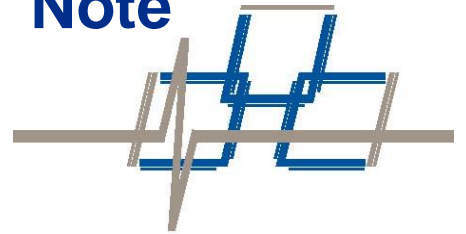


Laser Defender™ Hangar and Bay Door Protection

Application
Note



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Summary

The versatility of the Fiber SenSys intrusion detection technology allows for a wide array of implementation options. Laser Defender™ is a quality solution for interiors using Lidar technology. With a two-dimensional plane of coverage, the Laser Defender provides security by creating a virtual wall or ceiling of protection. The purpose of this application note is to define how to successfully plan, install, calibrate, and maintain the Laser Defender for the use of hangar and bay door protection. The two products discussed in this note include the LD308SH™ (30m detection radius 180°-190°) and the LD204S™ (20m x 20m at 95° coverage).

Introduction

The successful installation and operation of the Laser Defender are achieved by a thorough understanding of the security needs of the site. Exercising careful planning before an installation greatly increases durability and reliability throughout the life of the system. Advanced planning should be followed with proper installation to ensure the sensor operates to its full potential. As with any security system, periodic maintenance is necessary for long-lasting performance.

Fiber SenSys® recommends the following procedure for planning the installation of the Laser Defender interior security sensor:

- **Planning:** Survey the site to be protected, observe all accessible areas of intrusions, laser orientation (vertical and horizontal), wall or ceiling mount and record all information needed for the site design phase.
- **Design:** Create a strategy for protecting the site. Choose the best fit detector, it's location, number of zones and masking of unwanted areas from detection should it be necessary.
- **Installation:** Proper installation and alignment of the Laser Defender.
- **Configuration:** Settings for target size, location, area masking, and zone allocating.
- **High probability of detection:** Conduct a series of simulated intrusions per site criteria while maintaining a low nuisance and false alarm rate (NAR/FAR). Simulated intrusions may include:
 - Crawling
 - Jumping
 - Walking
 - Running
 - Rolling

Planning

The first step to a successful installation is performing a detailed site survey. The site survey includes identifying the level of security, threat assessments, area drawings, site walk-through, wire connections, and available mounting options. Analysis of the data obtained through this process aids in the proper planning of zone layout and equipment selection.

Level of Security and Threat Assessment

During this stage, it is helpful to think from an intruder's perspective. Try to imagine what weak points of the building you would exploit and why.

- Given the nature of the facility, what is the maximum level of knowledge and experience that potential intruders may possess?
- What are the most accessible entry points into the facility?
- What could cause a nuisance alarm?
 - Dusty environments
 - Moving objects
 - Unstable mounting
 - Steam or spray from ventilation

Site Mapping, Walk-through, Mounting location

Before conducting a walk-through, it is helpful to obtain a detailed drawing or blueprint showing the sites layout. This drawing should include ceiling heights, wall lengths, wire runs, and entry points. During the walk-through, take note of any details not illustrated in the drawing, such as fire extinguisher stations or other wall-mounted objects. These could affect the field-of-view of the laser detector. Data collected during the threat assessment and walk-through is used to determine zone layout and equipment quantities.

Design

Based on the previous data, selecting the appropriate detector for the application is next. The Laser Defender product line offers two sensing options.

- LD308SH - 30m radius detection coverage.
 - 19.2 to 30 VDC / 24 VAC.
 - 4 analog zone outputs / 1 master alarm output / 8 virtual zones for IP connection
 - Horizontal Mode for ceiling protection / Vertical Mode for wall protection.

- Please refer to PM-ENG-083 LD308SH Rev B installation manual for mounting types
- LD204S - 20m x 20m at 95° detection coverage.
 - 12 to 24 VDC / PoE(+) compatible.
 - 3 programmable analog zones / 4 virtual zones for IP connection.
 - Multiple mounting options for ceiling and wall protection. Please refer to PM-ENG-084 LD-204S Rev B installation manual for mounting types.

What are the size requirements for detection? The 4 figures below illustrate the detectable target size based on object color and reflectiveness. Note, detectable range depends on the reflectivity of the target, its shape, and speed in which the object traverses through the detection area. For military applications, install and test the system based on the black plate examples in Figure 1.

- Reflectivity of black plate: 10%
- Reflectivity of white plate: 90%

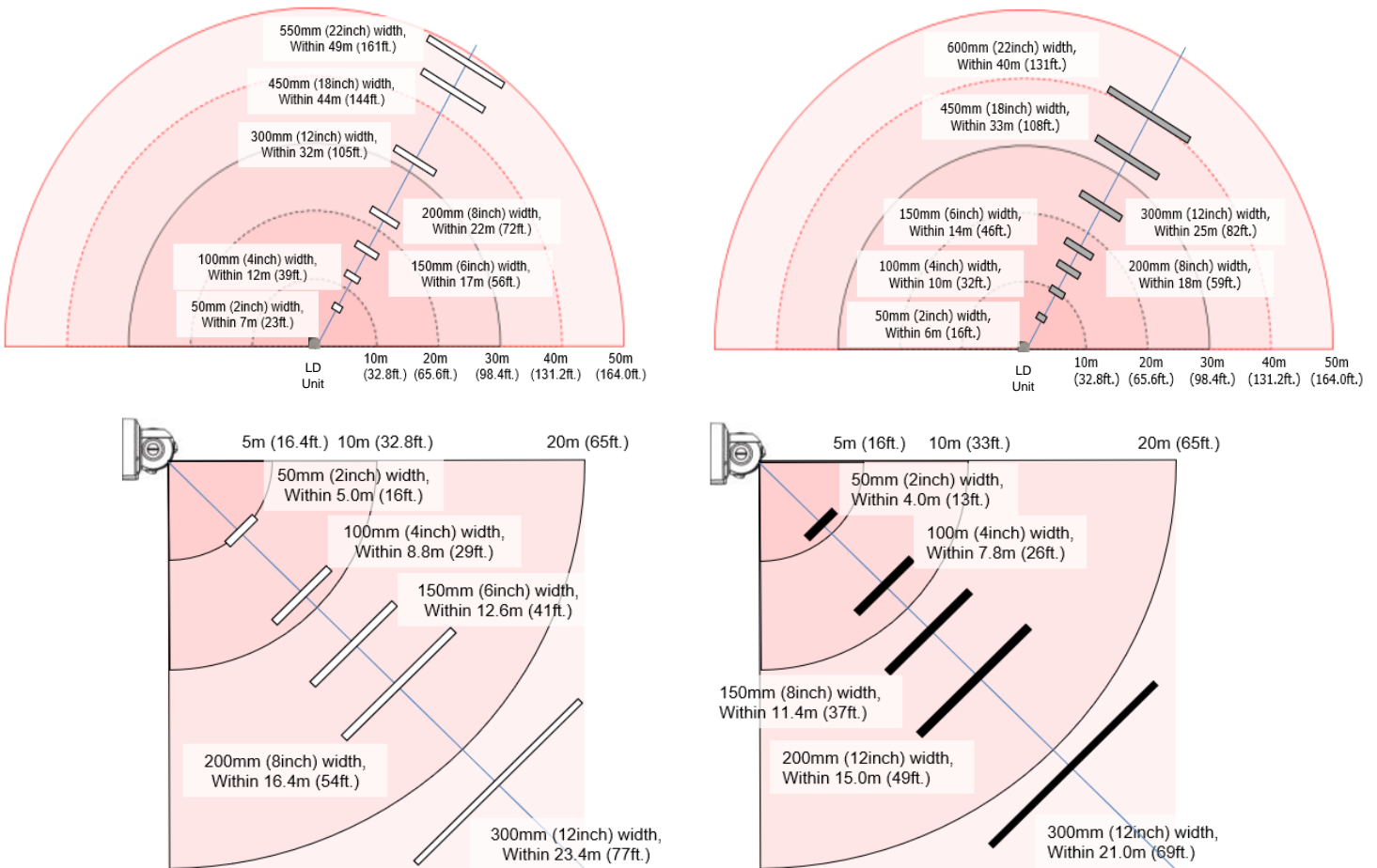


Figure 1: Object detection size based on color reflectivity (white left, black right)

Installation

Between the planning stage and the installation date, there could be some downtime. During this time, boxes and other peripheral devices could be installed or placed within the sensor's field-of-view. These changes to the site can create problems for the sensor's placement and how the sensor detects. Objects placed in the sensing area cause dead spots, also known as 'shadowing'. Cases like these should be avoided when possible and any movable objects removed from the detectors view.

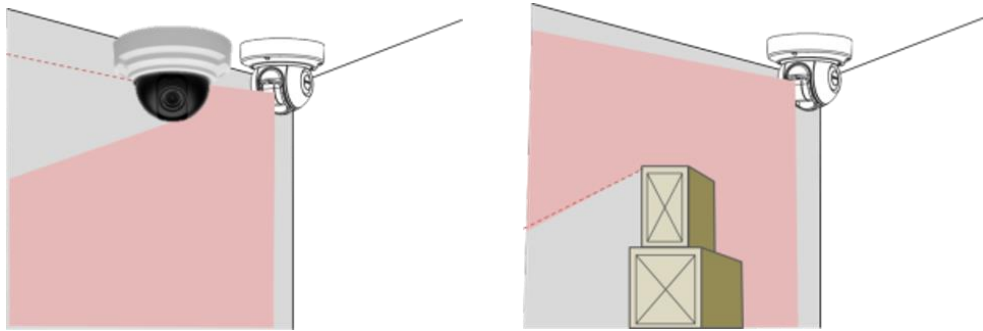


Figure 2: Dead zones from shadowing objects

Before tuning can begin, laser alignment ensures proper detection in the desired area. Alignment is best accomplished by using the Laser Area Checker (LAC-1). Using LED and audible indication, the LAC-1 sounds and flashes LEDs when in line with the laser's detection pattern, as seen in the figure below. This shows where the laser terminates and helps when adjusting the detector to its proper sensing position.



<p>HORIZONTAL DETECTION AREA</p> <p>[SIDE VIEW] 40° 40°</p> <p>[TOP VIEW] 40° 40°</p> <p>* See <caution> below</p> <p>Move up and down slowly</p>	<p>VERTICAL OR SLANTED DETECTION AREA</p> <p>[TOP VIEW] 40° 40°</p> <p>[SIDE VIEW] 40° 40°</p> <p>* See <caution> below</p> <p>Move back and forth slowly</p>
<p><HINTS> 3 LEDs indicate detection area sensitivity independently to locate high sensitive area precisely.</p> <p> If one of the 3 LEDs are blinking quickly, it stays in high sensitive area but the others do not.</p> <p> If all 3 LEDs are blinking quickly, all stay in high sensitive area, namely LAC-1 is located parallel to detection area.</p>	<p><CAUTION></p> <ul style="list-style-type: none"> LAC-1 can receive laser beams from the LD2045™ or LD308SH™ with ±40°. If out of this angle, you may not be able to have high sensitive indication. Place LAC-1's indicator side at right angle towards the LD2045™ or LD308SH™ front window.

Figure 3: Laser alignment using the LAC-1

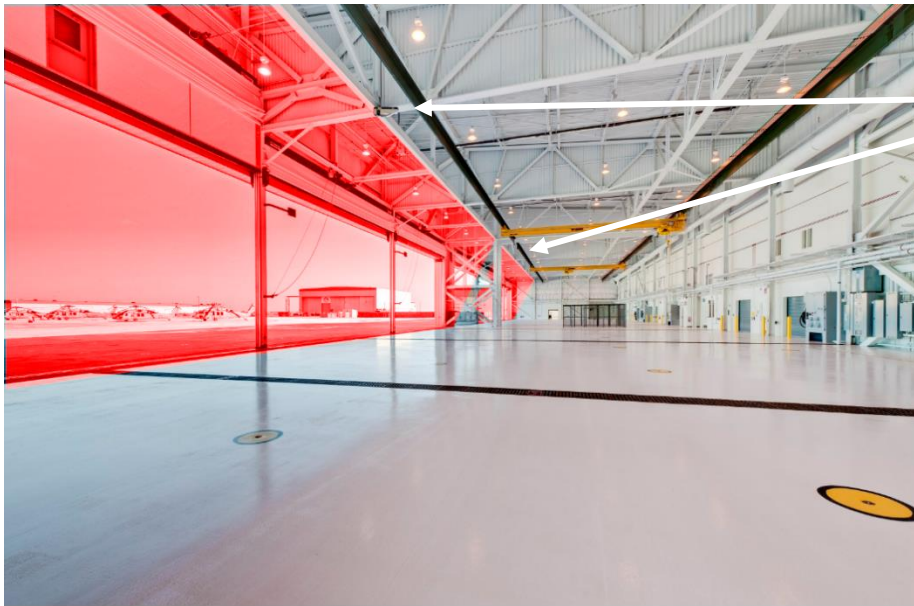
Running Intrusion

Time is an important factor when detecting a fast runner. High sensitivity and angling of the laser in a manner allows the detector more time to process fast intrusions.

Installing the laser facing straight down 270°, the LD308SH can detect a 5.5ft intruder running at a speed of 6.71mph. Any faster potentially results in a missed alarm. Using the same intruder height and high sensitivity, by angling the laser 30° would increase the running speed to 22mph.

Note:

Mounting height and detectable target size should be considered when choosing the mounting location. Refer to page 6 of this app note for detectable target size.



LD308SH



LD204S

Detection speed using the LD204S™:
270° = 8.9mph
Angled 30° = 24.8mph

Figure 4: Vertical mount hangar door protection

Configuration

To calibrate the sensor, first install the Laser Defender Manager Software (LDMS) on a laptop or workstation. This software is provided as a free download with each hardware purchase and can also be found at www.fibersensys.com/product/product-software. Connect the PC to the Laser Defender via Ethernet port. Change the network settings of the PC to fit the same subnet as the lasers default IP address.

(Example: IP address 192.168.0.100 and subnet mask 255.255.255.0 to communicate with the main port)

LD308SH:

IP address - 192.168.0.126

Subnet Mask - 255.255.255.0

Default Gateway - 192.168.0.1

LD204S:

Main Port - 192.168.0.126

Subnet Mask - 255.255.255.0

Default Gateway - 192.168.0.1

Maintenance Port - 192.168.1.126

Subnet Mask - 255.255.255.0

The LD204S offers two Ethernet ports, main, and maintenance. The main port inside the base is for constant connection to the LAN. This port supports PoE(+) and provides network alarm reporting. The maintenance port is used for the initial setup and post-install maintenance. This port is located near the laser window for easy access and avoids altering the laser alignment.

After launching the manager software, log in using the credentials below.

ID: LASERDEFENDER

Password: FSI

Click on Edit Group/Detector Information to select the detector currently connected to the PC. For this application note, we are using the LD204S as an example. In LDMS, confirm the PC's IP address fits the same subnet as the detector's default IP address. Click Connect (F1) to establish a connection to the Laser Defender.

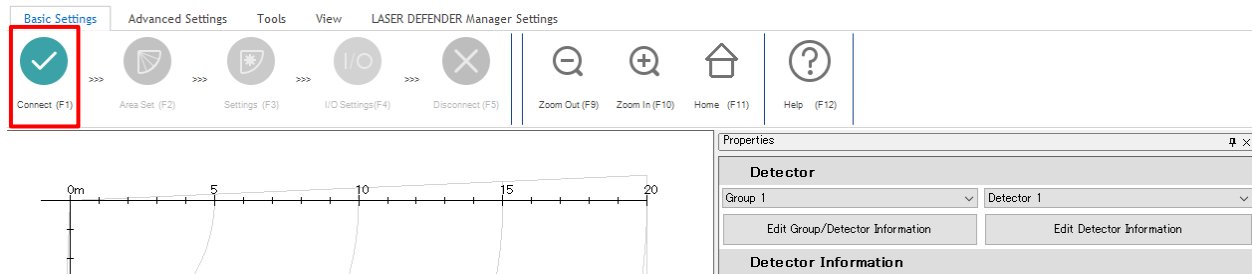


Figure 5: Connecting to the Laser Defender

If connection times out and aborts the connecting process, follow the troubleshooting steps below.

- Confirm power.
- Confirm IP addresses are on the same subnet. (LD204S maintenance port uses a different subnet).
- Check the physical connection
- IP conflict from other sensors. (Isolate sensor and try again)
- Contact Fiber SenSys technical support.

Settings

The screenshot shows the 'LASER DEFENDER Manager Settings' application. The top toolbar includes icons for 'Connect (F1)', 'Area Set (F2)', 'Settings (F3)', 'I/O Settings (F4)', 'Disconnect (F5)', 'Zoom Out (F9)', 'Zoom In (F10)', 'Home (F11)', and 'Help (F12)'. The 'Area Set (F2)' icon is highlighted with a red box. Below the toolbar is a graph with a horizontal axis from 0ft to 60ft and a vertical axis from 0ft to 60ft. A gray shaded area represents the sensing area. To the right is a 'Properties' panel for 'Detector 1'.

Detector Information	
Model	LD204S
Version	2.1.0 (11 Jul 2019)
Serial No.	1986880021S
IP Address	192.168.0.126

Detector Settings	
Detection Mode	Indoor mode
Environmental Resistance	Disable
Detection Area	Auto
Minimum Tracking Size	2.0 inch
Maximum Tracking Size	8.2 ft.
Sensitivity	150 msec.
Minimum Target Size (Width)	5.9 inch

Alarm Status			
B2	B1	A1	A2
Masking/Allocating File: No.1			
Replace			

Figure 6: Acquiring sensing information through Area Set

Once a connection to the Laser Defender has been made, the screen shows the detectors information and the sensing area displayed in the graph. Before any changes to the detector can be applied, an Area Set (F2) must be performed. The action of Area Set takes the perimeter edge of the sensors field-of-view and learns the entire sensing area as the primary focus of detection. The sensing area shows a gray outline around the perimeter.

Note: Any physical adjustments to the laser itself require another Area Set to relearn the laser's new position.

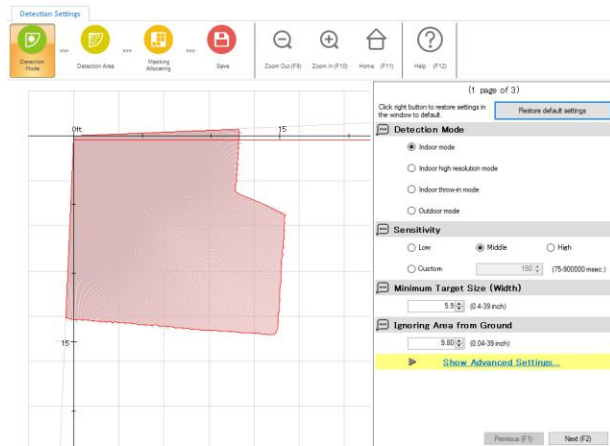


Figure 7: LD204S Detection Mode settings

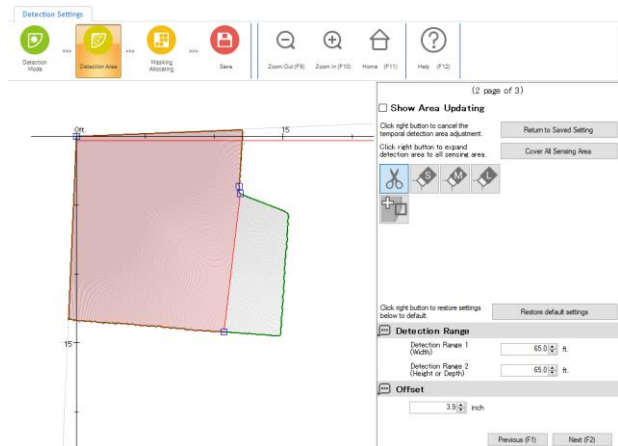


Figure 8: Removing unwanted areas using the scissor tool

Proceed to Settings (F3) and make the necessary detection changes to fit the application. Indoor Mode should be all that is necessary for most hangar door applications. For more information about the other modes, please refer to PM-ENG-084 LD-204S Rev B installation manual section 6-2 Detection Configuration. The next page provides adjustments to the detection area itself. Users can cut out unwanted areas or minimize the overall detection coverage. Offsetting the detection area places an area of non-detection around the entire perimeter of the sensing area. This helps avoid nuisance alarms caused by reflective surfaces.

The LD308SH offers a special mode specifically designed for ceiling and wall applications. This mode is Indoor Ceiling/Wall protection mode. Vertical is selected automatically in this mode and is available in horizontal installation for ceiling protection as well as vertical installation for wall protection. In this mode, the detectable distance for a 2in object is 16.4ft, while a 1ft object is detected at 100ft from the detector. Target size is not adjustable in this mode.

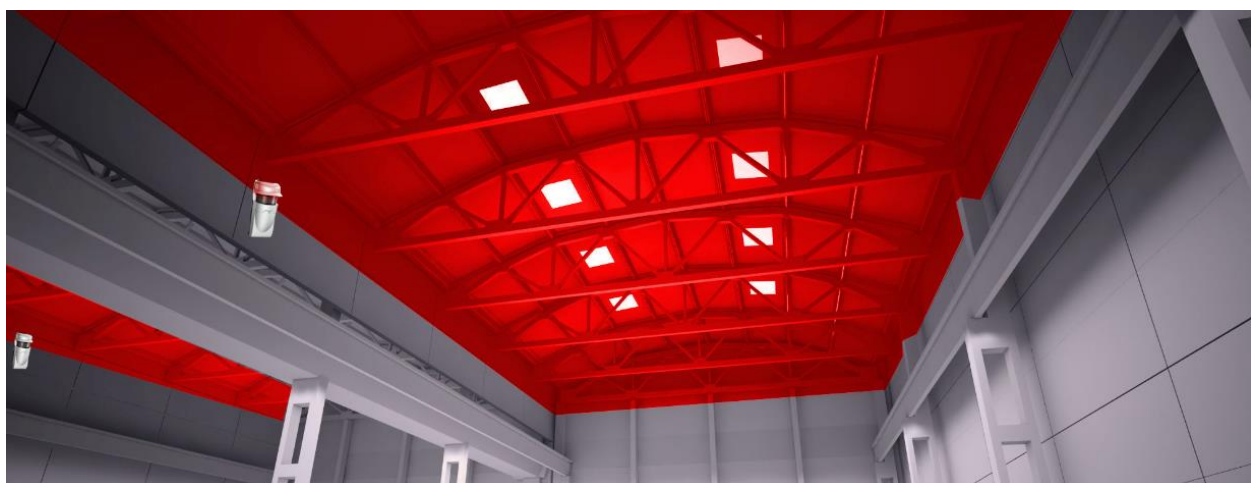


Figure 9: LD308SH in horizontal mode protecting skylights from intrusions using Indoor Ceiling/Wall protection mode

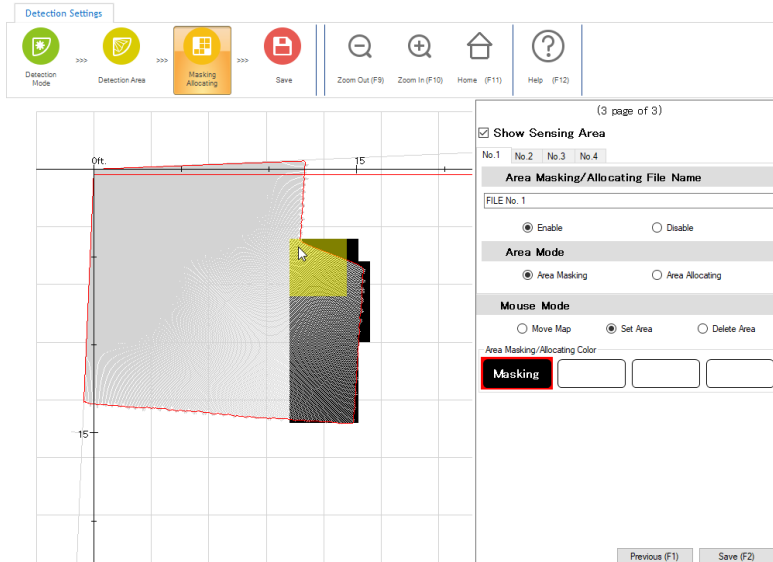


Figure 10: Masking unwanted areas

The third and final settings page covers area Masking and Allocating. Masking a section of the detection area becomes a non-detectable segment while the rest of the detection area remains detectable.

Enabling area allocating creates independent detection segments in the scanned area. Up to eight patterns can be allocated in the LD308SH; however, four patterns is set as default. This is commonly used with CCTV or independent zoning.

The scan area for the LD204S is divided into 10,000 segments, 7.8in squares.

The LD308SH is divided into 20,000 segments, 12in squares.

To save all detector settings either click the save button located at the bottom right corner of the screen or by clicking the red save button in the task bar.

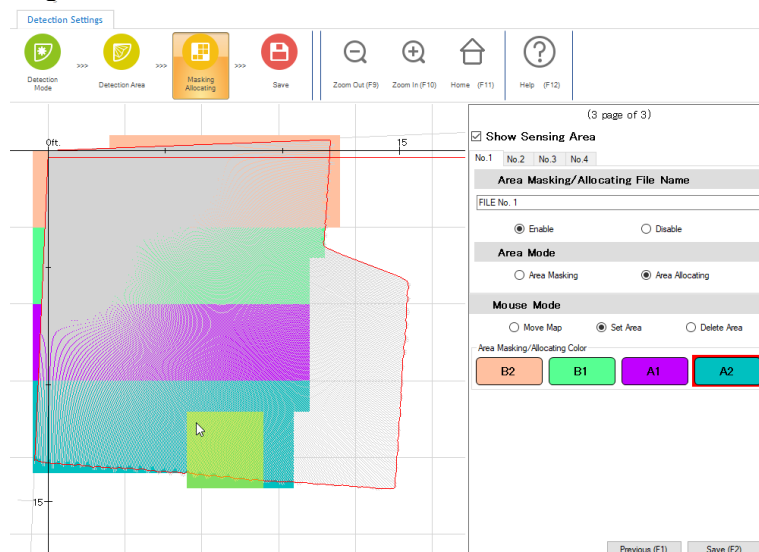
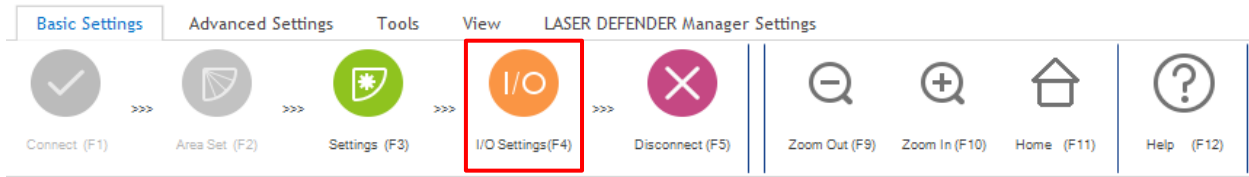


Figure 11: Zone selection using area allocating

Terminal Settings

Select relay I/O Settings for relay output configuration. Shown below in Figure 12 is the terminal settings page for the LD204S. Here the user can change alarm outputs from N/C to N/O. Users can also customize specific detection areas to a selected output. Additionally, trouble outputs can be selected for the desired output.

Terminal settings for the LD308SH change only the individual area output from N/O to N/C. All additional trouble outputs have their own dedicated output.



I/O Settings - □ ×

LASER DEFENDER Event Code Terminal

Signal Output 1

NC NO

Signal Output 2

NC NO

Signal Output 3

NC NO

Selection of Signal Output

	A1	A2	B1	B2	AM	AR	SO	DQ	TR	TA	DM
Output 1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Output 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Output 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Signal Input

Action: No Action ▼

Judgement Time: 1 (1-10 sec.)

Response: No Response ▼

Save Cancel

Figure 12: I/O terminal selector

Network Settings

Select the Advanced Settings tab and choose Network (F6) to change the detectors network settings.

Enter the preferred IP settings. Be sure the main and maintenance port remain on separate subnets. After saving the network settings, the detector resets and the user is disconnected from the detector. To reconnect to the Laser Defender, the IP address on the user's PC must be updated to fit the detector's new IP address scheme.

At this time, the Laser Defender can be connected to the LAN switch.

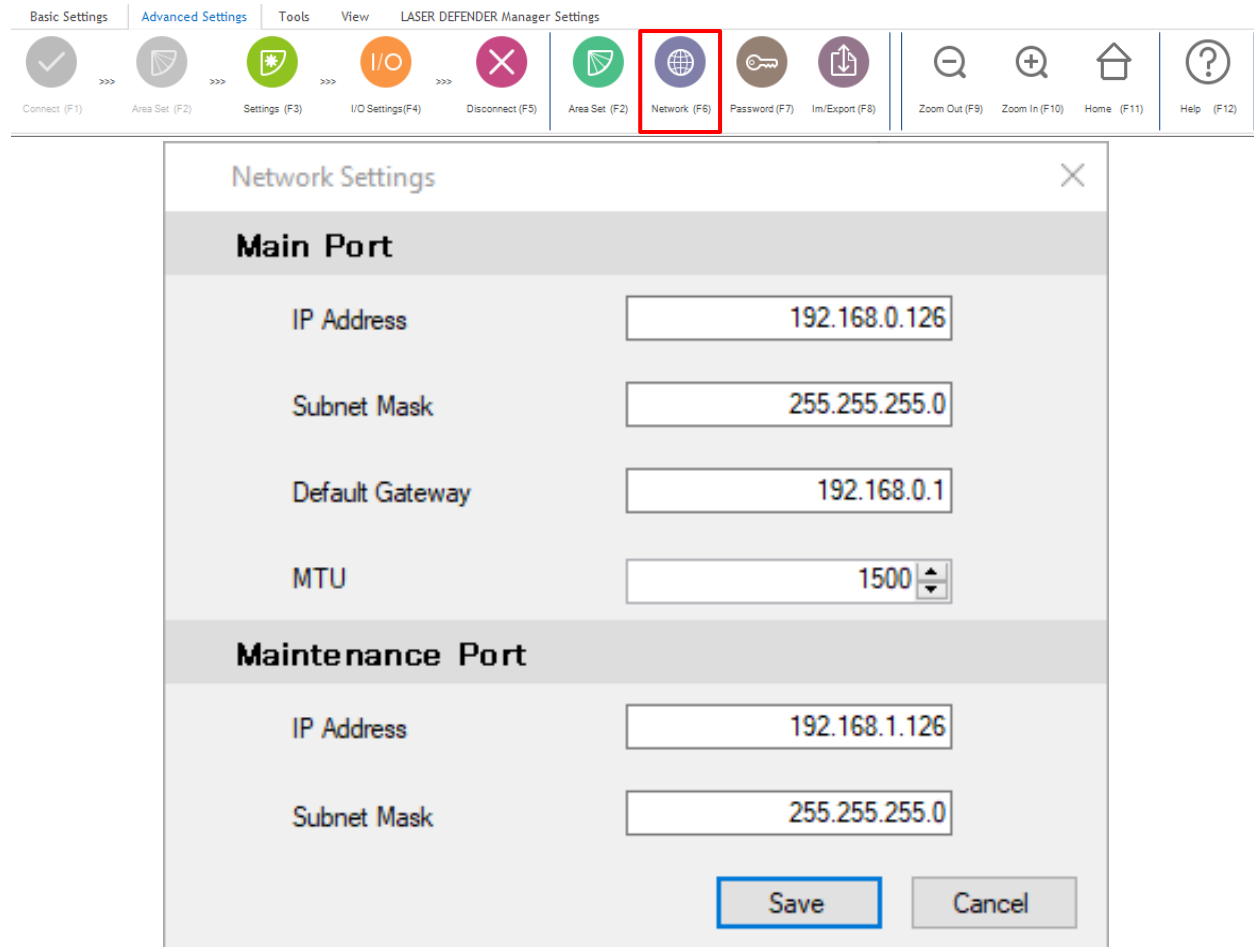


Figure 13: Changing network settings

Probability of Detection

To ensure reliable detection a series of simulated intrusion attempts must be conducted. These intrusion attempts are application-specific based on the laser's orientation. For example, the Laser Defender is ceiling mounted and in the vertical mode. The objective is to trigger an alarm when an intruder enters any part of the facility's openings. Be the intruder and simulate how the intruder attempts to bypass the detector.

These intrusion attempts may include:

- Crawling
- Jumping
- Walking
- Running
- Rolling

Simulate each attempt multiple times to confirm the laser is detecting reliably. Adjust settings as is necessary and continue to simulate the intrusions.

Maintenance

Periodic testing is a good way of extending the life of your system and ensuring correct functionality. Dusty environments, including cobwebs, put the Laser Defender at risk of unwanted trouble signals from laser window obscuring debris. Maintaining a clean laser window prevents these signals from occurring. Failure to maintain a clean laser window will eventually result in nuisance or missed alarms. The detection area needs maintenance as well, keep the detection area clear from boxes and other material that may obstruct the sensor field-of-view. Wet floors create reflective surfaces, and if offset is minimized or not used, this will result in nuisance alarms.

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