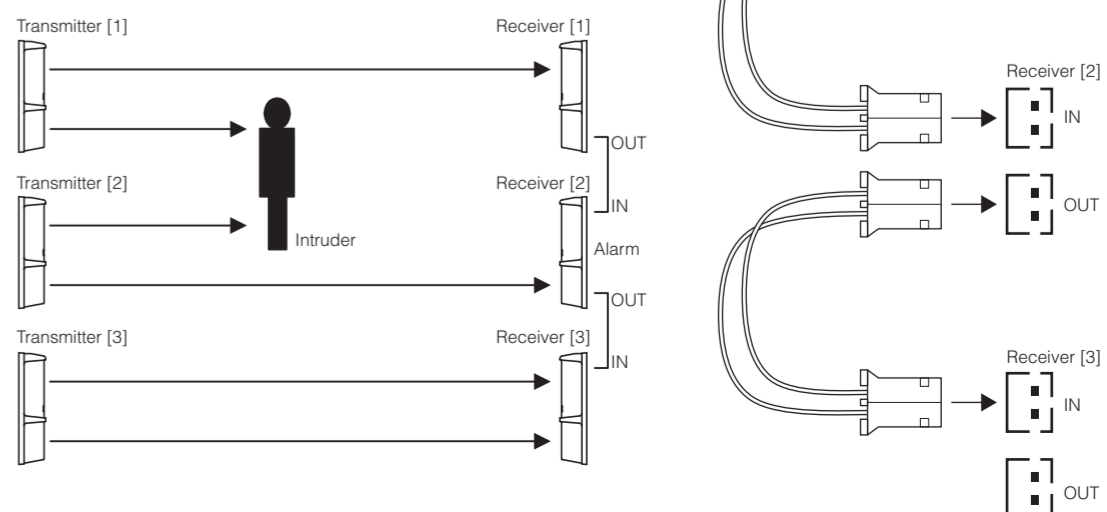
ON → OFF once → OFF twice → OFF three times → Flashing → ON three times → ON twice → ON once → OFF.

When the LED turns off, the alignment is complete.



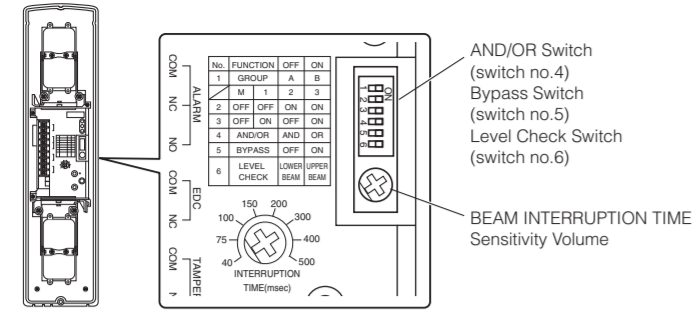
#### 8.7 HIGH DENSITY (This is a special feature for stacking gates.)

- By connecting HIGH DENSITY CONNECTION (OUT) of the receiver [1] and HIGH DENSITY CONNECTION (IN) of the receiver [2], AND GATE can be formed between the lower beam of the receiver [1] and the upper beam of the receiver [2]. Alarm is output to the receiver [2].
- By connecting HIGH DENSITY CONNECTION (OUT) of the receiver [2] and HIGH DENSITY CONNECTION (IN) of the receiver [3], AND GATE can be formed between the lower beam of the receiver [2] and the upper beam of the receiver [3]. Alarm is output to the receiver [3].
- Up to 8 units can be connected.
- Only alarm operations are interlinked.
- Other features including the EDC function independently in each of the receivers.
- **Caution:** All of the receivers to be connected must have AND GATE setting and the same sensitivity.
- Connecting high density connection cables
- Connect the high density connection cables that come with the product.
- **Caution:** The length of these cables must be within 2m.
- **Caution:** The connection of OUT and IN must be made 1 to 1, and do not connect them in parallel.



## 9 INITIAL SETTING

### Receiver



#### AND/OR GATE (on the receiver)

Set the dip switch No.4 on the receiver to:  
ON : OR GATE  
OFF : AND GATE (original Position)

#### BYPASS (on the receiver)

Set the dip switch No.5 on the receiver to:  
ON : BYPASS activated  
OFF : BYPASS not activated (original Position)

#### LEVEL CHECK (on the receiver)

Set the dip switch No.6 on the receiver to:  
ON : Performs label display and tester output of the upper beam  
OFF : Performs label display and tester output of the lower beam (original Position)

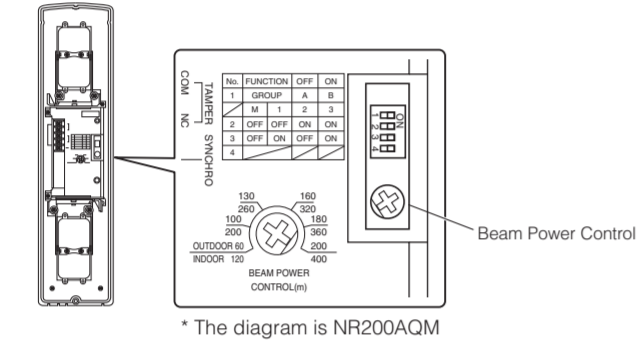
#### BEAM INTERRUPTION TIME (on the receiver)

Adjust with the rotary volume switch on the receiver.  
Slower setting reduce sensitivity.  
(original Position : 40msec)

1	2	3	4	5	6
Running	Jogging	Fast walking	Normal walking	Slow walking	Slow moving
40msec	100msec	200msec	300msec	400msec	500msec

Note: For UL applications the interruption time shall not exceed 75 msec.

### Transmitter



#### BEAM POWER CONTROL (on the transmitter)

Turn the volume on the transmitter clockwise to increase beam power and counterclockwise to decrease beam power.  
Refer to the following chart to set the volume based on the detection range (initial setting at maximum length).

Model	Volume Setting of Beam Power Control (OUT DOOR)						
NR60AQM	Volume	20	30	40	50	55	60
	Range	0-20m	20-30m	30-40m	40-50m	50-55m	55-60m
NR120AQM	Volume	40	60	80	100	110	120
	Range	0-40m	40-60m	60-80m	80-100m	100-110m	110-120m
NR200AQM	Volume	60	100	130	160	180	200
	Range	0-60m	60-100m	100-130m	130-160m	160-180m	180-200m

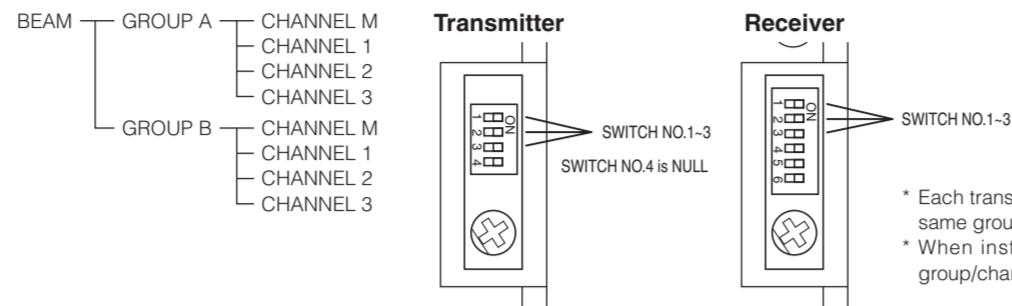
Model	Volume Setting of Beam Power Control (IN DOOR)						
NR60AQM	Volume	40	60	80	100	110	120
	Range	0-40m	40-60m	60-80m	80-100m	100-110m	110-120m
NR120AQM	Volume	80	120	160	200	220	240
	Range	0-80m	80-120m	120-160m	160-200m	200-220m	220-240m
NR200AQM	Volume	120	200	260	320	360	400
	Range	0-120m	120-200m	200-260m	260-320m	320-360m	360-400m

## 10 SELECTABLE BEAMS AND SYNCHRO WIRING

When installing only 1 set, beam group/channel setting and synchro wires are not required.  
Use the unit at all original positions (OFF) on the switch No. 1 to 3 of the transmitter and the receiver.

### 10.1 BEAM GROUP/CHANNEL

The selectable beams up to 8 kinds can be used. The unit has Group A and B beam for selection. Each group can be divided into 4 channels which are called Channel M (Master), Channel 1, Channel 2, and Channel 3. Channel 1 to 3 can emit beams only when Channel M on the same group provides each channel with synchro signal. When installing 2 or more sets on the same group, set only 1 set to Channel M and set the other sets to Channel 1 to 3. And synchro wires are required. (See SYNCHRO WIRING.)  
Set the dip switch No.1 to 3 on each transmitter and receiver for group/channel selection. See below chart.



#### GROUP SELECTION

SWITCH NO.1	GROUP
ON	B
OFF	A

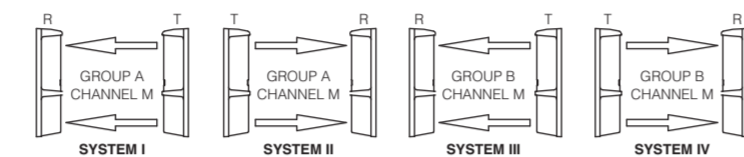
#### CHANNEL SELECTION

SWITCH NO.2	SWITCH NO.3	CHANNEL
OFF	OFF	M
OFF	ON	1
ON	OFF	2
ON	ON	3

- \* Each transmitter and receiver to be faced must be set to the same group/channel.
- \* When installing 2 or more sets, do not set to the same group/channel to avoid crosstalking.

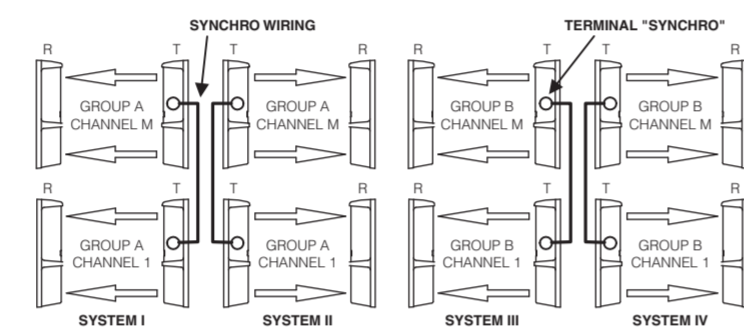
### 10.3 EXAMPLES

#### • 1 STACKING IN LONG DISTANCE



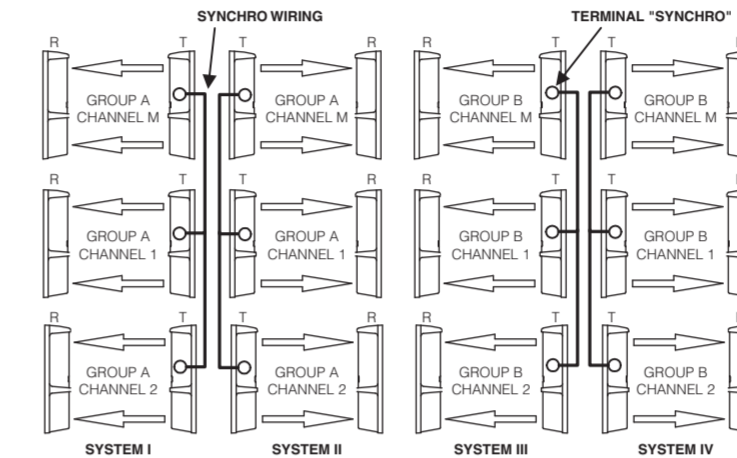
- [1] SYSTEM III must be set to group B to avoid crosstalking to SYSTEM I.
- [2] SYSTEM IV must be set to group B to avoid crosstalking to SYSTEM II.
- [3] Stay set to channel M on both groups and synchro wires are not required.

#### • 2 STACKING IN LONG DISTANCE



- [1] SYSTEM III must be set to group B to avoid crosstalking to SYSTEM I.
- [2] SYSTEM IV must be set to group B to avoid crosstalking to SYSTEM II.
- [3] Each top line set must be set to channel M and the bottom line sets to channel 1 to 3 to avoid crosstalking between the top and bottom line sets.
- [4] Do synchro wire on each group due to multiple channel use.

#### • 3 STACKING IN LONG DISTANCE



- [1] SYSTEM III must be set to group B to avoid crosstalking to SYSTEM I.
- [2] SYSTEM IV must be set to group B to avoid crosstalking to SYSTEM II.
- [3] Each top line set must be set to channel M and the other line sets to channel 1-2 to avoid crosstalking between the stacking sets.
- [4] Do synchro wire on each group due to multiple channel use.

### 10.2 SYNCHRO WIRING

Synchro wires are required when installing 2 or more sets on the same group. Do wire between terminal "SYNCHRO" of each transmitter on the same group. This synchro wire should be more than 0.65mm Dia.(0.3mm<sup>2</sup>) and should be run within 66ft.(20m) length.  
Synchronized transmitters must use a common power supply. Synchro wires are not required between the receivers. Do not wire between group A and B.

\* The system will not be activated when synchro wires are not connected properly or other unneeded wires are connected.  
(When required wires are not connected, Power LED will be flickered.)

#### CAUTION

When Power LED is flickered, shut off the power and reconnect wires correctly.

## 11 ALIGNMENT

There are two ways of optical module alignment: using the level LED and a voltmeter.

### 11.1 Alignment Using the Level LED

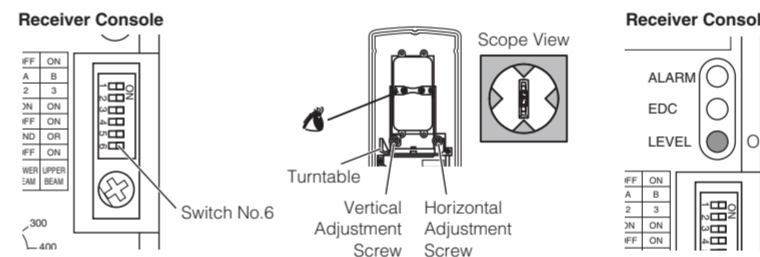
#### Alignment of the Upper Beam

- (1) Set the dip switch No.6 on the receiver to ON.
- (2) While looking into the scope at the center of the lens from a location 10 to 15 cm away, adjust the horizontal direction by rotating the turntable and the horizontal adjustment screw. Also, adjust the vertical direction by rotating the vertical adjustment screw. As shown in Scope View, adjust to locate the sensor of the receiver in the center of the viewing circle.
- (3) Check the level LED of the receiver.

When the level LED is off, the alignment is complete. If the level LED is not off, perform fine alignment of the transmitter and receiver using the horizontal and vertical adjustment screws. Repeat it until the level LED goes off.

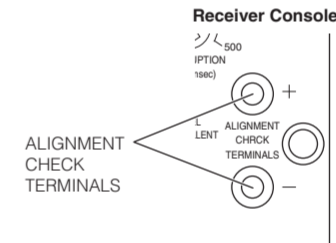
#### Alignment of the Lower Beam

- (4) Set the dip switch No.6 on the receiver to OFF.
  - (5) Perform lower beam alignment according to steps (2) and (3) above.
- When the level LED goes off, the alignment is complete.



### 11.2 Alignment Using a Voltmeter

- (1) Insert the voltmeter leads into the alignment check terminals of the receiver. Set the voltmeter to the DC voltage mode.
- (2) Adjust the upper and lower optical modules according to "11.1 Alignment Using the Level LED" so that the output value of the voltmeter reads 3.0V or higher.



## 12 OPERATION CHECK

### 12.1 ALARM OPERATION

- AND GATE : Check that the alarm LED on the receiver turns ON when all for beams are blocked simultaneously for the adjusted beam interruption time.
- OR GATE : Check that the alarm LED on the receiver turns ON when either of the upper/lower two beams are blocked for the adjusted beam interruption time.

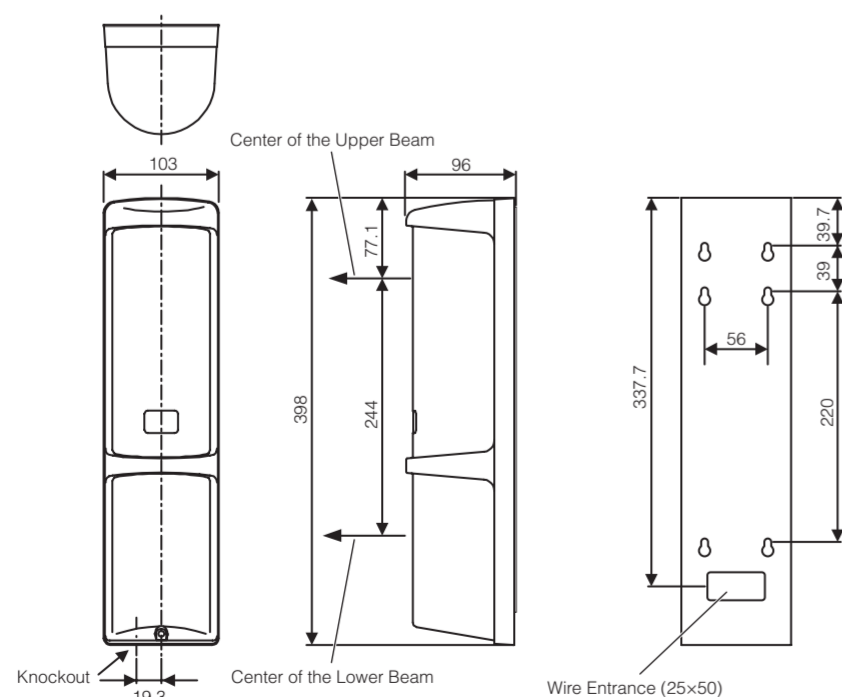
### 12.2 EDC OPERATION

- (1) When OR GATE is set, set the dip switch No.4 on the receiver to OFF (AND GATE).
- (2) Check that the EDC LED on the receiver turns ON in 3 seconds after only the upper beam is blocked.
- (3) Check that the ALARM LED on the receiver turns ON in the adjusted beam interruption time after the lower beam is blocked while the EDC LED stays ON.
- (4) Check that the EDC LED on the receiver turns ON in 3 seconds after only the lower beam is blocked.
- (5) Check that the ALARM LED on the receiver turns ON in the adjusted beam interruption time after the upper beam is blocked while the EDC LED stays ON.
- (6) Set the dip switch No.4 on the receiver to ON for OR GATE.

### 12.3 PERIODEC CHECK

This system should be tested at least once a week per above checking to ensure proper function.

## 14 DIMENSIONS



## 16 OPTIONAL PARTS

Part No.	Description
BP-1	Pole (ø42.7mm x 950mm 2-pcs)
BP-2	Pole (ø42.7mm x 1200mm 2-pcs)
BP-3	Wall-mount Pole (ø42.7mm 2-pcs)
PC1A	Water Pesticant Enclosure (2-pcs)
PC3A	Back-to-back Enclosure (1-pcs)
BH12T	Heater

\* Specifications are subject to change without prior notice.

## 13 TROUBLESHOOTING

### Check the following items if the system does not work normally.

- (1) Check that the input voltage is 10.5-28VDC at the terminal on both of the transmitter and the receiver.
- (2) Check that the loop resistance of the alarm output is under 100 Ω.
- (3) Check that the monitor LED on the transmitter turns ON.
- (4) Check that the alarm LED on the receiver turns ON when both of the upper/lower beams are blocked simultaneously for the adjusted beam interruption time.
- (5) Check that the output of the beam alignment check terminal on the receiver is over 3V.
- (6) Check that the level LED on the receiver turns OFF.

PROBLEM	CAUSE	SOLUTION
Constant alarm output	Something is blocking the beams.	Remove the object(s).
	Optical modules or covers need cleaning.	Clean the optical modules and the covers.
	Improper channel selection.	Select the proper channels.
False alarms often caused.	Synchro wires are not connected.	Connect the proper synchro wiring.
	Something move is blocking the beams.	Remove the object(s).
	Beam interruption time is set too quick.	Decrease the sensitivity.
	Near by source of electrical noise or RFI.	Change the installation site.
	Wiring too close to power sources or power line.	Change the wiring route.
	Unstable installation site.	Fix the installation site.
	Over the maximum protection range of the model.	Reinstall within the maximum range.
No alarm when beams blocked.	Inappropriate Beam Power Control level.	Readjust the control level.
	Frost or dew.	Attach the optical heater.
	Beams are reflected into the receiver.	Remove the reflective object or change the installation site.
EDC LED often turns ON.	Beam interruption time is set too slow.	Increase the sensitivity.
	Other beams are received by the receiver.	Adjust beams power of the transmitter.
	Change the installation site.	Change the installation site.
Power LED on the transmitter flicker.	Something is blocking the beams.	Remove the object(s).
	Installed on unstable ground.	Fix the installation site.
	Over the maximum protection range of the model.	Reinstall within the maximum range.
	Inappropriate Beam Power Control level.	Readjust the control level.
	Frost or dew.	Attach the optical heater.
	Required synchro wires are not connected.	Connect the proper synchro wiring.

## 15 SPECIFICATIONS

PRODUCT NAME	PHOTOELECTRIC BEAM DETECTOR		
Model	NR60AQM	NR120AQM	NR200AQM
Input Voltage	10.5-28VDC (Non-Polarity)		
Current Draw	Transmitter: under 20mA Receiver: under 100mA	Transmitter: under 24mA Receiver: under 100mA	Transmitter: under 28mA Receiver: under 100mA
Operating Temp./Humid.	-13°F~+140°F (-25°C ~ +60°C) under 95%RH		
Preservable Temp./Humid.	-22°F~+158°F (-30°C ~ +70°C) under 95%RH		
Alarm Output	Alarm	From C 0.2A@30VDC Output Period: 3sec	
	EDC	NC 0.2A@30VDC Output Period: 3sec	
	Tamper	NC 0.1A@30VDC Output Period: While the cover is removed.	
Selectable Beams	2Groups x 4Channels		
Max Coverage	Outdoor 200ft.(60m)	Outdoor 400ft.(120m)	Outdoor 660ft.(200m)
Beam Interruption Time	40msec - 500msec (variable)		
Optical Module	±90° Horizontal ±10° Vertical Adjustable		
Installation Site	Outdoor / Indoor (Pole / Wall Mount)		
IP Rate	IP 66		
Net Weight	Transmitter: 2.86lb (1.3kg) / Receiver: 2.86lb (1.3kg)		
Color	Black Mansel - 1.0		

\* Specifications are subject to change without prior notice.

## 17 OTHER INFORMATION

- At least once a year, clean the optical module and covers with a soft cloth, and perform walk testing to verify operation.
- The specifications are subject to change without prior notice.
- This unit designed to detect movement of an intruder and activates an alarm control panel.
- Being only a part of a complete system, we can not accept responsibility for any damages or other consequences resulting from an intrusion.

## ATSUMI ELECTRIC CO., LTD.

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